ANNUAL PROGRESS REPORT

(2021-2022)

Department of Organic Agriculture & Natural Farming

College of Agriculture

CSK Himachal Pradesh KrishiVishvavidyalaya

Palampur-176062 (H.P.)

Patron

Dr. Janardan Singh
Head

Compiled and edited by

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ACKNOWLEDGEMENT

The Annual Progress Report of the Department of Organic Agriculture and Natural Farming, College of Agriculture is based on the information furnished by the scientists working in the department. The work done during 2021-22 in the fields of teaching, research andextension has been compiled in this report.

The department receives its financial assistance through plan and non-plan schemes of the Government of Himachal Pradesh and adhoc research & development projects funded by the State Government, JICA, DBT,ICAR, New Delhi and other funding agencies. I am highly thankful to all these Institutions/Agencies for providing the financial assistance to this department.

The guidance, support and continuous encouragement provided by the Hon'ble Vice-Chancellor, Dr. H.K. Chaudhary, Dean, College of Agriculture, Dr. D. K. Vatsa and Director of Research, Dr. S.P. Dixit are gratefully acknowledged. Sincere thanks are also due to the Director, Extension Education, Dean, Post-Graduate Studies and respective heads of the Departments for rendering valuable guidance and keen interest in teaching, research and extension of the department.

The help and cooperation extended by the scientists, project, office and field staff of the department in accomplishing various activities with full devotion are thankfully acknowledged. I am very thankful to all the scientists and Mr. Raj Kumar for compiling and editing the report for the year of 2021-2022.

(Janardan Singh)
Head

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INTRODUCTION

Recent growing consensus about the ill effects of synthetic chemicals emphasized a need for change in agricultural production technologies through developing 'Organic Farming' which is a sustainable, eco-friendly and environmentally sound alternative agricultural approach. The activities to promote organic farming in this University were initiated during 2006, when the Model Organic Farm was established in an area of about 13 hectares for development of organic crop production technology along with Human Resource Development on various aspects of organic farming. To keep on the pace, in August 2009, a separate Department of Organic Agriculture was established to carry out exclusive research and different extension activities on organic farming for different stake holders of the state. Thereafter, with the inception of natural farming programme in state, this department also initiated efforts to carry out research on natural farming in addition to organic farming. As a result of which in January 2018, this department was renamed as 'Organic Agriculture & Natural Farming' a first of its own kind in the country. This department has three different research farms *viz.* i. Model Organic Farm (13 hectares) having dairy unit for carrying out exclusive research on organic farming; ii. ZBNF/Natural Farm (10 hectares) having dairy unit for carrying out research on various aspects of natural farming; iii.) Holta Farm (3 hectares) for carrying out comparative studies on natural, organic and inorganic farming.

For the wider adoption of natural farming in the state, a Zero Budget Natural Farming (ZBNF) centre was also established to demonstrate the cultivation of potential crops (cereals, pulses, oilseeds, vegetables, etc.) under natural farming system. This ZBNF Centre is acting as a focal point for the farmers of the state ultimately leading to successful transfer of technology to the farmers' fields and popularizing it for wider adoption. Presently, the technologies developed under natural farming system are being evaluated through multi locational studies. For wider adoption of this system, the University and different KVKs will disseminate the refined technologies for successful transfer to the farmers' fields. In addition to this, studies on the multiplication and popularization of different potential crops (Amaranth, Buckwheat and Chenopod) are also being under taken by this department, not only at the HQ but also at different multi-locational potential areas of the state under the Japan International Corporation Agency (JICA) funded project. However, under the ICAR sponsored NAHEP-CAAST project on 'Protected Agriculture & Natural Farming' evaluation of varieties of different vegetables and field crops under natural farming conditions are also being carried out. In order to standardize the different inputs being used in natural farming system studies on field evaluation and micro-biological analysis are also being under taken through a DBT sponsored *adhoc* research project.

The department is also engaged in carrying out research & extension on various aspects of organic/natural farming by preparing different types of organic and natural farming bioformulations/inputs for enhancing productivity and value addition. Efficacy of these bioformulations/inputs are being tested through research experiments and also being provided to different departments of the university and various agencies of the state, as per their requirement. The Scientists of the department are also extending the consultancy services in the field of

organic and natural farming to different field functionaries, farmers and stakeholders of the state as and when required.

Mandate

- Creation and dissemination of knowledge on organic agriculture & natural farming based on farm resource management

Thrust areas

- Evaluation and development of organic and natural farming input responsive varieties
- Scientific validation of different traditional organic/natural farming practices
- Standardization of suitable combinations of organic and natural farming inputs for nutrient and pest management
- Refinement of various agro-techniques
- Soil health and quality evaluation studies
- Integrated farming system development
- Human resource development through quality education and training

2. FACULTY AND STAFF POSITION

The department is doing its best to meet out the expectations of the university as well as the state government by developing, refining and disseminating the need based technologies on organic & natural farming. The faculty and non-teaching strength of this department is quite meagre because there is only one state scheme *viz.* APL-043-56 (II) and one ICAR sponsored AICRN on potential crops (ICAR-033-56) whereas, the other faculty are from different departments.

2.1 Faculty Position

Designation/Scale	Post	Filled	Vacant	Incumbent	Remarks
Head (37400-67000+GP)	-	1	-	Dr. Janardan Singh	Salary is being drawn from different departments
Principal Scientist (Agronomy) (37400-67000+GP)	-	1	-	Dr. Rameshwar Kumar	
Sr. Scientist (Plant Breeder) (37400-67000+GP)	1	1	-	Dr. Gopal Katna	ICAR-AICRN-033-56
Asst. Professor (Zoology) (18400-57000+GP)	-	1	-	Dr. Rakesh Kumar	Salary is being drawn from COBS

2.2 Staff Position

2.2.1 Office and Field staff					
Designation/Scale	**Posts**	**Filled**	**Vacant**	**Incumbent**	**Remarks**
Superintendent (63100 BP)	-	1	-	Smt. Nisha Bhardwaj	Salary being drawn from DEE
Sr. Scale Steno* (10300-34800+GP)	1	-	1	Sh. Raju Chauhan	Posted at V.C office, APL-043-56 (II)
Sr. Assistant (10300-34800+GP)	1	-	1	-	APL-043-56 (II)
Tech Assistant Gr-II (5910-20200+GP)	-	1	-	Sh. Bikram Singh	Salary being drawn from Seed Science & Technology
Field Assistant Gr-I (5910-20200+GP)	1	-	1		ICAR-AICRN-033-56

2.2.2 Research staff under ad hoc projects

Sr. No.	Name of the Project	Research staff	Incumbent
1.	NAHEP-CAAST on 'Protected Agriculture & Natural Farming'	Research Associate	Dr. Aditi Badiyala
2.	DUS testing of Buckwheat at CSKHPKV- RSS Sangla	Yong Professional-II	Mr. Manoj Kumar
3.	Popularization of Potential crops (Amaranth, Buckwheat and Chenopod) of North Western Himalayas as vegetable and seed under Organic and Natural Farming conditions through participatory plant breeding	Jr. Research Fellow	Mr. Raj Kumar
		Lab Assistant	Mr. Raman Kumar
4.	Establishment of Gurukul (Kurukshetra) Model of Zero Budget Natural Farming Centre at CSKHPKV, Palampur	Project Assistant	Mr. Kulbhushan
		Project Assistant	Smt. Anita Rana
		Field Helper	Sh. Santosh Kumar
5.	Evaluation, refinement and dissemination of technologies of Subhash Palekar Natural Farming (SPNF) in HP	Project Assistant	Ms.Sangeeta Kanwar
		Project Assistant	Sh. Santosh Kumar
		Field Assistant	Mr. Prashant
		Field Assistant	Mr. Vivek Gaurav
6.	Efficacy of indigenous cow based bio-formulations as soil inoculants and pesticides in agriculture	Jr. Research Fellow	Ms. Jyoti Bala

3. RESEARCH PROJECTS/SCHEMES

Presently, five ad hoc research projects funded by the ICAR, PPV & FRA and State Government of Himachal Pradesh, and two revolving fund schemes are in operation in the department.

3.1 On-going Research Projects

3.1.1 All India Coordinated Research Project (AICRPs)

Sr. No.	Name of project	Funding agency	Budget (Rs. in lakh)	Duration
1.	All India Coordinated Research Network Program on ‘ Potential Crops’	ICAR New Delhi	>30 lakhs	1996, long term

3.1.2 Ad hoc Research Projects

Sr. No.	Title of the Project	Funding agency	Budget (Rs. in lakh)	Duration
1.	NAHEP-CAAST on ‘Protected Agriculture & Natural Farming’	ICAR, New Delhi	20.00	Sept. 2019 to March 2023
2.	Establishment of Gurukul (Kurukshetra) Model of Zero Budget Natural Farming Centre at CSKHPKV, Palampur	H.P. Govt. Shimla	300.00	April 2018 to March 2023
3.	Evaluation, refinement and dissemination of technologies of Subhash Palekar Natural Farming (SPNF) in HP	-do-	185.15	April 2019 to March 2024
4.	Popularization of potential crops (Amaranth, Buckwheat and Chenopod) of North Western Himalayas as vegetable and seed under organic and natural farming conditions through participatory plant breeding	-do-	30.00	June 2021 to March 2024
5.	DUS testing of Buckwheat at CSKHPKV, RSS Sangla	PPV&FRA New Delhi	6.45	September 2021 onwards
6.	Efficacy of indigenous cow based bio-formulations as soil inoculants and pesticides in agriculture	DBT New Delhi	40.50	April 2022 to March 2025
7.	Capacity Building of Tribal Farmers of Himachal Pradesh through technological interventions in protected cultivation and organic farming - sub project ‘Economic upliftment of tribal farmers of HP through refinement and popularization of organic farming practices’	ICAR-TSP	19.00 (*Advance drawn*)	April 2019 to April 2023

3.2 Ad hoc Research Projects submitted

i. Research project entitled *"Evaluation, refinement and dissemination of technologies of Natural Farming in HP-II"* worth Rs. 304.08 lakhs was submitted and presented to *Prakritik Kheti Khushhal Kissan Yojna* (PK3Y), Govt. of Himachal Pradesh.

ii. Research project entitled "Enhancing livelihood security, youth empowerment and building entrepreneurship through production of organic & natural farming inputs" worth Rs. 53.80 lakh was prepared and submitted to the RKVY-RAFTAAR, Govt. of Himachal Pradesh.

3.3 Revolving fund scheme

Sr. No.	Name of the scheme (code)	Year of start	Seed money (Rs.)	Balance as on 31.7.2022 (Rs.)
1.	Revolving fund (RF-B-47-126-56)	2009	-	2,84,798 (2021-22)
2.	ELP (B-67-148-56)	2018	6,270	1,32,738

4. TEACHING

The faculty of the department is involved in teaching of various courses on organic farming and other related fields to UG, PG & Ph. D students of the University. In addition, they are also engaged in guiding the students of undergraduate, post graduate and doctoral programmes of their respective departments.

4.1 Courses taught

Sr. No.	Course No.	Course Title	Cr. Hrs	Name of Teacher
1.	ELP	Experiential Learning Programme (ELP) on Organic Agriculture Module (First Semester)	0+10	Dr. Janardan Singh Dr. Rameshwar Kumar Dr. Gopal Katna Dr. Rakesh
2.	ELP	Experiential Learning Programme on Organic Agriculture Module (Second Semester)	0+10	Dr. Janardan Singh Dr. Rameshwar Kumar Dr. Gopal Katna Dr Rakesh
3.	Agron 3610	Rainfed Agriculture &Watershed Management	1+1	Dr. Janardan Singh
4.	Agron 3611	Principles of Organic Agriculture	1+1	Dr. Rameshwar Kumar
5.	GP 367	Crop Improvement-II (*Rabi* crops)	1+1	Dr. Gopal Katna Dr. Uttam Chand
6.	GP 356	Intellectual Property Rights	1+0	Dr Gopal Katna
7.	GP 244	Commercial Plant Breeding	1+2	Dr. Gopal Katna Dr Uttam Chand
8.	Zoo.311	Applied Zoology	4+2	Dr. Rakesh Kumar
9.	Zoo.351	Elementary Human Physiology	2+1	Dr. Rakesh Kumar
10.	Zoo.312	Aquatic Biology	4+2	Dr. Rakesh Kumar Dr. Radhika Sharma
11.	Bio.111	Introductory Biology *(Two Sections)*	1+1	Dr. Rakesh Kumar
12.	Zoo.221	Genetics & Evolutionary Biology	4+2	Dr. Rakesh Kumar Dr. D.P. Pandey
13.	Zoo.121	Comparative Anatomy and Developmental Biology of Vertebrates	4+2	Dr. Rakesh Kumar
14.	Zoo 322	Reproductive Biology	4+2	Dr. Rakesh Kumar

Master's Programme				
1.	Agron 501	Modern Concepts in Crop Production	3+0	Dr. Rameshwar Kumar
2.	PGS 503	Intellectual Property and its management in agriculture	1+0	Dr. Gopal Katna
Ph. D. Programme				
1.	Agron 602	Crop Ecology	2+0	Dr. Janardan Singh

4.2 Experiential Learning Programme (ELP) on Organic Agriculture for the students of B.Sc. Agriculture, IVth year

Sr. No.	Name of Student	Admission No.
7th Batch (Sept. 2021)		
1.	Shreya Katoch	A-2018-01-101
2.	Vibha Singh	A-2018-01-117
3.	Ruchika Jarial	A-2018-01-085
4.	Sonali	A-2018-01-106
5.	Avantika Sharma	A-2018-01-028
6.	Aarzoo	A-2018-01-005
7.	Aakriti	A-2018-01-002
8.	Saina Walia	A-2018-01-088
9.	Kusum	A-2018-01-052
10.	Shivani Gupta	A-2018-01-099
11.	Shreya Guleria	A-2018-01-100
12.	Muskan	A-2018-01-061
13.	Ritesh Kumar	A-2018-01-080
14.	Shaurya Bhardwaj	A-2018-01-094
15.	Dhruv	A-2017-01-035
16.	Suraj Sharma	A-2018-01-109
17.	Sachin Verma	A-2018-01-086
18.	Abhay Verma	A-2018-01-007
8th Batch (March 2022)		
1.	Amandeep Verma	A-2018-01-014
2.	Ankit	A-2018-01-019
3.	Ashish Sharma	A-2018-01-026
4.	Diksha Kumari	A-2018-01-038
5.	Koyal	A-2018-01-045
6.	Kashish Sharma	A-2018-01-047
7.	Keerti Sharma	A-2018-01-048
8.	Muskan	A-2018-01-060
9.	Nitika Thakur	A-2018-01-068
10.	Prajwal Thakur	A-2018-01-073
11.	Ritvik Dogra	A-2018-01-081
12.	Robin Singh	A-2018-01-083
13.	Shalini Dogra	A-2018-01-091
14.	Shashwat Sood	A-2018-01-092
15.	Shivalika	A-2018-01-096
16.	Shreya Kumari	A-2018-01-102
17.	Sonali Katoch	A-2018-01-107
18.	Vani Mahendru	A-2018-01-114

4.3 Students' research guidance

Sr. No.	Name & Admission No. of the students	Programme	Name of Guide	Guiding/guided
1.	Shilpa (A-2018-40-008)	Ph.D	Dr. Janardan Singh	Guided
2.	Pooja (A-2020-40-005)	Ph.D	Dr. Janardan Singh	Guiding
3.	Belal Ahmad (A-2021-40-005)	Ph.D	Dr. Janardan Singh	Guiding
4.	Sachin Saharan (A-2020-30-013)	M.Sc	Dr. Janardan Singh	Guiding
5.	Shagun Jaggi (A-2021-30-019)	M.Sc	Dr. Janardan Singh	Guiding
6.	Rimzim (A-2021-30-101)	M.Sc	Dr. Janardan Singh	Guiding
7.	Saleman (A-2018-30-026)	M.Sc	Dr. Janardan Singh	Guided
8.	Raveena (A-2019-40-006)	Ph.D	Dr. Rameshwar Kumar	Guiding
9.	Arjun Singh (A-2021-40-004)	Ph.D	Dr. Rameshwar Kumar	Guiding
10.	Priyanshi Sood (A2020-30-012)	M.Sc	Dr. Rameshwar Kumar	Guiding
11.	Pranjal Sharma (A-2021-30-018)	M.Sc	Dr. Rameshwar Kumar	Guiding
12.	Raghav Sood (A-2020-30-042)	M.Sc	Dr. Gopal Katna	Guiding
13.	Ira (A-2020-30-038)	M.Sc	Dr. Gopal Katna	Guiding

5. RESEARCH

5.1 Significant research achievements

5.1.1 Varietal Evaluation

- **Rice:** The genotypes HPR 2720 (38.16 q/ha), HPR 1068 (35.16 q/ha) and HPR 1156 (30.56 q/ha) were found significantly highest yielders out of the fifteen genotypes evaluated under natural farming conditions.
- **Maize:** Two local collections of maize germplasm *viz*. Sainj-local and Jwalapur-local were multiplied under natural farming conditions. Among these, the plant height, number of plants/m^2, number of cobs/plant were higher in Sainj local than that of Jwalapur local. The variety Sainj local was found to be significantly highest yielder and superior than that of Jwalapur local.
- **Finger millet:** The genotypes VL 324 (15.43 q/ha) followed by VL 149 (15.07 q/ha) were found to be highest yielder among the five genotypes of finger millet evaluated under natural farming conditions.
- **Wheat:** Out of the eighteen genotypes evaluated, HPWO-5 (17.83 q/ha), MCTLH-21 (16.66 q/ha), Kanku (16.51 q/ha) were superior to that of other genotypes.
- **Lentil:** Out of the fifteen genotypes of lentil evaluated, HPLO-3 (7.90 q/ha) and DKL-13-3 (7.86 q/ha) and DKL-13-6 (7.73 q/ha) were superior to that of other genotypes.
- **Barley:** A set of 9 varieties of barley were evaluated under natural farming conditions out of which BHS-352 (16.04 q/ha) followed by BHS-400 (14.58 q/ha) and VLB-118 (13.32 q/ha) were the promising varieties and at par with each other.

5.1.2 Crop production

- **Paddy:** Among two varieties of paddy *i.e.* variety I: HPR-1068 and variety II: HPR-2880, tested for productivity the organic package (application of FYM @ 10 t/ha and spray of compost tea) produced higher yields to the tune of 41.29 and 40.79 q/ha, respectively. However, the natural farming treatment (application of *ghanjeevamrit* @ 5q/ha + spray of *jeevamrit* at 14 days interval + mulching+ *whapsa*) was the second best treatment in terms of yield production in both the varieties.
- **Maize:** In maize+soybean intercropping system, the organic package (application of FYM @ 10 t/ha and spray of compost tea) produced higher maize grain equivalent yield (67.92 q/ha) followed by natural farming treatment *i.e.* application of *jeevamrit* at 14 days interval (30.71 q/ha) and soybean intercrop yield (13.22 q/ha) closely followed by the natural farming treatment Maize + soybean + spray of *Jeevamrit* at 14 days interval which is the most economical treatment in getting the higher maize equivalent yield (66.58 q/ha), gross returns (76331.60), net returns (29521.60) and B:C (1.63) as compared to the organic production system.

- **Fingermillet:** The organic package (application of FYM @ 10 t/ha and spray of compost tea) produced higher grain equivalent yield of fingermillet (12.14 q/ha) followed by the natural farming treatment *i.e.* Fingermillet + soybean (line sowing) + application of *jeevamrit* at 14 days interval (11.06 q/ha).
- In wheat+gram and wheat+lentil intercropping system, the organic package produced the higher wheat grain yield, wheat equivalent yield (15.20 q/ha) and lentil grain yield (4.21 q/ha). Whereas, the natural farming system system was found to be the most economical in getting the higher gross returns (Rs. 76331.60), net returns (Rs. 29521.60) and B:C (1.63) as compared to the organic production system.
- In wheat+pea and wheat+sarson intercropping systems, organic farming treatment produced higher wheat equivalent yield (44.13 q/ha) and grain yield of peas (15.9 q/ha). However, natural farming treatment resulted in higher net returns and B:C as compared to the organic farming treatment.
- Among two varieties of oats *i.e.* Kent and Palampur-I, both the varieties produced significantly higher grain yield, net returns and B:C under natural farming treatments as compared to the organic farming treatments.

5.1.3 Soil & microbial studies

- The soil pH was in the range of 4.97 to 5.94 and EC was in the range of 0.01- 0.1. In case of paddy, chemical properties of soil *i.e.* percent organic carbon, microbial biomass carbon, available N,P,K and microbiological properties *i.e.* general bacterial count, phosphate solubilizing bacterial count, actinomycetes bacterial count and nitrogen fixing bacterial count were recorded highest at 14 days interval treatment of *jeevamrit* under SPNF conditions while the dehydrogenase activity (DHA) and fungal count were enhanced under organic package.
- Natural farming system enhanced the soil chemical properties and microbiological properties in comparison to the organic package in maize intercropping system.
- The soil chemical properties *i.e.* percent organic carbon, dehydrogenase activity, microbial biomass carbon, available N,P,K and fungal count were recorded maximum in natural system while microbiological properties were recorded highest in organic package in fingermillet crop.

5.1.4 Microbial studies in cow urine and cow dung

i. Total viable counts (TVC) of 10% (19/189) animals were more than 300 crores cfu/gm. This included cattle of
   a. Indigenous breeds - 12.00% (n=6/50)
   b. Pahari - 9.43% (n=5/53)
   c. Crossbred - 10.86% (n=5/46)
   d. Exotic breed - 13.63% (n=3/22)

ii. TVC > 300 crores cfu/gm were non-significantly associated with all the breeds of cattle.

iii. None of the churu or buffalo dung samples had TVC ≥ 300 crores cfu/gm.

iv. Highest TVC counts for buffalo and churu were 226 and 50 crores cfu/gm, respectively.

v. Nitrogen fixing bacteria counts >300 crores cfu/gm were recorded in indigenous and exotic breeds of cattle.
vi. Highest nitrogen fixing bacteria counts for Churu and Buffalo were 7.7 crores and 22.5crores cfu/gm respectively.

5.1.5 Human Resource Development

During the period under report, 468 farmers, 81 students and 25 officials belonging to different line departments/Universities were imparted training on various aspects of natural farming at ZBNF centre, CSKHPKV, Palampur

5.2 Experimental Results

5.2.1 Crop demonstrations

***Kharif* 2021**

Plant production under irrigated conditions

During *Kharif* 2021 the results of the demonstration conducted at Zero Budget Natural Farm, CSKHPKV, Palampur reflects that under irrigated conditions the yield of paddy (37.75 q/ha), finger millet equivalent yield (28.56 q/ha), mash (12.85 q/ha) and cowpea (11.65 q/ha) was higher under natural farming system as compared to organic package. Among pulses, vegetables and oilseeds the yields of mash (12.85 q/ha), cowpea (11.65 q/ha), green chilli (27.5 q/ha), okra (22.5 q/ha) and soybean (31.0 q/ha) were also higher under natural farming system as compared to organic package. Whereas, under organic farming conditions the yields of maize alone (24.5 q/ha), maize equivalent yield (60.9 q/ha), ricebean (14.75 q/ha), adzukibean and frenchbean (9.0 q/ha) were higher as compared to the natural farming system (Table 1).

Table 1. Comparative performance of different crops under irrigated conditions

Sr. No.	Crops	Yield (q/ha)		
		NF	Organic	Control
a.	**Cereals/Millets**			
i.	Paddy	37.75	36.25	26.25
ii.	Maize	21.00	24.50	14.00
iii.	Finger millet+Soybean (Finger millet equiv. yield)	28.56	27.35	17.83
iv.	Maize +Soybean (Maize grain equiv. yield)	52.73	60.09	30.51
b.	**Pulses**			
i.	Mash	12.85	11.25	7.00
ii.	Ricebean	14.50	14.75	10.50
iii.	Adzukibean	14.50	14.75	10.50
iv.	Cowpea	11.65	11.10	6.25
c.	**Vegetables**			
i.	Green chilli	27.50	23.50	13.50
ii.	Frenchbean	7.50	9.00	3.00
iii.	Okra+ Beans (As green manure)	22.50	19.00	12.50
d.	**Oilseed** (Soybean)	31.00	29.00	19.50

**NF: Natural Farming*

Plant production under rainfed conditions

The results of the experiments reflected that among cereals and pulses the maize equivalent yield (47.86 q/ha), finger millet equivalent yield (27.68 q/ha), yield of mash (6.0 q/ha), ricebean (10.50 q/ha), adzukibean (9.75 q/ha) and soybean (23.75 q/ha) were higher under natural farming practices as compared to the organic farming system. Whereas, the organic package produced the higher yields of maize alone (17.5 q/ha) and cowpea (9.5 q/ha) as compared to the natural farming system under rainfed conditions (Table 2).

Table 2. Comparative performance of different crops under rainfed conditions

Sr. No.	Crops	Yield (q/ha)		
		NF	Organic	Control
a.	**Cereals**			
i.	Maize	14.25	17.50	7.90
ii.	Finger millet+ Soybean (Finger millet equiv. yield)	27.68	26.93	18.25
iii.	Maize +Soybean (Maize grain equiv. yield)	47.86	43.60	29.42
b.	**Pulses**			
i.	Mash	6.00	5.00	4.50
ii.	Ricebean	10.5	8.75	6.00
iii.	Adzukibean	9.75	7.50	3.75
iv.	Cowpea	9.00	9.50	6.00
c.	**Oilseed**			
	Soybean	23.75	22.50	13.90

***Rabi* 2021-22**

Demonstrations on different crops under irrigated conditions

The results of the demonstrations conducted under irrigated conditions reflects that among cereals the yield of wheat, lentil, wheat equivalent yield in wheat+gram and wheat+linseed intercropping system was higher under natural farming system. Whereas, yield of gram, *gobhi sarson*, wheat equivalent yield in wheat+sarson, wheat+peas and wheat+lentil intercropping system was higher under organic farming system as compared to the natural farming practices (Table 3).

Table 3. Comparative performance of different crops under irrigated conditions

Sr. No.	Crops	Yield (q/ha)		
		NF	Organic	Control
a.	**Cereals, pulses oilseeds**			
i.	Wheat	32.25	29.25	24.00
ii.	Gram	9.00	11.00	6.50
iii.	Lentil	10.50	8.75	5.60
iv.	*Gobhi Sarson*	11.50	12.25	8.75
v.	Wheat+gram – (Wheat equiv. yield)	38.71	38.14	20.89
vi.	Wheat+ *Sarson* (*Wheat* equiv. yield)	28.60	31.31	13.29
vii.	Linseed +Peas (Linseed equiv. yield)	13.43	14.99	7.38
viii.	Wheat+linseed -(Wheat equiv. yield)	24.71	20.06	12.50
ix.	Wheat+lentil -(Wheat equiv. yield)	27.27	33.19	19.53

b.	Vegetables			
i.	Garlic	44.00	36.50	16.00
	Methi	0.75	0.60	4.00
ii.	Peas	59.00	47.00	22.00
	Methi	0.68	0.85	4.75
iii.	Onion	93.50	109.00	37.50
iv.	Radish	54.00	60.00	11.00
v.	*Methi*	2.25	2.75	1.00

Plant production under rainfed conditions

Under rainfed conditions, the results of demonstrations revealed that the yield of gram, lentil and wheat equivalent yield in wheat+gram intercropping system was higher under natural farming system. Whereas, yields of wheat, *Gobhi sarson*, Linseed equiv. yield (Linseed+ peas), Wheat equiv. yield in wheat+sarson and wheat+linseed intercropping system was higher under organic farming system as compared to the natural farming practices (Table 4).

Table 4. Comparative performance of different crops under rainfed conditions

Sr. No.	Crops	Yield (q/ha)		
		NF	Organic	Control
i.	Wheat	26.75	29.75	17.25
ii.	Gram	7.50	6.75	4.40
iii.	Lentil	11.00	10.55	7.50
iv.	Wheat+gram –(Wheat equiv. yield)	31.97	30.07	20.06
v.	Linseed+ peas (Linseed equiv. yield)	13.63	14.26	9.59
vi.	*Gobhi sarson*	10.00	11.10	6.65
vii.	Wheat+sarson- (Wheat equiv. yield)	23.75	29.92	17.79
viii.	Wheat+linseed- (Wheat equiv. yield)	22.61	25.19	10.34

Soil and microbiological studies

The results of the experiments conducted under irrigated conditions showed that the pH was in the range of 4.78 to 5.2 and EC was in the range of 0.09 to 0.16. Percent organic carbon, dehydrogenase activity and microbial biomass carbon were highest in natural farming treatment than organic farming treatment. Available N, P and K were the highest in natural farming treatments for all crops than organic treatment. In case of soybean available P, microbial biomass carbon and dehydrogenase were highest in organic treatment. In case of Adzukibean percent organic carbon and microbial biomass carbon were highest in organic treatment (Table 5).

The results of the experiments conducted under rainfed conditions showed that the pH was in the range of 4.49 to 5.18 and EC was in the range of 0.09 to 0.14. Percent organic carbon was highest in natural farming treatments for maize, soybean, maize+soybean crops than organic treatment. Dehydrogenase activity was highest in soybean, fingermillet +soybean, cowpea, mash, adzukibean and ricebean crops than organic treatments. Microbial biomass carbon was highest in natural farming treatment than organic farming treatment for most of the crops. Available N, P

and K was highest in natural farming treatment for maize, soybean, maize+ soybean, fingermillet + soybean, cowpea, mash, adzukibean and ricebean crops (Table 6).

Table 5. Estimation of soil (0-15 cm) parameters of irrigated experiment at harvest

Kharif Crops	Sample Name	% OC	Dehydrogenase activity (µg TPFg^{-1} soil hr^{-1})	Microbial biomass carbon (µg/g)	Available N (kg^{-1} ha)	Available P(kg^{-1} ha)	Available K(kg^{-1}ha)	pH	EC
		0-15	0-15	0-15	0-15	0-15	0-15	0-15	0-15
Green Chilli + Beans	A1 (NF)	0.66	4.78	69.57	250	32.24	134.70	5.14	0.16
	A1 (ORG)	0.64	4.76	61.65	219	29.74	125.72	4.99	0.11
	A1 (CON)	0.54	4.72	50.93	191	20.04	116.74	4.8	0.14
Okra+ Beans	A2 (NF)	0.57	4.40	69.72	216	31.24	172.86	4.98	0.17
	A2 (ORG)	0.55	4.18	61.80	213	24.28	121.23	4.87	0.09
	A2 (CON)	0.44	3.31	57.45	206	20.83	112.25	4.78	0.13
Maize	A3 (NF)	0.58	4.28	70.03	244	28.22	139.19	5.2	0.11
	A3 (ORG)	0.57	4.26	66.77	241	26.88	114.49	5.05	0.13
	A3 (CON)	0.45	3.86	54.66	216	21.28	110.01	5.04	0.11
Soybean (*Harit soya)*	A4 (NF)	0.62	4.82	78.54	272	29.00	177.35	5.1	0.11
	A4 (ORG)	0.61	4.79	79.88	250	23.52	162.76	5.0	0.12
	A4 (CON)	0.45	3.79	48.14	191	19.04	112.25	4.99	0.13
Maize+ Soybean	A5 (NF)	0.60	4.86	63.36	253	30.24	125.49	5.0	0.11
	A5 (ORG)	0.59	4.80	60.56	213	21.28	122.80	4.99	0.11
	A5 (CON)	0.51	4.56	41.92	197	21.28	110.01	4.98	0.14
Finger millet+ Soybean	A6 (NF)	0.57	5.58	63.67	255	28.00	130.21	5.05	0.12
	A6 (ORG)	0.56	5.40	60.56	244	25.76	110.11	4.9	0.12
	A6 (CON)	0.52	5.20	44.72	191	19.04	107.98	5.0	0.13
Cowpea	A7 (NF)	0.63	5.36	70.81	247	32.48	116.74	5.2	0.11
	A7 (ORG)	0.62	5.33	59.32	244	30.24	114.49	4.97	0.13
	A7 (CON)	0.52	5.19	52.80	188	21.28	91.59	5.18	0.14
Paddy	A8 (NF)	0.56	5.02	68.32	275	30.24	150.19	5.1	0.12
	A8 (ORG)	0.53	4.97	65.53	263	25.76	147.72	4.99	0.13
	A8 (CON)	0.50	4.58	54.35	191	21.28	104.84	5.1	0.14
Paddy	A9 (NF)	0.57	4.75	69.88	282	25.76	169.72	5.05	0.13
	A9 (ORG)	0.56	4.73	63.67	270	21.28	167.25	4.9	0.14
	A9 (CON)	0.52	4.70	50.31	188	21.28	122.35	5.08	0.11
Mash	A10(NF)	0.63	4.50	66.77	250	32.48	161.41	4.9	0.14
	A10(ORG)	0.62	4.47	60.56	245	31.24	159.17	5.08	0.14
	A10(CON)	0.46	4.48	63.67	210	21.28	123.02	5.0	0.12
Adzukibean	A11 (NF)	0.62	4.88	62.42	269	32.48	176.46	5.0	0.12
	A11(ORG)	0.63	4.65	62.89	264	31.24	163.21	4.9	0.14
	A11(CON)	0.48	4.38	51.24	190	25.52	123.02	4.98	0.12
Ricebean	A12 (NF)	0.57	4.52	69.88	263	30.24	183.86	5.03	0.11
	A12(ORG)	0.56	4.51	64.60	259	28.00	174.88	4.93	0.12
	A12(CON)	0.47	4.40	52.80	192	26.52	132.00	5.0	0.14
Soybean (Palam soya)	A13 (NF)	0.66	4.30	75.31	282	24.30	134.70	5.01	0.11
	A13(ORG)	0.64	4.31	72.98	272	26.76	132.45	4.99	0.12
	A13(CON)	0.53	4.30	49.38	194	23.52	112.25	5.05	0.13

Table 6. Estimation of soil (0-15) parameters of rainfed experiment at harvest

Kharif Crops	Sample Name	% OC	Dehydrogenase activity (µg TPFg^{-1} soil hr^{-1})	Microbial biomass carbon	Available N (kg^{-1} ha)	Available P (kg^{-1}ha)	Available K (kg^{-1}ha)	pH	EC
		0-15	0-15	0-15	0-15	0-15	0-15	0-15	0-15
Maize	B1 (NF)	0.51	3.58	74.54	291	32.48	125.72	5.18	0.09
	B1(ORG)	0.48	3.59	71.43	288	30.24	121.23	4.86	0.09
	B1(CON)	0.44	3.54	51.55	250	19.04	96.08	4.69	0.09
Soybean	B2 (NF)	0.53	4.63	78.88	291	32.48	139.19	4.98	0.10
	B2(ORG)	0.51	4.61	75.93	219	30.24	137.39	4.95	0.11
	B2(CON)	0.47	4.56	55.12	266	19.04	128.86	4.63	0.09
Maize+ Soybean	B3 (NF)	0.51	4.63	80.75	282	28.00	142.33	4.89	0.10
	B3(ORG)	0.50	4.65	76.71	279	25.76	141.88	4.83	0.10
	B3(CON)	0.40	4.59	54.04	188	19.04	119.20	4.67	0.08
Finger millet +Soybean	B4 (NF)	0.42	5.45	69.88	285	30.24	143.23	4.56	0.11
	B4(ORG)	0.43	5.44	65.53	279	28.00	127.96	4.90	0.10
	B4(CON)	0.39	5.40	51.24	219	19.04	125.72	4.92	0.09
Cowpea	B5 (NF)	0.43	5.61	66.77	260	34.72	148.17	4.99	0.14
	B5(ORG)	0.44	5.58	58.54	257	28.00	118.98	4.96	0.11
	B5(CON)	0.41	5.54	49.84	188	23.52	116.74	4.97	0.10
Mash	B6 (NF)	0.45	4.68	68.64	282	30.24	148.17	4.92	0.14
	B6(ORG)	0.46	4.54	59.68	279	28.00	139.19	4.88	0.12
	B6(CON)	0.44	4.45	55.90	219	18.81	127.96	4.88	0.10
Adzuki bean	B7 (NF)	0.49	4.05	71.43	254	34.72	137.39	4.99	0.13
	B7(ORG)	0.51	4.04	69.88	247	34.72	112.25	4.92	0.10
	B7(CON)	0.42	3.87	51.24	219	21.28	101.69	4.49	0.09
Ricebean	B8(NF)	0.45	4.38	68.32	250	34.72	130.88	4.99	0.14
	B8(ORG)	0.46	4.37	67.55	247	30.24	119.43	4.70	0.11
	B8(CON)	0.45	4.16	42.39	216	21.28	106.18	4.96	0.09

In experiments conducted under irrigated conditions, general bacterial count was higher in natural farming treatment than organic treatment for green chilli, okra, maize, soybean, fingermillet, paddy, mash, adzukibean and ricebean. Fungus count was higher in natural farming treatment than organic treatment for most of the crops. Actinomycetes count and P-solubilizing bacterial count was also higher in natural farming treatment than organic treatment for maize+soybean, finger millet+soybean, green chilli+beans, adzukibean, mash, cowpea, ricebean and paddy crops. Nitrogen fixing bacterial count was higher in natural farming treatment than organic treatment crops (Table 7).

Table 7. Estimation of Microbial count in soil (0-15 cm depth) of irrigated experiment

Kharif Crops	Sample	Nutrient Agar	Fungus	P-Solubilizers	Actinomycetes	N fixers
		CFU $X10^4$	CFU $X10^2$	CFU $X10^3$	CFU $X10^3$	CFU $X10^3$
Green Chilli+Beans	A1 (NF)	29.3	15	25.7	15.4	23.0
	A1 (ORG)	27.1	7	24.8	13.8	17.8
	A1 (CON)	17.8	5	16.1	12.2	12.1
Okra+Beans	A2 (NF)	22.5	14	22.7	21.8	23.8
	A2 (ORG)	27.8	11	25.0	22.7	21.2
	A2 (CON)	11.8	2	6.3	8.4	8.8
Maize	A3 (NF)	16.5	7	9.2	11.8	11.8
	A3 (ORG)	13.2	9	8.1	11.1	11.0
	A3 (CON)	9.2	14	7.1	7.8	6.7
Soybean	A4 (NF)	20.1	5	10.7	15.2	11.2

(Harit Soya)	A4 (ORG)	16.5	15	9.8	13.3	8.4
	A4 (CON)	8.8	10	7.0	8.3	6.8
Maize+ Soybean	A5 (NF)	14.4	15	5.5	6.8	8.7
	A5 (ORG)	13.8	12	4.3	5.4	5.4
	A5 (CON)	5.7	11	3.1	4.7	4.9
Fingermillet +Soybean	A6 (NF)	25.7	17	12.7	17.2	16.4
	A6 (ORG)	23.5	14	11.1	15.8	15.2
	A6 (CON)	15.1	7	4.4	10.8	5.2
Cowpea	A7 (NF)	22.1	15	5.3	14.4	20.4
	A7 (ORG)	20.7	13	3.8	12.6	14.8
	A7 (CON)	4.6	9	2.4	3.1	4.2
Paddy	A8 (NF)	12.5	14	4.8	16.2	6.2
	A8 (ORG)	11.4	14	3.7	12.8	5.0
	A8 (CON)	5.3	10	3.0	4.7	2.9
Paddy	A9 (NF)	17.0	13	6.3	15.3	15.7
	A9 (ORG)	12.1	11	5.7	10.5	10.5
	A9 (CON)	9.2	8	3.5	9.2	5.3
Mash	A10(NF)	24.8	13	8.2	16.8	16.2
	A10 (ORG)	23.0	8	9.1	10.8	9.3
	A10 (CON)	21.7	8	5.1	9.1	8.3
Adzukibean	A11 (NF)	7.5	17	4.0	5.8	5.2
	A11 (ORG)	5.2	12	3.3	3.7	4.5
	A11 (CON)	4.1	10	7.3	3.2	3.4
Ricebean	A12 (NF)	7.8	16	4.7	4.7	6.8
	A12 (ORG)	6.5	14	3.9	3.8	4.7
	A12(CON)	3.7	11	2.9	3.3	3.0
Soybean (Palam Soya)	A13 (NF)	8.5	15	4.2	5.8	5.7
	A13 (ORG)	6.1	12	3.7	4.1	5.3
	A13 (CON)	3.8	10	2.8	3.1	2.8

In rainfed experiments, general bacterial count, fungus count, phosphate solubilizer bacterial count, actinomycetes count, nitrogen fixing bacterial count were highest in natural farming treatment than organic treatment for most of the crops (Table 8).

Table 8. Estimation of Microbial count in soil (0-15 cm depth) of rainfed experiment

***Kharif* Crops**	**Sample**	**Nutrient Agar**	**Fungus**	**P-Solubilizers**	**Actinomycetes**	**Nitrogen fixers**
		CFU $X10^4$	CFU $X10^2$	CFU $X10^3$	CFU $X10^3$	CFU $X10^3$
Maize	B1 (NF)	15.8	5	7.5	7.5	7.5
	B1 (ORG)	17.4	4	7.0	6.2	6.9
	B1(CON)	8.3	3	5.8	5.7	5.4
Soybean	B2 (NF)	27.1	5	7.6	6.7	6.8
	B2 (ORG)	23.7	5	6.5	5.6	6.5
	B2(CON)	7.7	4	5.8	4.9	5.1
Maize+ Soybean	B3 (NF)	28.9	8	7.2	6.5	6.8
	B3 (ORG)	22.1	7	6.5	6.3	6.5
	B3(CON)	5.5	5	5.8	5.7	5.8
Fingermillet + Soybean	B4 (NF)	28.9	7	7.9	7.2	7.1
	B4 (ORG)	24.2	7	6.9	6.9	6.7
	B4(CON)	8.1	4	6.5	5.7	5.7

Cowpea	B5 (NF)	14.5	7	6.9	7.5	9.8
	B5 (ORG)	9.2	5	6.6	6.5	8.5
	B5(CON)	7.3	4	5.0	5.5	5.3
Mash	B6 (NF)	29.3	7	7.3	7.2	8.2
	B6 (ORG)	23.3	5	6.9	6.8	6.8
	B6(CON)	6.7	4	5.8	5.5	5.0
Adzukibean	B7 (NF)	28.3	6	8.0	7.8	7.8
	B7 (ORG)	22.7	6	7.1	6.7	6.9
	B7(CON)	7.1	5	6.5	5.9	5.7
Ricebean	B8(NF)	29.2	7	8.4	7.8	7.8
	B8 (ORG)	28.8	6	7.8	7.0	7.0
	B8(CON)	8.3	5	6.1	5.8	6.1

5.2.2 Development of package of practices of SPNF

i. Productivity and economics of paddy under natural farming system

Varieties: HPR-1068 and HPR-2880 Design: RBD Replications: 3

Seed treatment with *Beejamrit*, basal application of *Ghanjeevamrit* @ 5q/ha and *Jeevamrit* @ 500 l/ha except organic and control.

Treatments: 10

T_1 Paddy (Var.1) + spray of *Jeevamrit* at 14 days interval
T_2 Paddy (Var.1) + spray of *Jeevamrit* at 21 days interval
T_3 Paddy (Var.1) + spray of *Jeevamrit* at 28 days interval
T_4 Paddy (Var.2) + spray of *Jeevamrit* at 14 days interval
T_5 Paddy (Var.2) + spray of *Jeevamrit* at 21 days interval
T_6 Paddy (Var.2) + spray of *Jeevamrit* at 28 days interval
T_7 Organic package (Var.1)
T_8 Organic package (Var.2)
T_9 Absolute control (Var.1)
T_{10} Absolute control (Var.2)

To study the effect of natural farming inputs on the productivity and economics of paddy, an experiment was conducted at Zero Budget Natural Farm, CSKHPKV Palampur during *Kharif* 2021. A perusal of the data depicts that under organic farming treatment, application of FYM @ 10 t/ha + spray of compost tea at 15 days resulted in higher yields in both the varieties of paddy *i.e.* 41.29 q/ha and 40.79 q/ha, respectively. Whereas, under natural farming system, application of *Jeevamrit* at 14 days interval produced paddy grain yield 40.66 q/ha in variety 2 and 39.69 q/ha in variety 1 which is at par with the organic package. However, the natural farming treatment along with *Jeevamrit* at 14 days interval was observed to be the most economical treatment with higher net returns of Rs. 56566 and B:C of 1.86 as compared to the organic package (Table 9).

Table 9. Effect of treatments on the productivity and economics of paddy

Treatment		Grain yield (q/ha)	Gross returns (Rs.)	Net returns (Rs.)	B:C
T_1	Paddy (Var.1) + *Jeevamrit* at 14 DI	39.69	85142	54804	1.80
T_2	Paddy (Var.1) + *Jeevamrit* at 21 DI	38.22	81688	52100	1.76
T_3	Paddy (Var.1) + *Jeevamrit* at 28 DI	29.55	63008	34170	1.18
T_4	Paddy (Var.2) + *Jeevamrit* at 14 DI	40.66	86903	56566	1.86
T_5	Paddy (Var.2) + *Jeevamrit* at 21 DI	39.47	84472	54885	1.85
T_6	Paddy (Var.2) + *Jeevamrit* at 28 DI	36.32	77459	48622	1.68
T_7	Organic package (Var.1)	41.29	88154	43891	0.99
T_8	Organic package (Var.2)	40.79	86889	42627	0.96
T_9	Absolute control (Var.1)	17.59	37723	15460	0.69
T_{10}	Absolute control (Var.2)	26.07	55391	33129	1.48
CD at 5%		**4.14**	-	-	-

ii. Productivity and economics of maize intercropping system under natural farming system

Varieties: *Bajaura Makka* Lobia: Him Lobia-I Design: RBD Replication: 3

Seed treatments with *Beejamrit*, basal application of *Ghanjeevamrit* @ 5q/ha and *Jeevamrit* @ 500 l/ha except organic and control.

Treatments: 13

T_1 Maize + lobia + spray of *Jeevamrit* at 14 days interval
T_2 Maize + lobia + spray of *Jeevamrit* at 21 days of interval
T_3 Maize + lobia + spray of *Jeevamrit* at 28 days of interval)
T_4 Maize + soybean + spray of *Jeevamrit* at 14 days of interval
T_5 Maize + soybean + spray of *Jeevamrit* at 21 days of interval
T_6 Maize + soybean + spray of *Jeevamrit* at 28 days of interval
T_7 Maize + spray of *Jeevamrit* at 14 days of interval
T_8 Maize + spray of *Jeevamrit* at 21 days of interval
T_9 Maize + spray of *Jeevamrit* at 28 days of interval
T_{10} Organic package- Maize + soybean
T_{11} Organic package- maize + lobia
T_{12} Absolute control (Maize)
T_{13} Maize sole (organic)

An experiment was conducted to study the effect of natural farming inputs on the productivity and economics of maize intercropping system at Natural Farming centre, CSKHPKV, Palampur during *Kharif* 2021. The results of the experiment revealed that the organic package treatment T_{10} produced higher maize equivalent yield (67.92 q/ha) and soybean intercrop yield (13.22 q/ha) closely followed by the natural farming treatment Maize + soybean + spray of *Jeevamrit* at 14 days interval which is the most economical treatment in getting the higher maize equivalent yield (66.58 q/ha), gross returns (76331), net returns (29521) and B:C (1.63) as compared to the organic production system. The maize grain yield (24.20 q/ha) and

lobia grain yield (10.35 q/ha) were higher under this treatment as compared to the organic package (Table 10).

Table 10.Effect of treatments on the productivity & economics of maize intercropping system

Treatment		Yield (q/ha)			MEqY (q/ha)	Gross return (Rs.)	Net Return (Rs.)	B: C
		Maize	Lobia	Soybean				
T_1	Maize+lobia+*Jeevamrit* at 14 DI	21.82	10.35	-	46.33	70200	23390	1.50
T_2	Maize+lobia+*Jeevamrit* at 21 DI	20.36	7.37	-	37.82	59263	13253	1.29
T_3	Maize+ lobia+ *Jeevamrit* at 28 DI	18.47	6.83	-	34.64	50695	6085	1.14
T_4	Maize+soybean+*Jeevamrit* at 14 DI	24.20	-	12.39	66.58	76331	29521	1.63
T_5	Maize+soybean+*Jeevamrit* at 21 DI	22.88	-	10.47	58.70	65280	19270	1.42
T_6	Maize+soybean+*Jeevamrit* at 28 DI	20.15	-	7.64	46.28	60581	15971	1.36
T_7	Maize+*Jeevamrit* at 14 DI	21.17	-	-	21.17	60362	16537	1.38
T_8	Maize + *Jeevamrit* at 21 DI	19.94	-	-	19.94	51533	8508	1.20
T_9	Maize + *Jeevamrit* at 28 DI	17.78	-	-	17.78	48131	6506	1.16
T_{10}	Organic package-Maize+ soybean	22.69	-	13.22	67.92	72510	21435	1.42
T_{11}	Organic package- maize+ lobia	20.33	9.84	-	43.64	78929	27854	1.55
T_{12}	Absolute control (Maize)	20.16	-	-	20.16	62888	15763	1.33
T_{13}	Maize sole (organic)	12.36	-	-	12.36	31633	5633	1.12
	CD at 5%	**2.28**	**1.30**	**1.72**	**4.70**	**-**	**-**	**-**

MEqY: Maize grain equivalent yield

iii. Productivity and economics of fingermillet under natural farming system

Varieties: BL-149 Design: RBD Replication: 3

Seed treatments with Beejamrit, basal application of *Ghanjeevamrit* @ 5q/ha and *Jeevamrit* @ 500 l/ha except organic and control.

Treatments: 10

T_1 Fingermillet+ soybean (broadcasting) + spray of *Jeevamrit* at 14 days interval
T_2 Fingermillet+ soybean (broadcasting) + spray of *Jeevamrit* at 21 days interval
T_3 Fingermillet+ soybean (broadcasting) + spray of *Jeevamrit* at 28 days interval
T_4 Fingermillet+ soybean (line sowing) + spray of *Jeevamrit* at 14 days interval
T_5 Fingermillet+ soybean (line sowing) + spray of *Jeevamrit* at 21 days interval
T_6 Fingermillet+ soybean (line sowing) + spray of *Jeevamrit* at 28 days interval
T_7 Fingermillet+ soybean (broadcasting) + Organic package
T_8 Fingermillet+ soybean (line sowing) + Organic package
T_9 Fingermillet+ soybean (broadcasting) + Absolute control
T_{10} Fingermillet+ soybean (line sowing) + Absolute control

An experiment was conducted at Natural Farming centre, to study the effect of natural farming inputs on fingermillet + soybean intercropping system during *Kharif* 2021. The results of the experiment presented in Table 11 revealed that the treatment T_8 (Fingermillet + soybean

(line sowing) + organic package) followed by Fingermillet+ soybean (line sowing) + spray of *Jeevamrit* at 14 days interval produced higher equivalent yield of fingermillet *i.e.* 20.91 q/ha and 19.57 q/ha, respectively. However, the gross returns, net returns and benefit cost ratio was recorded higher with the treatment T_4 Fingermillet+ soybean (line sowing) + *Jeevamrit* at 14 days intervals compared to the organic package (Table 11).

Table 11. Effect of treatments on the productivity and economics of finger millet

Treatment		Yield (q/ha)		FMG Eq Yield (q/ha)	Gross return (Rs)	Net Return (Rs)	B:C
		Finger millet	Soybean				
T_1	Fingermillet+ soybean (broadcasting) + *Jeevamrit* at 14 DI	3.22	5.70	13.19	39723	12435	0.46
T_2	Fingermillet+ soybean (broadcasting) + *Jeevamrit* at 21 DI	2.99	5.26	12.19	36732	10194	0.38
T_3	Fingermillet+ soybean (broadcasting) + *Jeevamrit* at 28 DI	2.81	4.92	11.42	34448	8660	0.34
T_4	Fingermillet+ soybean (line sowing) + *Jeevamrit* at 14 DI	5.25	8.18	19.57	59041	30003	1.03
T_5	Fingermillet+ soybean (line sowing) + *Jeevamrit* at 21 DI	4.62	7.70	18.09	54605	26318	0.93
T_6	Fingermillet+ soybean (line sowing) + *Jeevamrit* at 28 DI	3.84	7.14	16.34	49374	21836	0.79
T_7	Fingermillet+ soybean (broadcasting) + Organic package	3.07	5.73	13.10	39494	1781	0.05
T_8	Fingermillet+ soybean (line sowing) + Organic package	6.14	8.44	20.91	58183	18720	0.47
T_9	Fingermillet+ soybean (broadcasting) + Absolute control	6.60	2.62	11.19	34818	17105	0.97
T_{10}	Fingermillet+ soybean (line sowing) + Absolute control	1.55	3.55	7.76	23294	3832	0.20
CD at 5%		**2.70**	**1.22**	**1.96**	-	-	-

FMG Eq: Finger millet Equivalent yield

iv. Effect of scheduling of *Jeevamrit* spray on productivity and economics of wheat based intercropping system under natural farming conditions

Design: RBD Replication: 3

Seed treatments with *Beejamrit,* basal application of *Ghanjeevamrit* @ 5q/ha in all treatments except organic and absolute control

Treatments: **13**

T_1 Wheat + gram (1:1) + spray of *Jeevamrit* at 14 days interval
T_2 Wheat + gram (1:1) + spray of *Jeevamrit* at 21 days interval
T_3 Wheat + gram (1:1) + spray of *Jeevamrit* at 28 days interval
T_4 Wheat + lentil (1:1) + spray of *Jeevamrit* at 14 days interval
T_5 Wheat + lentil (1:1) + spray of *Jeevamrit* at 21 days interval
T_6 Wheat + lentil (1:1) + spray of *Jeevamrit* at 28 days interval
T_7 Wheat (sole crop) + spray of *Jeevamrit* at 14 days interval

T_8 Wheat (sole crop) + spray of *Jeevamrit* at 21 days interval
T_9 Wheat (sole crop) + spray of *Jeevamrit* at 28 days interval
T_{10} Organic package- Wheat alone
T_{11} Organic package- Wheat + gram
T_{12} Organic package- Wheat + lentil
T_{13} Absolute control (Wheat + gram)

An experiment was conducted at Natural Farming centre, to study the effect of natural farming inputs on the productivity and economics of wheat+gram and wheat+lentil intercropping system during *Rabi* 2021-22. The results of the experiment conducted on wheat+gram and wheat+lentil intercropping system depicted that the organic package produced the higher wheat grain yield, wheat equivalent yield (15.20 q/ha) and lentil grain yield (4.21 q/ha) in treatment T_{11} (Organic package-wheat + gram). Whereas, the natural farming system treatment T_4 (wheat+lentil (1:1) + *jeevamrit* at 14 days interval) was found to be the most economical in getting the higher gross returns (Rs. 76331), net returns (Rs. 29521) and B:C (1.63) as compared to the organic production system (Table 12).

Table 12. Effect of treatments on productivity & economics of wheat intercropping system

Treatment		Yield (q/ha)			WEQ (q/ha)	Gross returns(Rs.)	Net returns (Rs)	B:C
		Wheat	Gram	Lentil				
T_1	Wheat+gram (1:1)+*Jeevamrit* at 14 DI	13.22	3.62	-	13.80	70200	23390	1.50
T_2	Wheat+gram (1:1)+*Jeevamrit* at 21 DI	12.10	2.42	-	12.79	59263	13253	1.29
T_3	Wheat+gram (1:1)+*Jeevamrit* at 28 DI	10.28	2.01	-	13.13	50695	6085	1.14
T_4	Wheat+lentil (1:1)+*Jeevamrit* at 14 DI	14.20	-		13.00	76331	29521	1.63
T_5	Wheat+lentil (1:1)+*Jeevamrit* at 21 DI	13.53	-	3.92	13.86	65280	19270	1.42
T_6	Wheat+lentil (1:1)+*Jeevamrit* at 28 DI	12.23	-	2.45	14.22	60581	15971	1.36
T_7	Wheat (sole crop) + *Jeevamrit* at 14 DI	16.27	-	2.28	13.07	60362	16537	1.38
T_8	Wheat (sole crop)+*Jeevamrit* at 21 DI	13.25	-	-	11.77	51533	8508	1.20
T_9	Wheat (sole crop)+*Jeevamrit* at 28 DI	13.11	-	-	12.59	48131	6506	1.16
T_{10}	Organic package- Wheat alone	14.04	3.56	-	11.33	72510	21435	1.42
T_{11}	Organic package- Wheat + gram	14.40	-	4.21	15.20	78929	27854	1.55
T_{12}	Organic package- Wheat + lentil	16.87	-	-	14.92	62888	15763	1.33
T_{13}	Absolute control (Wheat + gram)	8.12	-	-	8.27	31633	5633	1.12
CD at 5%		1.69	0.41	0.39	2.03		-	-

Sale rate of Wheat: Rs.2000/-, Gram: Rs. 6000/-, Lentil: Rs. 5500/- quintal

v. Effect of time of application of *Jeevamrit* on productivity and economics of wheat based cropping system under natural farming conditions

Design: RBD Replication: 3

Seed treatments with *Beejamrit,* basal application of *Ghanjeevamrit* @ 5q/ha and *Jeevamrit* @ 500 l/ha except organic and control.

Treatments: 11

T_1 Wheat + pea (1:1) + spray of *Jeevamrit* at 14 days interval
T_2 Wheat + pea (1:1) + spray of *Jeevamrit* at 21 days interval
T_3 Wheat + pea (1:1) + spray of *Jeevamrit* at 28 days interval

T_4 Wheat + sarson (1:1) + spray of *Jeevamrit* at 14 days interval
T_5 Wheat + sarson (1:1) + spray of *Jeevamrit* at 21 days interval
T_6 Wheat + sarson (1:1) + spray of *Jeevamrit* at 28 days interval
T_7 Organic package-wheat alone
T_8 Organic package- Wheat + pea
T_9 Organic package- Wheat + sarson
T_{10} Absolute control-with T_1
T_{11} Absolute control-with T_4

An experiment was conducted at ZBNF farm to study the effect of different treatments on wheat based intercropping system. The results of the study revealed that the treatment T_8 (Organic package -wheat+pea) produced the significantly higher wheat equivalent yield (44.13 q/ha) as compared to the natural farming practices (40.91 q/ha). Similarly, the higher grain yield of wheat (12.77 q/ha) and peas (15.90 q/ha) were also obtained with the organic package, whereas, the natural farming system produced the higher grain yield of sarson (7.21 q/ha) which is at par with the organic package in the wheat+pea+sarson intercropping system. However the natural farming treatment T_1 (Wheat + peas (1:1) + spray of *Jeevamrit* at 14 days interval) was comparatively better in getting the highest gross returns of Rs. 103093 net returns of Rs. 69918 and B:C of 2.11 closely followed by T_8 (Organic package -wheat+pea) as compared to rest of the treatments (Table 13).

Table 13. Effect of treatments on the productivity of wheat based cropping system

Treatment	Yield (q/ha)			WEQ (q/ha)	Gross returns (Rs.)	Net return	B:C
	Wheat	Peas	Sarson				
T_1 Wheat + pea (1:1) + *Jeevamrit* at 14 DI	10.92	14.25	--	40.91	103093	69918	2.11
T_2 Wheat + pea (1:1) + *Jeevamrit* at 21 DI	9.55	12.07	--	34.95	87375	54950	1.69
T_3 Wheat + pea (1:1) + *Jeevamrit* at 28 DI	9.29	10.58	--	31.56	79783	48108	1.52
T_4 Wheat +sarson (1:1) +*Jeevamrit* at 14 DI	9.29	--	7.21	25.98	65677	34122	1.08
T_5 Wheat +sarson (1:1)+ *Jeevamrit* at 21 DI	10.03	--	6.99	26.21	67307	36502	1.18
T_6 Wheat + sarson (1:1) +*Jeevamrit* at 28 DI	8.55	--	6.44	23.46	58650	28595	0.95
T_7 Organic package-wheat alone	12.77	--	--	12.77	32078	-10721	-0.25
T_8 Organic package- wheat + pea	10.66	15.90	--	44.13	112443	69843	1.64
T_9 Organic package- wheat + sarson	9.62	--	7.03	25.89	65449	24469	0.60
T_{10} Absolute control-with T1	6.88	5.55	--	18.56	48434	25834	1.14
T_{11} Absolute control-with T4	6.77	--	3.03	13.78	34450	13470	0.64
CD at 5%	**2.35**	**2.13**	**2.7**	**2.39**	-	-	-

Sale rate of Wheat: Rs.2000/-, Peas: Rs. 4000/-, Sarson: Rs. 4400/- quintal

vi. Effect of time of application of *Jeevamrit* on productivity and economics of gram & lentil

Design: RBD Replication: 3

Seed treatments with *Beejamrit*, basal application of *Ghanjeevamrit*@ 5q/ha and *Jeevamrit* @ 500 l/ha except organic and control.

Treatments: 10

T_1 Gram + spray of *Jeevamrit* at 14 days interval
T_2 Gram + spray of *Jeevamrit* at 21 days interval
T_3 Gram + spray of *Jeevamrit* at 28 days interval
T_4 Lentil + spray of *Jeevamrit* at 14 days interval
T_5 Lentil + spray of *Jeevamrit* at 21 days interval
T_6 Lentil + spray of *Jeevamrit* at 28 days interval
T_7 Organic package-gram
T_8 Organic package-lentil
T_9 Absolute control with gram
T_{10} Absolute control with lentil

An experiment was conducted to study the effect of different treatments on the productivity of gram and lentil under organic and natural farming system. The results obtained from the study revealed that the natural farming system along with the application of *Jeevamrit* at 14 days interval produced the higher grain yield of gram (0.61 q/ha) than the organic package. Whereas the organic package produced the higher grain yield of lentil (0.39 q/ha) as compared to the natural farming system which are at par with each other (Table 14).

Table 14. Effect of treatments on the productivity of gram and lentil

Treatment	Yield (q/ha)		Gross returns(Rs.)	Net return (Rs.)	B:C
	Gram	Lentil			
T_1 Gram + *Jeevamrit* at 14 DI	0.61	-	4204	-28571	-0.87
T_2 Gram + *Jeevamrit* at 21 DI	0.48	-	3293	-28732	-0.90
T_3 Gram + *Jeevamrit* at 28 DI	0.43	-	2933	-28341	-0.91
T_4 Lentil + *Jeevamrit* at 14 DI	-	0.31	1964	-30060	-0.94
T_5 Lentil + *Jeevamrit* at 21 DI	-	0.30	1892	-29382	-0.94
T_6 Lentil + *Jeevamrit* at 28 DI	-	0.25	1537	-28987	-0.95
T_7 Organic package-gram	0.55	-	3683	-38516	-0.91
T_8 Organic package-lentil	-	0.39	2416	-39033	-0.94
T_9 Absolute control with gram	0.33	-	2293	-19906	-0.90
T_{10} Absolute control with lentil	-	0.22	1376	-19773	-0.93
CD at 5%	**0.223**	**-**	**-**	**-**	**-**

However, attack of the pod borer in gram declined the crop yield to a higher extent and it could not be managed by the available natural farming practices. Whereas, the heavy hailstorm and some agroclimatic conditions resulted in shattering of the lentil crop during the flowering stage and the yield was decreased (Table 14).

vii. Effect of time of application of *Jeevamrit* on productivity and economics of different varieties of oats under natural farming system

Design: RBD Replication: 3

Seed treatments with *Beejamrit*, basal application of *Ghanjeevamrit* @ 5q/ha and *Jeevamrit* @ 500 l/ha except organic and control treatments.

Treatments: 10

T_1 Oat (Kent) + spray of *Jeevamrit* at 14 days interval
T_2 Oat (Kent) + spray of *Jeevamrit* at 21 days interval
T_3 Oat (Kent) + spray of *Jeevamrit* at 28 days interval
T_4 Oat (Palampur-1) + spray of *Jeevamrit* at 14 days interval
T_5 Oat (Palampur-1) + spray of *Jeevamrit* at 21 days interval
T_6 Oat (Palampur-1) + spray of *Jeevamrit* at 28 days interval
T_7 Organic package- Oat (Kent)
T_8 Organic package- Oat (Palampur-1)
T_9 Absolute control-with Kent
T_{10} Absolute control-with Palampur-1

To study the effect of different treatments on the two varieties of oats an experiment was conducted at ZBNF farm during the season. The results reflected that the higher yield of oats in both the varieties was obtained under natural farming system with the treatments T_3 (23.32 q/ha) & T5 (18.14 q/ha) respectively, as compared to the organic package. In addition, the natural farming treatments were observed to be the best in getting the higher gross returns, net return and B:C in both the varieties of oats as compared to the organic package (Table 15).

Table 15. Effect of treatments on the productivity of oats

Treatment	Yield (q/ha)	Gross returns (Rs)	Net returns(Rs)	B:C
T1. Oat (Kent)+spray of *Jeevamrit* at 14 DI	21.85	98704	67829	2.20
T2. Oat (Kent)+spray of *Jeevamrit* at 21 DI	17.18	77239	47114	1.56
T3. Oat (Kent)+spray of *Jeevamrit* at 28 DI	23.32	101775	72400	2.46
T4. Oat (Palampur-1)+spray of *Jeevamrit* at 14 DI	14.62	69115	38240	1.24
T5. Oat (Palampur-1)+spray of *Jeevamrit* at 21 DI	18.14	81930	51805	1.72
T6. Oat (Palampur-1)+spray of *Jeevamrit* at 28 DI	15.36	69940	40565	1.38
T7. Organic package-Oat (Kent)	16.10	72174	31874	0.79
T8.Organic package- Oat (Palampur-1)	16.10	72967	32667	0.81
T9. Absolute control-with Kent	7.22	35610	15310	0.75
T10. Absolute control-with Palampur-1	8.51	39376	19076	0.94
CD at 5%	**8.271**	**-**	**-**	**-**

5.2.3 Varietal Evaluation

i. Evaluation of rice genotypes/varieties for seed yield and its related traits

Fifteen genotypes of rice were evaluated in randomized block design of $9m^2$ plot size with three replications by following all the practices of natural farming conditions. The analysis of variance revealed that all the traits under study had significant variation. The variation for days to maturity ranged from 99.33 to 106.66 days with overall mean of 102.17 days. The genotype Kalighini was observed to be significantly early maturing than that of other genotypes. Plant height ranged from 85.16 to 147.00 cm with a mean value of 104.71 cm. The genotype

HPR 2795 was significantly superior for plant height as compared to others. The extent of variation observed for number of tillers ranged from 6.00 to 8.43 with overall mean of 7.20. The extent of variation observed for seed/panicle trait ranged from 101.03 to 136.06 with a mean value of 119.86. The genotypes HPR 2720, HPR HPR 2143 were superior than that of other genotypes. Seed yield ranged from 12.10 q/ha to 38.16 q/ha with overall mean of 24.26 q/ha. The genotypes HPR 2720 (38.16 q/ha), HPR 1068 (35.16 q/ha) and HPR 1156 (30.56 q/ha) were at par with each other. Among 15 genotypes of paddy evaluated under ZBNF conditions genotypes HPR 2720 followed by HPR 1068 were found to be highest yielder as compared to the other lines (Table 16).

Table 16. Evaluation of rice genotypes for seed yield and its related traits under Natural Farming conditions

Treatment/ Variety	Days to 50% flowering	Days to 75% maturity	Plant Height (cm)	Number of tillers	Seeds/ panicle	Yield (q/ha)
HPR19	68.66	100.66	85.50	8.43	101.03	25.50
HPR 29	69.66	102.66	89.23	8.40	121.23	18.93
HPR1068	71.00	102.33	101.93	7.53	110.33	35.17
HPR 2143	65.00	103.33	95.33	7.66	124.00	24.27
HPR2880	66.00	103.00	96.33	6.8	108.73	27.23
Kalighini	64.00	99.33	125.93	6.06	124.30	21.58
Sattu Dhan	65.00	101.33	110.23	7.96	119.53	25.17
Suila Dhan	67.00	101.66	108.60	6.00	118.10	23.24
HPR 2720	69.66	100.66	116.43	7.96	136.06	38.17
HPR 2795	67.33	102.00	147.00	6.03	127.80	20.53
HPR 2143	64.66	103.66	100.53	6.33	134.00	28.17
PUSA 1509	65.33	102.33	85.16	6.46	121.43	16.47
PUSA 1121	68.00	106.66	95.90	7.83	118.20	20.63
HPR 1156	64.66	100.66	122.76	6.6	117.30	30.57
HPR 2612	67.33	102.33	89.86	7.93	115.96	15.83
G.M.	**66.88**	**102.17**	**104.71**	**7.20**	**119.86**	**24.76**
CD at 5%	**0.81**	**0.89**	**3.50**	**0.65**	**1.99**	**1.64**

ii. Evaluation of Finger millet genotypes with respect to different traits under Natural Farming conditions

Five genotypes of finger millet were evaluated in randomized block design of 3.6m^2 plot size with 4 replications following all the practices of Natural Farming conditions. The analysis revealed that all the traits of finger millet under study had significant variation. The variation for days to maturity ranged from 148.50 to 153.75 days with overall mean of 150.3 days. The genotypes VL 347 was observed to be significantly early maturing than that of other genotypes. The extent of variation observed for plant height ranged from 100.50 to 112.50 with overall mean of 106.65 cm. The genotype VL 149 was observed to be significantly superior as compared to others. Number of spikelets ranged from 6.20 to 7.67 with a mean value of 7.00. Among these 5 genotypes VL 149 followed by VL 352 were at par with each other as compared

to other genotypes. Seed yield ranged from 8.27 q/ha to 15.43 q/ha with overall mean of 11.94 q/ha. The genotypes VL 324 (15.43 q/ha) and VL 149 (15.07 q/ha) were significantly superior than that of other genotypes. Among all these 5 genotypes of finger millet evaluated under ZBNF conditions genotype VL 324 followed by VL 149 was found to be highest yielder as compared to the other (Table 17).

Table 17. Evaluation of finger millet genotypes for seed yield and its related traits under Natural Farming conditions

Treatment/ Variety	Days to 50% flowering	Days to 75% maturity	Plant Height (cm)	Number of spikelets	Yield (q/ha)
VL 315	109.5	149.0	106.0	7.02	8.27
VL 352	106.2	153.7	107.0	7.17	10.25
VL 149	107.0	150.0	112.5	7.67	15.07
VL 347	101.5	148.5	100.5	6.20	10.70
VL 324	106.7	150.2	107.2	6.95	15.43
G.M.	**106.2**	**150.3**	**106.6**	**7.00**	**11.94**
CD at 5%	**0.84**	**1.70**	**0.96**	**0.48**	**0.50**

iii. Maize

Two local collections of maize germplasm *viz*. Sainj-local and Jwalapur-local were procured from Kullu and grown under ZBNF conditions. Self seeds were procured from these two varieties and will be evaluated during next *Kharif* season for further evaluation and multiplication. Among these two local varieties of maize, Sainj Local had plant height, number of plants/m, number of leaves or cobs/plant were higher than that of Jwalapur Local. The variety Sainj local was found to be significantly highest yielder and superior than that of Jwalapur local (Table 18).

Table 18. Evaluation of maize genotypes under natural farming conditions

Traits	Sainj local	Jwalapur local
Plant height cm	214.0	191.6
Number of plants/m	6.2	5.8
Number of leaves/plant	13.5	13.0
Plant diameter	3.0	3.0
Number of cobs/plant	2.0	1.6
Cobs procured	25	25

iv. Wheat

Eighteen genotypes of wheat were evaluated in randomized block design of $3m^2$ plot size with three replications by following all the practices of SPNF conditions. The analysis of variance revealed that all the traits under study had significant variation. The genotypes HPWO-5 (17.83 q/ha) MCTLH-21 (16.66 q/ha), Kanku (16.51 q/ha) were significantly superior to that of other genotypes (Table 19).

Table 19. Evaluation of wheat genotypes for seed yield and its related traits under SPNF conditions

Treatment/ Variety	Days to 50% flowering	Days to 75% maturity	Plant height (cm)	Yield (q/ha)
HPWO-4	121.66	161.66	77.73	13.06
MCTLH-21	125	158.33	94.13	16.66
MCTLH-25	116.66	156.66	85.6	11.79
KANKU	111.66	154.66	98.16	16.51
HPWO-5	106.66	155	72.73	17.83
HPW-249	121.66	153.66	82.3	12.00
MCTLH-19	115	160	82.13	9.83
MCTLH-23	120.66	154.33	78.83	11.72
MCTLH-24	115	159.66	78.96	11.45
HPW-349	116.66	158.33	87.13	13.31
MCTLH-28	121.66	164.66	80.16	13.79
MCTLH-26	106.66	160	81.16	14.03
MCTLH-27	103.33	159	78.16	14.14
MCTLH-29	107.66	157.66	77.7	10.86
MCTLH-6	120	171.66	87.8	8.75
MCTLH-22	103.33	160	91.73	14.75
HPW-155	108.33	157.66	85.66	10.75
HPW-368	121.66	160.66	79.66	13.75
G.M.	114.63	159.09	83.32	13.05
CD at 5%	**7.29**	**7.78**	**4.04**	**0.31**

v. Barley

A set of 9 varieties of barley were evaluated in randomized block design of 5.0m^2 plot size with 3 replications following all the practices of SPNF conditions. The analysis of variance revealed that all the traits of barley under study had significant variation. The top yielder was BHS-352 (16.04 q/ha), followed by the entries BHS-400 (14.58 q/ha) and VLB-118 (13.32 q/ha) which were at par with each other (Table 20).

Table 20. Evaluation of barley varieties for seed yield and its related traits under SPNF conditions

Treatment/ Variety	Days to 50% flowering	Days to 75% maturity	Plant height (cm)	Yield (q/ha)
HBL-316	108.3	151.66	67.73	8.66
HBL-713	111.7	145	84.13	11.27
VLB-118	120	147.66	75.6	13.32
BHS-352	101.7	156.66	88.16	16.04
HBL-113	105	146.66	62.73	12.26
BHS-400	107	156.66	72.3	14.58
HBL-804	108.3	150	72.13	12.83
HBL-276	115	148.66	73.83	10.18
BHS-380	113.7	145	75.96	10.9
Grand mean	110.07	149.77	74.73	12.23
CD at 5%	8.86	8.66	3.56	2.17

vi. Lentil

Fifteen genotypes of lentil were evaluated in randomized block design of 3.6m^2 plot size with three replications by following all the practices of SPNF conditions. The analysis of variance for 15 genotypes of lentil revealed that all the traits under study had significant variation. The genotypes HPLO-3 (7.90 q/ha) followed by DKL-13-3 (7.86 q/ha) and DKL-13-6 (7.73 q/ha) were superior to that of other genotypes (Table 21).

Table 21. Evaluation of lentil genotypes for seed yield and its related traits under SPNF conditions

Treatment/ Variety	Days to 50% flowering	Days to75% maturity	Plant height (cm)	Number of branches	Yield (q/ha)
VIPASHA	110.00	153.33	36.94	29.46	6.24
DKL-59	111.66	148.33	34.44	28.18	7.34
HPLO-3	112.33	148.33	32.41	26.24	7.90
DKL-13-6	102.66	145.00	38.62	33.81	7.73
DKL-13-2	101.66	148.33	39.67	34.31	7.41
DKL-13-3	104.00	150.00	33.11	26.94	7.86
DKL-57	96.66	148.33	38.89	29.38	6.79
DKL-13-1	102.00	151.33	36.39	27.39	6.38
MARKANDEY	108.33	148.33	36.78	27.81	5.38
HPLO-1	108.33	155.00	32.99	27.32	6.85
DKL-13-4	101.66	141.66	42.73	30.24	7.11
DKL-50	98.33	140.00	36.24	29.87	6.46
HPLO-2	111.66	155.00	33.15	26.91	6.14
DKL-37	101.66	153.33	40.17	31.92	6.23
DKL-61	106.66	153.33	37.29	28.98	5.58
Grand mean	**105.17**	**149.31**	**36.65**	**29.25**	**6.75**
CD at 5%	**6.60**	**8.07**	**5.50**	**4.94**	**1.02**

5.2.4 Microbial evaluation in cow dung and urine

Work done/ target achieved

- 189 faecal samples were collected per-rectal from indigenous breeds of cows, pahari cows, cross bred cows, exotic cows,buffalo and churu for Total Viable count(TVC) and counts of nitrogen fixing bacteria from organized farms,goushalas and farmers field (Table 23)

- Samples were collected from 4 agroclimatic zones comprising 9 distrcts and 54 different places (Table 22).

Table 22. Samples collected from different agro climatic zones from various breed/species of animals

Agro climatic zones	District	Breed wise number of sample collection (No.)	Location (No.)
Sub-mountains low hills sub-tropical (Zone-I)	Kangra, Sirmour, Hamirpur, Mandi	Indigenous breed = 24 (Sahiwal, Rathi, Gir, Red Sindhi) Pahari = 8 Cross bred =6 (Desi x Jersey) Buffalo = 8 Exotic=5	Ganoh (3), Bholiyan (1), Mazra (1), Dhaulakuan (1), Nurpur (3) Thakudwara Goushala Jamli (1), Vinod Memorial Goushala Samona, Sujanpur (1), Suan (2), Ranital (1), Dohb (1). Hatli (1), Shiholpuri (1) and Jangal (1)
Mid-hills sub-humid (Zone-II)	Kangra, Mandi	Exotic = 10 (Jersey / HF) Pahari= 18 Indigenous breed = 12 (Sahiwal.Red Sindhi) Cross Bred =12 (Desi x Jersey) Buffalo (8)	CSKHPKV Farm (2) Goushala Kangehan Jaisinghpur (1) Goushala Saliyana Panchrukhi (1), KVK Kangra (1), Chambi (1), Navriti Dhanotu (1), kvk SunderNagar (1), Megal (1), Tatail (1), Mohini Goushala Nori (1), Jandpur (1), Trehal (1), Tharu (1), Kamathu (1)
High hills sub temperate wet (Zone-III)	Kullu, Solan, Mandi, Shimla	Pahari = 16 Indigenous breed = 14 (Red Sindhi/ Sahiwal/Kankrej) Exotic = 7 (Jersey / HF) Cross Bred = 13 (Desi x Jersey)	KVK Bajaura (1), Sainj (1) Pharmacist training college Goushala solan UHF, Nauni (1), Subathu Ashram Goushala (1), Baila (Janjehli panchayat (1), Chapar (Road Panchayat) (1), Thach (Balidhar panchayat (1), Tandi (Murag panchayat) (1), Kyodinaal (Dhimkataru panchayat) (1), Gadhdhar Bara panchayat (1), Deodhar Bara panchayat (1), Swandi bara panchayat (1), Vill Shah Panchayat Sanarsa (1), Hare Krishna Gouhala Rampur (1), Vill Dofda(1)
High hills temperate dry (Zone-IV)	Lahaul & Spiti, Kinnaur	Churi = 4 Pahari = 9 Cross Bred = 15 (Desi x Jersey)	Sagnam (1), Kibber (1), Losar (1), Kaza (1), Kesori (1), Hinsa (1) Udaipur, Jangla (1), Salgran (1), Pooh (1), Nako (1), Tabo (1)

Zone wise sampling detalis

Zone-1

Number of districts covered under study (n=4): Kangra, Sirmour, Hamirpur, Mandi

Sample collecting location (n=12): Nurpur, Ganoh, Suan, Ranital, Dohb, Hatli, Shiholpuri, Jangal, Bholiyan, Mazra, Dhaulakuan, Thakudwara Goushala Jamli , Vinod Memorial Goushala Samona, Sujanpur

Zone-2

Number of districts covered under study (n=2): Kangra, Mandi.

Sample collecting location (n=13):CSKHPKV Livestock Farm and ZBNF FarmPalampur, KVK Kangra, Chambi, Navriti Dhanotu, Goushala Kangehan Jaisinghpur, Goushala Saliyana Panchrukhi, Tatail, Mohini Goushala Nori, Jandpur, Trehal, Tharu, Kamathu KVK Sunder Nagar, Goushala Megal.

Zone-3

Number of districts covered under study (n=4): Kullu, Solan, Mandi, Shimla

Sample collecting location (n=17): Katani Ashram, Shubathu ; Kalyani Pahari Cow Anusandhan Kendra, Khalnag, Arki; Dairy Farm, UHF Solan;Goushala, Veterinary Pharmacists Training Institute, Jaunaji Rd, Nauni, Solan.Kullu- KVK livestock Farm, Bajaura and Vill. Shalwar Sainj, Baila (Janjehli panchayat), Chapar (Road panchayat), Thach (Balidhar panchayat), Tandi (Muran panchayat) Kyodinaal (Dhimkataru panchayat), Gadhdhar, Deodhar, Swandi (Bara panchayat),

Vill Shah Panchayat Sanarsa, Hare Krishna Goushala Rampur & Vill Dofda.

Zone-4

Number of districts covered under study (n=2): Lahaul & Spiti and Kinnaur

Sample collecting location (n=12): Village Kibber & Sagnam, Kaza, Lossar, Kesori, Hinsa, Udaipur, Vill Jangla, Salgran, Pooh, Nako,Tapri,Tabo.

Table 23. Different breeds of animals investigated during the study

Sr. No.	Breed/species	No.
1	Pahari	51
2	Indigenous (Sahiwal, Rathi, Red Sindhi, Kankrej, Haryana, Gir)	50
3	Cross bred	46
4	Exotic (Jersey, Holstein Friesian)	22
5	Churi	4
6	Buffalo	16
	Total	**189**

Sample collection from native cattle's of Himachal Pradesh

Pooh, Kinnaur

Nako, Kinnaur

Trehal, Kangra

Taboo, Lahaul & Spiti

Chapar,Janjehli, Mandi

Navriti, Goushala Dhanotu, Kangra

Tandi, Thunag, Mandi

Gaushala Jamli, Hamirpur

Table 24. Zone wise total viable counts and nitrogen fixing bacteria counts of faecal samples in cattle, buffalo and Churu

Zone –I	**No. of animals**	**TVC/gm of feces at 35^0 C±2**	**Nitrogen fixing 28^0 C±2**
Indigenous breed	24	0.027->300 crores	0.0069->300 crores
Pahari	8	0.125-35.5crore	0.046-18.2 crore
Cross Bred	6	0.04- 75.0 crore	0.29-23.8 crore
Buffalo	8	0.047-226.5crores	0.024-22.5 crores
Exotic	5	0.047- 66.0crores	1.12-22.0 crores
Zone –II	**No. of animals**	**TVC/gm of feces at 35^0 C±2**	**Nitrogen fixing 28^0 C±2**
Indigenous breed	12	0.075->300 crores	0.0001-80 crores
Pahari	18	0.019->300 crore	0.00031-24.8 crores
Cross Bred	12	0.065->300 crore	1.71-26.3 crore
Buffalo	8	0.027-58.0 crores	0.72-22.3 crores
Exotic	**10**	**0.018->300 crore**	**0.01->300 crore**
Zone –III	**No. of animals**	**TVC/gm of feces at 35^0 C±2**	**Nitrogen fixing 28^0 C±2**
Indigenous breed	14	0.050-86.5 crore	0.00039-183 crore
Pahari	16	0.043- >300crore	0.000039-81 crore
Cross Bred	13	0.39->300 crore	1.35-28.8 crore
Exotic	7	0.139 - 48.5crore	0.00015-211.0crore
Zone –IV	**No. of animals**	**TVC/gm of feces at 35^0 C±2**	**Nitrogen fixing 28^0 C±2**
Churu	4	0.006-50 crore	0.0029 – 7.7 crore
Pahari	9	0.31 - > 300 crore	2.28 – 26.3 crore
Cross Bred	15	0.565 - >300 crore	1.6 – 241.0 crore

Table 25. Total bacterial counts and nitrogen fixing bacteria counts of faecal samples collected from animals reared under agro climatic zones of Himachal Pradesh

Breed / Species of animal	Zone I		Zone II		Zone III		Zone IV	
	Total Viable Count (crores)	Nitrogen Fixing (crores)	Total Viable Count (crores)	Nitrogen Fixing (crores)	Total Viable Count (crores)	Nitrogen Fixing (crores)	Total Viable Count (crores)	Nitrogen Fixing (crores)
Pahari	0.125 - 35.5	0.046 - 18.2	0.019 - >300	0.00031–24.8	0.043 - >300	0.000039–258.0	0.31 - >300	2.28 – 26.3
Indigenous	0.027 - >300	0.0069 - >300	0.075 - >300	0.0001–80.0	0.050 – 86.5	0.00039–183	Nil	Nil
Cross Bred	0.04 – 75.0	1.71 – 26.3	0.065 - >300	1.71 – 26.3	0.39 - >300	1.35 – 28.08	0.565->300	1.6 – 241.0
Exotic	0.047 – 66.0	1.12 - 22.0	0.018 - > 300	0.01 - >300	0.139 – 48.5	0.00015 – 211.0	Nil	Nil
Buffalo	0.047 – 226.5	0.024 – 22.5	0.027 – 58	0.72 – 22.3	Nil	Nil	Nil	Nil
Churu	Nil	Nil	Nil	Nil	Nil	Nil	0.006 – 50	0.0029 – 7.7

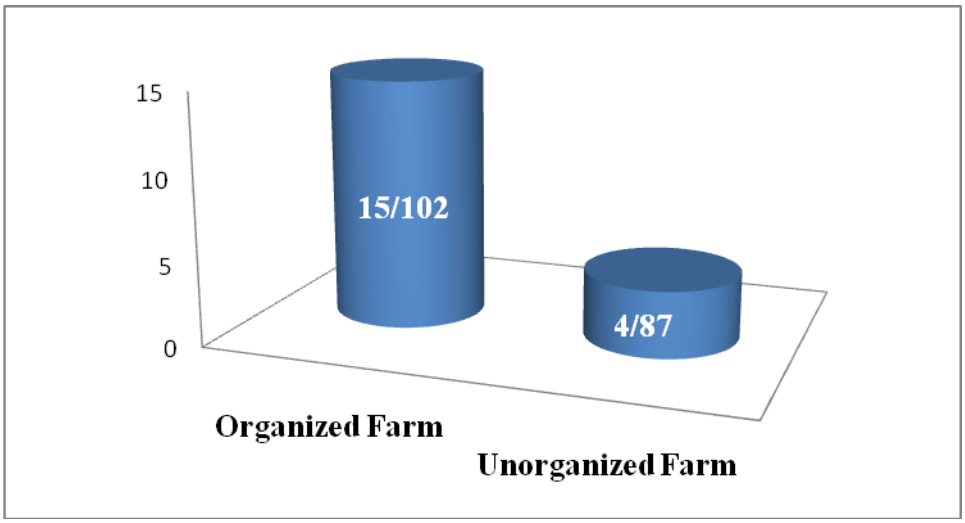
Table 26. Comparison of Total Viable Counts and Nitrogen fixing bacteria in Organized and Unorganized animal management system in different agro-climatic zones

Zones	Organized (Dairy/Stall Fed)			Unorganized (Stall Fed/Open Grazing)		
	No. of sample	TVC	NF	No. of sample	TVC	NF
Zone – I	27	0.3 - >300	0.032 - >300	24	0.027 - 75	0.0069 – 102
Zone – II	42	0.019 - >300	0.0001 - >300	18	0.027 – 58	0.72 – 24.7
Zone – III	33	0.050 - >300	0.00015 - 258	17	0.62 - >300	0.000039 - 211
Zone – IV	-	-	-	28	0.006 - >300	0.0029-241

Table 27. Zone-wise distribution of animals with Total Viable counts more than 300 crores per gm of dung sample

Zone	Breed	Number	Location	Animal Husbandry practice
Zone I	Rathi	01	Ganoh, Kangra	Gaushala
	Red Sindhi	01	KVK, Dhaula Kuan	Organized farm
	Sahiwal	01	KVK, Dhaula Kuan	Organized farm
Zone II	Holstein Frisian	01	CSK HPKV	Organized farm
	Pahari	02	CSK HPKV	Organized farm
	Sahiwal	01	CSK HPKV	Organized farm
	Pahari	01	KVK, Sunder Nagar	Organized farm
	Jersey	02	KVK, Kangra	Organized farm
	Red Sindhi	01	KVK, Kangra	Organized farm

	Sahiwal	01	Nauri, Kangra	Gaushala
	Crossbred	01	Nauri, Kangra	Gaushala
Zone III	Crossbred	02	Chapra & Baila, Janjehli, Mandi	Unorganized dairy farmer
	Crossbred	01	KVK Baijura	Organized Farm
	Pahari	01	Hare Krishna Goushala	Organized Farm
Zone IV	Crossbred	01	Kibber, Lahual & Spiti	Unorganized Dairy farmer
	Pahari	01	Sagnam, Lahual & Spiti	Unorganized Dairy farmer



Total Viable Counts more than 300 crores in dung samples of different breeds of cows in Organized and Unorganized Farm

Results

1. Total viable counts (TVC) of 10% (19/189) animals were more than 300 crores cfu/gm. This included cattle of
   a. Indigenous breeds - 12.00% (n=6/50)
   b. Pahari - 9.43% (n=5/53)
   c. Crossbred - 10.86% (n=5/46)
   d. Exotic breed - 13.63% (n=3/22)

2. TVC > 300 crores cfu/gm were non-significantly associated with all the breeds of the cattle.
3. None of the churu or buffalo dung samples had TVC ≥ 300 crores cfu/gm.
4. Highest TVC counts for buffalo and churu were 226 and 50 crores cfu/gm, respectively.
5. Nitrogen fixing bacteria counts >300 crores cfu/gm were recorded in indigenous and exotic breeds of cattle.
6. Highest nitrogen fixing bacteria counts for Churu and Buffalo were 7.7 crores and 22.5crores cfu/gm respectively.

5.2.5 Soil Microbiological Studies

i. To study the effects of SPNF inputs on productivity and economics of paddy

Varieties: HPR-1068 and HPR-2880 Design: RBD Replication: 3

Treatments: 10

T_1 Paddy (Var.1) + spray of Jeevamrit at 14 days interval
T_2 Paddy (Var.1) + spray of Jeevamrit at 21 days interval
T_3 Paddy (Var.1) + spray of Jeevamrit at 28 days interval
T_4 Paddy (Var.2) + spray of Jeevamrit at 14 days interval
T_5 Paddy (Var.2) + spray of Jeevamrit at 21 days interval
T_6 Paddy (Var.2) + spray of Jeevamrit at 28 days interval
T_7 Organic package (Var.1)
T_8 Organic package (Var.2)
T_9 Absolute control (Var.1)
T_{10} Absolute control (Var.2)

The soil pH was in the range of 4.97 to 5.94 and EC was in the range of 0.09- 0.1. The soil chemical properties (percent organic carbon, microbial biomass carbon & available N) and microbiological properties (general bacterial count, phosphate solubilizing bacterial count and nitrogen fixing bacterial count) were recorded highest in treatment T_4 Paddy (Var.2) + spray of jeevamrit at 14 days interval. In case of available P & K and actinomycetes count treatment T_1 Paddy (Var.1) + spray of jeevamrit at 14 days interval showed highest results while in case of fungal count highest count was recorded in treatment T_7 {Organic package (Var.1)}. Dehydrogenase activity was highest in T_8 treatment {Organic package (Var.2)} (Table 28 & 29).

Table 28. Effect of treatments on the soil parameters at harvest of paddy

Treatment	%OC	Microbial biomass Carbon	Dehydrogenase Activity (µg TPFg-1 soil hr-1)	Available N (Kg/ha)	Available P (Kg/ha)	Available K (Kg/ha)	pH	EC
T_1	0.81	85.77	4.95	224	32.58	137	5.18	0.10
T_2	0.78	81.50	4.94	212	31.37	130	5.06	0.09
T_3	0.77	76.86	4.90	208	29.54	129	5.05	0.09
T_4	0.83	86.22	4.94	225	31.24	131	5.94	0.09
T_5	0.79	78.51	4.88	210	30.86	128	5.04	0.09
T_6	0.78	77.83	4.89	209	29.55	127	5.01	0.09
T_7	0.80	85.52	4.95	212	29.10	132	5.02	0.09
T_8	0.82	83.10	4.96	215	28.98	131	5.02	0.09
T_9	0.68	72.22	3.90	200	23.34	114	4.97	0.09
T_{10}	0.68	72.04	3.92	199	23.31	114	5.03	0.09
CD at 5%	**0.02**	**3.33**	**0.01**	**2.85**	**0.83**	**3.22**	**0.11**	**0.01**

Table 29. Effect of treatments on the microbial count at harvest of paddy

Treatment	Nutrient Agar $\times 10^4$	Phosphate Solubilizing bacteria $\times 10^4$ cfux10^4	Actinomycetes $\times 10^4$	Fungus $\times 10^2$	Nitrogen fixing bacteria $\times 10^4$
T_1	12.0	7.7	8.4	4	8.5
T_2	6.8	4.8	5.9	3	5.6
T_3	6.4	5.0	4.9	3	5.0
T_4	12.3	7.9	7.3	5	8.8
T_5	7.4	6.1	5.6	5	6.7
T_6	7.8	5.6	5.6	2	4.5
T_7	10.7	4.3	4.5	6	5.0
T_8	9.3	5.1	7.5	5	3.9
T_9	7.0	3.6	4.0	2	3.4
T_{10}	6.3	3.4	5.1	2	3.4
CD at 5%	**0.32**	**0.25**	**0.20**	**0.86**	**0.21**

ii. To study the effect of SPNF inputs on productivity and economics of maize intercropping system

Varieties: *Bajaura Makka* Lobia-Him Lobia-I Design: RBD Replication: 3

Treatments: 13

T_1 Maize + lobia + spray of jeevamrit at 14 days interval
T_2 Maize + lobia + spray of jeevamrit at 21 days of interval
T_3 Maize + lobia + spray of jeevamrit at 28 days of interval)
T_4 Maize + soybean + spray of jeevamrit at 14 days of interval
T_5 Maize + soybean + spray of jeevamrit at 21 days of interval
T_6 Maize + soybean + spray of jeevamrit at 28 days of interval
T_7 Maize + spray of jeevamrit at 14 days of interval
T_8 Maize + spray of jeevamrit at 21 days of interval
T_9 Maize + spray of jeevamrit at 28 days of interval
T_{10} Organic package- Maize + soybean
T_{11} Absolute control (Maize)
T_{12} Organic package- maize + lobia
T_{13} Maize sole (organic)

The soil pH was in the range of 4.73 to 5.44 and EC was in the range of 0.11- 0.13. The soil chemical properties (percent organic carbon, dehydrogenase activity, microbial biomass carbon, available N & P) and microbiological properties (general bacterial count, phosphate solubilizing bacterial count, actinomycetes count, fungus count and nitrogen fixing bacterial count) were recorded highest in treatment T_1 Maize + lobia + spray of jeevamrit at 14 days interval. In case of available K treatment T_4 Maize + soybean + spray of jeevamrit at 14 days of interval showed highest results (Table 30).

Table 30. Effect of treatments on the soil parameters at harvest of maize

Treatment	%OC	Microbial Biomass Carbon	Dehydrogenase activity (µg TPFg-1 soil hr-1)	Available N (Kg/ha)	Available P (Kg/ha)	Available K (Kg/ha)	pH	EC
T_1	0.81	86.56	4.91	255	29.32	135	5.12	0.12
T_2	0.72	81.36	4.81	243	28.54	131	5.18	0.13
T_3	0.71	78.55	4.76	242	28.33	131	4.73	0.13
T_4	0.76	82.56	4.88	254	28.86	136	5.34	0.11
T_5	0.71	81.70	4.78	246	28.76	131	5.31	0.12
T_6	0.71	72.53	4.75	233	28.63	129	5.24	0.12
T_7	0.75	80.33	4.82	238	27.82	128	5.24	0.11
T_8	0.70	72.60	4.77	232	27.61	126	5.31	0.12
T_9	0.68	71.50	4.77	231	27.18	126	5.16	0.12
T_{10}	0.87	81.10	4.85	254	28.34	127	5.30	0.12
T_{11}	0.83	84.36	4.82	199	28.89	128	5.42	0.12
T_{12}	0.85	86.31	4.81	235	28.54	131	5.19	0.12
T_{13}	0.68	66.60	4.76	225	29.30	135	5.44	0.13
CD at 5%	**0.02**	**0.55**	**0.07**	**2.70**	**1.30**	**3.60**	**0.28**	**0.01**

Table 31. Effect of treatments on the microbial count at harvest of maize

Treatment	Nutrient Agar $\times 10^4$	Phosphate Solubilizers $\times 10^4$	Actinomycetes $\times 10^4$	Fungus $\times 10^2$	Nitrogen fixing bacteria $\times 10^3$
T_1	27.1	16.9	19.5	7.6	12.8
T_2	25.8	12.0	15.8	5	8.7
T_3	21.5	11.7	14.4	5	8.9
T_4	22.4	13.7	19.1	5	12.9
T_5	20.5	11.1	16.2	5	11.0
T_6	17.8	12.0	15.9	4	11.3
T_7	19.6	10.6	12.4	6	7.4
T_8	17.6	9.5	9.9	6	9.7
T_9	16.1	7.9	8.4	4	7.8
T_{10}	20.2	16.2	19.3	4	12.7
T_{11}	12.0	9.4	6.3	5	9.8
T_{12}	19.9	12.0	16.1	3	11.2
T_{13}	20.8	16.3	15.0	3	10.8
CD at 5%	**0.24**	**0.22**	**0.20**	**0.74**	**0.02**

iii. To study the effect of S.P.N.F. inputs on productivity and economics of fingermillet

Varieties: Finger millet (local) Design: RBD Replication: 3

Treatments: 10

T_1 Fingermillet+soybean (broadcasting) + spray of jeevamrit at 14 days interval
T_2 Fingermillet+soybean (broadcasting) + spray of jeevamrit at 21 days interval
T_3 Fingermillet+soybean (broadcasting) + spray of jeevamrit at 28 days interval
T_4 Fingermillet+soybean (line sowing) + spray of jeevamrit at 14 days interval

T_5 Fingermillet+soybean (line sowing) + spray of jeevamrit at 21 days interval
T_6 Fingermillet+soybean (line sowing) + spray of jeevamrit at 28 days interval
T_7 Fingermillet+soybean (broadcasting) + Organic package
T_8 Fingermillet+soybean (line sowing) + Organic package
T_9 Fingermillet+soybean (broadcasting) + Absolute control
T_{10} Fingermillet+soybean (line sowing) + Absolute control

Table 32. Effect of treatments on the soil parameters at harvest of fingermillet

Treatment	%OC	Microbial Biomass Carbon	Dehydrogenase activity (µg TPFg-1 soil hr-1)	Available N (Kg/ha)	Available P (Kg/ha)	Available K (Kg/ha)	pH	EC
T_1	0.87	84.97	4.77	239	29.60	128	5.21	0.10
T_2	0.82	79.19	4.70	227	29.35	128	5.18	0.1
T_3	0.80	78.04	4.64	223	29.27	126	5.19	0.11
T_4	0.84	82.80	4.69	234	30.47	127	5.06	0.11
T_5	0.81	78.35	4.68	231	30.37	125	5.21	0.13
T_6	0.81	78.33	4.63	225	30.17	125	5.24	0.13
T_7	0.83	81.89	4.69	235	30.42	127	5.27	0.11
T_8	0.85	81.92	4.68	233	30.03	124	5.29	0.09
T_9	0.78	73.70	4.64	218	27.65	118	5.24	0.10
T_{10}	0.77	72.96	4.60	214	27.08	118	5.02	0.10
CD at 5%	**0.02**	**1.63**	**0.03**	**0.78**	**0.89**	**0.53**	**0.07**	**0.009**

Table 33. Effect of treatments on the microbial count at harvest of fingermillet

Treatment	Nutrient Agar $\times 10^4$	Phosphate Solubilizing bacteria $\times 10^4$	Actinomycetes $\times 10^4$	Fungus $\times 10^2$	Nitrogen fixing bacteria $\times 10^4$
T_1	25.3	6.3	5.3	4	5.0
T_2	24.1	6.0	4.8	3	3.8
T_3	15.0	4.6	4.0	2	3.6
T_4	19.7	5.7	4.5	8	4.8
T_5	19.4	5.0	3.8	3	4.0
T_6	16.4	4.0	3.6	3	3.8
T_7	25.7	9.6	8.3	3	5.3
T_8	24.0	8.5	7.3	5	3.2
T_9	8.3	2.8	4.3	4	4.2
T_{10}	5.9	3.6	3.4	4	3.5
CD at 5%	**0.26**	**0.23**	**0.19**	**0.1**	**0.21**

The soil pH was in the range of 5.02 to 5.29 and EC was in the range of 0.09-0.13. The soil chemical properties (percent organic carbon, dehydrogenase activity, microbial biomass carbon, available P & K) were recorded highest in treatment T_1 Fingermillet+soybean (broadcasting) + spray of jeevamrit at 14 days interval and microbiological properties (general bacterial count, phosphate solubilizing bacterial count, actinomycetes count and nitrogen fixing bacterial count) were recorded highest in treatment T_7 Fingermillet + soybean (broadcasting) +

Organic package Maize + lobia + spray of jeevamrit at 14 days interval. Available P and Fungus count was recorded highest in treatment T_4 Fingermillet + soybean (line sowing) + spray of jeevamrit at 14 days interval.

iv. To study the effects and time of application of *jeevamrit* on productivity and economics of wheat cropping systems

Design-RBD Replication-3

Treatments: 13

T_1 Wheat+gram (1:1)+*Jeevamrit* at 14 DI
T_2 Wheat+gram (1:1)+*Jeevamrit* at 21 DI
T_3 Wheat+gram (1:1)+*Jeevamrit* at 28 DI
T_4 Wheat+lentil (1:1)+*Jeevamrit* at 14 DI
T_5 Wheat+lentil (1:1)+*Jeevamrit* at 21 DI
T_6 Wheat+lentil (1:1)+*Jeevamrit* at 28 DI
T_7 Wheat (sole crop) + *Jeevamrit* at 14 DI
T_8 Wheat (sole crop)+*Jeevamrit* at 21 DI
T_9 Wheat (sole crop)+*Jeevamrit* at 28 DI
T_{10} Organic package- Wheat alone
T_{11} Organic package- Wheat + gram
T_{12} Organic package- Wheat + lentil
T_{13} Absolute control (Wheat + gram)

The data presented in table 34 and 35 shows the data on %OC, microbial biomass carbon, dehydrogenase activity, available N, P, K, soil pH, EC and microbiological properties recorded after the harvest during 2021-2022. The soil pH was in the range of 5.07- 5.46 and EC was in the range of 0.090- 0.098.

Table 34. Estimation of soil (0-15) parameters in wheat cropping systems

Treatment	% OC	Microbial biomass Carbon µg/gm	Dehydrogenase Activity (µg TPFg-1 soil hr-1)	Available N (Kg/ha)	Available P (Kg/ha)	Available K (Kg/ha)	pH	EC
T_1	0.72	84.37	4.90	262	25.01	211.07	5.14	0.097
T_2	0.68	77.64	4.77	258	23.14	206.58	5.22	0.093
T_3	0.59	76.61	4.77	255	22.77	215.56	5.07	0.092
T_4	0.66	81.27	4.87	266	25.01	220.80	5.36	0.094
T_5	0.65	79.20	4.80	256	24.47	206.58	5.33	0.093
T_6	0.65	76.61	4.73	250	24.26	208.83	5.26	0.090
T_7	0.64	75.57	4.83	263	25.76	202.09	5.28	0.094
T_8	0.66	78.16	4.78	256	23.52	215.56	5.33	0.092
T_9	0.70	82.30	4.76	251	23.14	209.58	5.18	0.090
T_{10}	0.68	81.78	4.84	264	25.76	218.56	5.32	0.098
T_{11}	0.73	81.27	4.86	261	25.38	208.08	5.44	0.095
T_{12}	0.74	80.75	4.87	257	23.14	208.08	5.21	0.097
T_{13}	0.61	71.43	4.59	228	23.52	208.83	5.46	0.090
CD at 5%	**0.02**	**NS**	**0.07**	**5.89**	**1.10**	**5.93**	**NS**	**NS**

The soil chemical properties *i.e.* microbial biomass carbon, dehydrogenase activity and microbiological properties (general bacterial count, phosphate solubilizing bacterial count and fungus count) were recorded highest in treatment T_1 (Wheat+ Gram+ spray of jeevamrit at 14 days interval). In case of, available N & K, actinomycetes count and nitrogen fixing bacterial count, treatment T_4 (Wheat+ Lentil+ Spray of jeevamrit at 14 days interval) showed highest results while % OC and available P were highest in organic package (Table 34 & 35).

Table 35. Effect of treatments on the microbial count in wheat cropping systems

Treatment	Nutrient Agar $\times 10^4$	Phosphate Solubilizing bacteria $\times 10^3$	Actinomycetes $\times 10^3$	Fungus $\times 10^2$	Nitrogen fixing bacteria $\times 10^3$
T_1	24.7	13.9	14.1	3	11.1
T_2	24.2	11.1	11.6	2	8.0
T_3	19.7	10.7	11.0	2	7.6
T_4	21.1	11.3	14.7	2	12.4
T_5	18.6	9.5	12.6	1	11.0
T_6	11.3	8.7	10.9	2	11.2
T_7	17.8	10.0	10.5	1	9.2
T_8	16.2	9.6	10.6	2	8.6
T_9	12.1	8.5	9.7	1	8.1
T_{10}	18.8	10.2	12.3	2	8.6
T_{11}	17.6	11.3	12.8	2	9.0
T_{12}	17.7	10.6	12.5	1	9.1
T_{13}	7.1	5.5	6.5	1	4.1
CD at 5%	**2.1**	**1.93**	**NS**	**0.98**	**1.03**

v. To study the effects and time of application of jeevamrit on productivity and economics of gram and lentil

Crop- Gram (18-2) Lentil (HPLO-3) Design- RBD Replication-3

Treatments:10

T_1 Gram + spray of *Jeevamrit* at 14 days interval
T_2 Gram + spray of *Jeevamrit* at 21 days interval
T_3 Gram + spray of *Jeevamrit* at 28 days interval
T_4 Lentil + spray of *Jeevamrit* at 14 days interval
T_5 Lentil + spray of *Jeevamrit* at 21 days interval
T_6 Lentil + spray of *Jeevamrit* at 28 days interval
T_7 Organic package-gram
T_8 Organic package-lentil
T_9 Absolute control with gram
T_{10} Absolute control with lentil

The data presented in table 36 and 37 showed the data on %OC, microbial biomass carbon, dehydrogenase activity, available N, P, K, soil pH, EC and microbiological properties. The soil pH was in the range of 4.36- 4.80 and EC was in the range of 0.068- 0.095. (Table 36)

Table 36. Estimation of soil (0-15) parameters in gram and lentil

Treatment	% OC	Microbial biomass carbon (µg/gm)	Dehydrogenase Activity (µg TPFg-1 soil hr-1)	Available N (Kg/ha)	Available P (Kg/ha)	Available K (Kg/ha)	pH	EC
T_1	0.74	93.70	4.82	261.14	45.54	183.66	4.53	0.084
T_2	0.63	92.07	4.51	252.61	28.74	139.33	4.54	0.075
T_3	0.64	90.37	4.66	235.16	38.82	128.00	4.60	0.082
T_4	0.73	95.10	4.70	248.37	26.13	128.33	4.56	0.068
T_5	0.65	90.74	4.58	231.45	33.97	123.66	4.50	0.078
T_6	0.64	89.25	4.52	220.27	41.81	157.33	4.80	0.072
T_7	0.73	97.33	4.71	240.21	44.35	131.66	4.37	0.093
T_8	0.71	94.14	4.72	234.87	44.05	136.33	4.55	0.071
T_9	0.61	83.70	3.77	216.85	28.74	179.33	4.36	0.095
T_{10}	0.65	81.08	3.42	220.12	36.21	118.00	4.53	0.090
CD at 5%	**0.02**	**7.15**	**0.18**	**NS**	**2.43**	**6.87**	**0.012**	**0.001**

The %OC, dehydrogenase activity, available N, P, K and microbiological properties (general bacterial count, phosphate solubilizing bacterial count and nitrogen fixing bacterial count) in treatment T_1 (Gram+ Spray of jeevamrit at 14 days interval) showed highest results. In case of fungus count and actinomycetes count, treatment T_4 (Lentil+ Spray of jeevamrit at 14 days interval) showed highest results (Table 37).

Table 37. Effect of treatments on the microbial count

Treatment	Nutrient Agar $\times 10^4$	Phosphate Solubilizing bacteria $\times 10^3$	Actinomycetes $\times 10^3$	Fungus $\times 10^2$	Nitrogen fixing bacteria $\times 10^3$
T_1	14.6	4.9	4.2	2	4.4
T_2	13.9	4.4	4.0	2	4.3
T_3	12.5	3.9	4.1	2	4.1
T_4	13.4	4.8	4.6	3	4.1
T_5	13.0	4.5	4.2	2	4.0
T_6	11.6	4.1	3.8	2	4.1
T_7	13.4	4.3	4.0	2	4.2
T_8	13.2	4.0	3.9	2	3.9
T_9	6.3	3.8	3.4	2	3.7
T_{10}	6.2	3.2	3.1	1	3.2
CD at 5%	**0.95**	**0.66**	**0.63**	**NS**	**0.40**

vi. To study the effect of jeevamrit on productivity and economics of wheat based cropping system

Design: RBD Replications: 3

Seed treatments with Beejamrit, basal application of Ghanjeevamrit @ 5q/ha and jeevamrit @ 500 l/ha at 30 days interval in all the treatments

Treatments: 11

T_1	Wheat + pea (1:1)	+ spray of Jeevamrit at 14 days interval
T_2	Wheat + pea (1:1)	+ spray of Jeevamrit at 21 days interval
T_3	Wheat + pea (1:1)	+ spray of Jeevamrit at 28 days interval
T_4	Wheat + sarson (1:1)	+ spray of Jeevamrit at 14 days interval
T_5	Wheat + sarson (1:1)	+ spray of Jeevamrit at 21 days interval
T_6	Wheat + sarson (1:1)	+ spray of Jeevamrit at 28 days interval
T_7	Organic package-wheat alone	
T_8	Organic package- Wheat + pea	
T_9	Organic package- Wheat + sarson	
T_{10}	Absolute control-with T_1	
T_{11}	Absolute control-with T_4	

The data presented in table 38 and 39 showed the data on %OC, microbial biomass carbon, dehydrogenase activity, available N, P, K, soil pH, EC and microbiological properties recorded after the harvest during 2021-2022. The soil pH was in the range of 4.02- 5.15 and EC was in the range of 0.067- 0.098. The % OC was recorded highest in treatment T_7 (Organic package-wheat alone). The microbial biomass Carbon, dehydrogenase activity and available N were recorded highest in treatment T_4 (Wheat + sarson (1:1) + spray of jeevamrit at 14 days interval). In case of, available K, general bacterial count, phosphate solubilizing bacterial count, actinomycetes count, fungus count and nitrogen fixing bacterial count, treatment T_1 (Wheat + pea (1:1) + spray of jeevamrit at 14 days interval) showed highest results. In case of available P, treatment T_9 (Organic package- Wheat + sarson) showed highest results (Table 38 & 39).

Table 38. Estimation of soil (0-15) parameters in wheat based cropping system

Treatments	%OC	Microbial biomass Carbon (µg/gm)	Dehydrogenase Activity (µg TPFg^{-1} soil hr^{-1})	Available N (Kg/ha)	Available P (Kg/ha)	Available K (Kg/ha)	pH	EC
T_1	0.73	103.34	4.64	252	48.90	218.87	4.53	0.081
T_2	0.63	99.45	4.50	242	35.84	215.56	4.02	0.067
T_3	0.64	73.50	4.42	231	44.72	143.71	4.09	0.08
T_4	0.65	113.58	4.68	262	53.76	203.59	4.24	0.093
T_5	0.53	78.68	4.35	235	35.09	157.93	4.36	0.084
T_6	0.71	76.61	4.31	228	41.06	169.91	4.19	0.097
T_7	0.75	69.36	4.60	220	45.92	141.46	4.23	0.070
T_8	0.72	98.86	4.42	245	42.18	149.70	4.25	0.085
T_9	0.65	74.54	4.23	231	54.88	138.47	4.45	0.098
T_{10}	0.53	69.48	4.25	215	44.05	138.57	4.50	0.097
T_{11}	0.52	70.50	4.15	208	38.00	147.45	5.15	0.083
CD at 5%	**0.02**	**8.03**	**0.26**	**9.96**	**1.11**	**5.61**	**0.05**	**0.001**

Table 39. Effect of treatments on the microbial count in wheat based cropping system

Treatment	Nutrient Agar $\times 10^4$	Phosphate Solubilizing bacteria $\times 10^3$	Actinomycetes $\times 10^3$	Fungus $\times 10^2$	Nitrogen fixing bacteria $\times 10^3$
T_1	21.0	5.1	4.5	5	4.9
T_2	18.7	4.7	4.1	4	4.5
T_3	15.9	3.7	4.1	3	3.7
T_4	18.4	3.5	4.4	4	3.6
T_5	17.0	3.3	4.3	3	3.2
T_6	14.9	3.4	3.8	3	3.5
T_7	17.5	3.9	3.5	5	3.8
T_8	17.0	4.0	3.6	3	3.8
T_9	17.1	3.7	3.6	2	3.2
T_{10}	14.5	3.7	3.2	2	3.3
T_{11}	14.6	3.6	3.0	1	3.1
CD at 5%	**1.03**	**0.57**	**0.25**	**1.21**	**0.31**

vii. To study the effect and time of application of jeevamrit on productivity and economics of Oats

Treatments

T_1 Oat (Kent) + spray of *Jeevamrit* at 14 days interval
T_2 Oat (Kent) + spray of *Jeevamrit* at 21 days interval
T_3 Oat (Kent) + spray of *Jeevamrit* at 28 days interval
T_4 Oat (Palampur-1) + spray of *Jeevamrit* at 14 days interval
T_5 Oat (Palampur-1) + spray of *Jeevamrit* at 21 days interval
T_6 Oat (Palampur-1) + spray of *Jeevamrit* at 28 days interval
T_7 Organic package- Oat (Kent)
T_8 Organic package- Oat (Palampur-1)
T_9 Absolute control-with Kent
T_{10} Absolute control-with Palampur-1

The data presented in table 40 and 41 showed the data on %OC, microbial biomass carbon, dehydrogenase activity, available N, P, K, soil pH, EC and microbiological properties recorded after the harvest during 2021-2022. The soil pH was in the range of 4.85- 5.35 and EC was in the range of 0.088-0.099. The %OC, available N, P, general bacterial count, phosphate solubilizing bacterial count, fungus count and nitrogen fixing bacterial count were recorded highest in treatment T_1 (Oats (Palampur Kent) + Spray of jeevamrit at 14 days intervals). In case of microbial biomass carbon, available K and actinomycetes count, treatment T_4 (Oats (Palampur 1) + Spray of jeevamrit at 14 days intervals) showed highest results. Dehydrogenase activity was maximum in treatment T_7 Organic Package- Oats (Palampur Kent) (Table 40 & 41).

Table 40. Estimation of soil (0-15) parameters in oats

Treatment	%OC	Microbial biomass Carbon(µg/gm)	Dehydrogenase Activity (µg TPFg^{-1} soil hr^{-1})	Available N (Kg/ha)	Available P (Kg/ha)	Available K (Kg/ha)	pH	EC
T_1	0.80	98.22	4.70	311	37.36	122.05	5.35	0.088
T_2	0.70	92.65	4.69	271	30.45	114.69	5.17	0.097
T_3	0.64	91.19	4.68	267	36.00	106.47	5.12	0.090
T_4	0.66	98.95	4.72	292	32.45	137.95	4.85	0.097
T_5	0.65	92.25	4.66	244	34.93	110.82	4.96	0.088
T_6	0.63	90.30	4.66	225	33.56	108.22	5.09	0.096
T_7	0.76	96.73	4.73	303	36.70	129.70	5.07	0.091
T_8	0.73	92.75	4.70	298	29.66	117.13	4.92	0.099
T_9	0.52	87.91	3.84	268	25.29	103.08	5.01	0.093
T_{10}	0.58	87.50	3.85	272	26.37	106.09	5.13	0.095
CD at 5%	**0.03**	**6.32**	**0.05**	**NS**	**3.67**	**8.25**	**NS**	**0.003**

Table 41. Effect of treatments on the microbial count in oats

Treatment	Nutrient Agar $\times 10^4$	Phosphate Solubilizing bacteria $\times 10^3$	Actinomycetes $\times 10^3$	Fungus $\times 10^2$	Nitrogen fixing bacteria $\times 10^3$
T_1	14.9	5.2	3.7	4	4.4
T_2	13.4	4.5	3.9	3	3.8
T_3	12.6	4.2	3.7	2	3.7
T_4	13.8	4.7	4.5	2	4.1
T_5	13.5	4.6	4.1	2	3.8
T_6	12.2	4.5	3.8	3	3.4
T_7	13.5	4.4	4.0	3	4.3
T_8	13.4	4.5	4.0	2	4.1
T_9	9.1	4.1	3.7	3	3.4
T_{10}	5.9	3.5	3.4	1	3.2
CD at 5%	**0.87**	**0.28**	**0.38**	**1.20**	**0.45**

5.3. PG research findings/results

Sr. No.	Name & Admission No. of the students	Research topic	Findings
1.	**Raghuveer Choudhary (A-2019-30-019)**	Comparative efficacy of different components of natural farming in wheat + gram cropping system	• Combined application of different components of zero budget natural farming i.e.*ghanjeevamrit* + *jeevamrit* + mulching proved to be the best treatment for developing a most productive wheat + gram cropping system. However, application of *ghanjeevamrit* + *jeevamrit* came out to be the best treatment in terms of net returns per rupee invested. • Soil fertility status in terms of available nutrients (NPK) was significantly improved through the application of *ghanjeevamrit* + *jeevamrit* + *mulching* and also through *ghanjeevamrit* + *jeevamrit* only
2.	**Navjot Rana (A-2017-40-008)**	Evaluation of traditional and conventional farming practices in legume based cropping systems under mid- hills of H.P. Himalayas	• In different cropping systems, mash-garlic system in combination with integrated farming practices i.e., conventional farming practice (43.0 and 43.6 kg ha^{-1} day^{-1}, respectively) came out to be best in terms of system productivity followed by organic farming practices i.e., traditional farming practice. • Use of inorganic farming practices and mash-garlic cropping system proved to be more economical and resulted in lowest cost of cultivation, high gross returns and highest net returns per rupee invested. • Organic farming practices came out to be best in terms of effect on soil health of the system whereas integrated farming practice improved only soil physical & chemical properties
3.	**Saleman (A-2019-30-020)**	Effect of organic and inorganic sources of nutrients on productivity of soybean	The treatment, T_6 (50 percent RDF (Fertilizers) + 50 percent RDN (FYM) proved to be the best treatment for enhancing yield and profitability of soybean under mid-hill conditions of Himachal Pradesh
4.	**Shilpa (A-2018-40-008)**	Studies on tillage, organic and inorganic sources of nutrients in mustard-soybean cropping system	Reduced tillage and 100 per cent recommended dose of fertilizers were found to be the best treatments for better growth & higher productivity and profitability of mustard-soybean cropping system

5.4. Students' lab research work

Sr. No.	Name of student	Name of Department	Name of Advisor	Nature of work
1.	Shilpa (Ph.D.)	Agronomy	Dr. Janardan Singh	1 Microbial count 2 Dehydrogenase activity 3 Biomass carbon 4 Phosphatase activity 5 Urease activity
2.	Deeksha (Ph.D.)	Soil Science	Dr. Naveen Dutt	1 Microbial count 2 Dehydrogenase activity 3 Biomass carbon 4 Phosphatase activity 5 Urease activity
3.	Deepika Suri (Ph.D.)	Soil Science	Dr. R.K. Sharma	Biomass carbon and nitrogen
4.	Raveena (Ph.D.)	Agronomy	Dr. Rameshwar Kumar	1 Microbial count 2 Dehydrogenase activity 3 Biomass carbon 4 NPK analysis 5 pH 6 Electric conductivity 7 Organic carbon
5.	Neha Chauhan (Ph.D.)	Soil Science	Dr. Sanjay Kumar Sharma	1 Microbial count 2 Dehydrogenase activity 3 Biomass carbon 4 Phosphatase activity
6.	Sukhchain Singh (Ph.D.)	Agronomy	Dr. Naveen Kumar	1 Microbial count 2 Biomass carbon
7.	Anjali Thakur (Ph. D.)	Soil Science	Dr. S.P. Dixit	1 Dehydrogenase activity 2 Biomass carbon and nitrogen 3 Urease activity 4 Phosphatase activity
8.	Gaytri Helta (Ph.D.)	Agronomy	Dr. G.D. Sharma	1 Microbial count 2 Dehydrogenase activity 3 Biomass carbon 4 NPK analysis 5 pH 6 Electric conductivity 7 Organic carbon
9.	Varun Parmar (Ph.D.)	Soil Science	Dr. Naveen Dutt	Isolation of microbes and enzymes
10.	Hemali (Ph.D.)	Soil Science	Dr. Pardeep Kumar	Soil moisture curve
11.	Ankit (Ph.D.)	Agronomy	DR. Sandeep Manuja	Biomass carbon

12.	Lachha Choudary (Ph.D.)	Agronomy	Dr. Sanjay Kumar	1 Microbial count 2 Biomass carbon
13.	Amrita Kumari (Ph.D.)	Soil Science	Dr. S.P. Dixit	1 Dehydrogenase activity 2 Biomass carbon and nitrogen
14.	Arjun Singh (Ph.D.)	Agronomy	Dr. Rameashwar	1 Microbial count 2 NPK analysis 3 pH 4 Organic carbon
15.	Anchal Sharma (M.Sc.)	Agronomy	Dr. G.D. Sharma	1 Microbial count 2 Dehydrogenase activity 3 Biomass carbon 4 TSS and Mucilage
16.	Alisha Sharma (M.Sc.)	Soil Science	Dr. R.P. Sharma	1 Microbial count 2 Dehydrogenase activity 3 Biomass carbon 4 Phosphatase activity 5 Urease activity
17.	Shweta (M.Sc.)	Soil Science	Dr. Sanjay K. Sharma	1 Microbial count 2 Dehydrogenase activity 3 Biomass carbon 4 Urease activity
18.	Priyanshi Sood (M.Sc.)	Agronomy	Dr. Rameshwar	Microbial count
19.	Dinesh (M.Sc.)	Soil Science	Dr. S.S. Paliyal	Microbial count
20.	Sachin (M.Sc.)	Agronomy	DR. Janardan Singh	1 NPK analysis 2 pH 3 Electric conductivity 4 Organic carbon
21.	Shweta Sagar (M.Sc.)	Microbiology	Dr. Abhishek Walia	Microbial isolation
22.	Pooja (M.Sc.)	Agronomy	Dr. Janardan Singh	1 NPK analysis 2 pH 3 Electric conductivity
23.	Shabnam Thakur (M.Sc.)	Agronomy	Dr. Suresh Kumar	Microbial count
24.	Raghav Sood (M.Sc.)	Plant Breeding	Dr. Gopal Katna	Protein analysis

6. EXTENSION

Faculty of the department plays an important role in dissemination of technologies on 'Organic and natural farming' through delivering lectures and Radi/TV talks, laying out of demonstrations, organization of different training programmes, field days etc..

6.1. Lectures delivered in different programmes: Faculty of the department delivered 72 lectures in on and off campus training programmes during the period under report.

Demonstrations: 126 demonstrations on paddy, maize, millets, mash, ricebean, adzukibean, soybean, wheat, gram, lentil, linseed, cowpea cucumber, green chili, okra, peas and soybean with natural farming and organic farming practices along with control were conducted at ZBNF farm.

6.2. Front-line demonstrations conducted

Sr. No.	Name of technology disseminated	No. of beneficiaries
1.	Transfer of technology was carried out in the form of raising demonstrations on Organic cultivation of Pea on about 6 ha area on farmers' field in Pin valley in village Sagnam and of different choice based agroforestry systems on farmers' fields through peoples' participation approach	25
2.	Raised demonstration trials on Onion on farmers' fields in village Mollichak, Banuri Palampur	5
3.	Farmers' field trials on buckwheat at Nichar area of Distt. Kinnaur, Amaranthus at Diyar area of Distt. Kullu and Chenopodium and Amaranthus at Naanj and Kelodhar area of Distt. Mandi through participatory plant breeding	40
4.	Buckwheat trials under AICRN conducted at Kalpa, Distt. Kinnaur	5
5.	Pea seed was distributed for raising demonstrations at Sagnam, Sichling and Hurling village, Spiti valley under the ICAR, TSP project	35

6.3. Workshop/seminar/training organized

Sr. No.	Topic	Duration	Sponsoring Agency
1.	Curtain Raiser of "International Year of Millets 2023" under the Nutri-cereals Multi-stakeholder Mega Convention, and *Poshan Vatika*& Tree Plantation Campaign was conducted at CSKHPKV, Palampur on 17th September 2021, in which 138 participants including farmer (60) and girls (78) were present	One day	Department of Organic Agriculture & Natural Farming, CSKHPKV, Palampur
2.	Five type of fruit plants (100 No.) were distributed among the farmers & girls		

3.	Field days at Sangla & Lari under the project AICRN on Potential Crops (TSP) in which 200 farmers participated	Two days	ICAR, New Delhi
4.	Training programme on Organic & Natural Farming under the TSP project for 25 farmers in Hurling village, Distt. Lahaul & Spiti	One day	TSP, ICAR New Delhi
5.	Training programme on "Popularization of potential crops (Amaranth, Buckwheat and Chenopod) of North Western Himalayas as vegetable and seed under organic and natural farming conditions through participatory plant breeding" at Gram Panchayat Naanj and Gram Panchayat Kelodhar in Karsog valley, Distt. Mandi on 22nd -23rd December 2021	Two days	State Adhoc. JICA, Shimla
6.	One day training programme to the SC farmers of Maulichak under AICRP on Agroforestry on 25th March 2022	one day	AICRP on Agroforestry New Delhi
7.	Two days training programme under the JICA project "Popularization of potential crops (Amaranth, Buckwheat and Chenopod) of North Western Himalayas as vegetable and seed under organic and natural farming conditions through participatory plant breeding" for 100 farmers on 28-29th March 2022 at Garsa and Sainj valley, Distt. Kullu	Two days	State Adhoc. JICA, Shimla
8.	Field days on 'Organic and natural farming' under ICAR, TSP project on 12th-13th April 2022	Two days	TSP, ICAR New Delhi
9.	Training programme on 'Importance of potential crops (Amaranth and Buckwheat)' under ICAR, AICRN project on 15th - 16th April 2022	Two days	ICAR, AICRN New Delhi
10.	Virtual Lecture Series on 'Scope, importance & challenges of Organic & Natural Farming in India' organized by Department of Organic Agriculture & Natural Farming, CSK HPKV, Palampur on 6th June 2022	One day	Organic Agricultural Society of India (OASI)
11.	Field day on Organic Farming on 24th July 2022 at Diora, Distt. Chamba and 25th July 2022 on Himgiri, Distt. Chamba for 200 participants	Two days	TSP, ICAR New Delhi
12.	A Plantation Drive of planting 300 trees viz. Shahtoot- *(Morus alba)*, Kachnaar- (*Bauhinia variegata*), Aonla - (*Phyllanthus emblica*), Harad - (*Terminalia chebula*) and Bheda- (*Terminalia bellirica*) at ZBNF Centre of this department by Dr. Janardan Singh, HOD on 22nd July 2022. During the drive Dr. Mandeep Sharma, Dean COVAS was the Chief guest and Dr. Pardeep Kumar, Dean, CUHP, Dharamshala was the guest of honour, where in 100 students from COA and 10 faculty members were also present	One day	Department of Organic Agriculture & Natural Farming

7. PUBLICATIONS

7.1. Research papers

i. Choudhary R, Kumar R, Sharma GD, Sharma RP, Rana N and Dev P 2022. Effect of natural farming on yield performances, soil health and nutrient uptake in wheat+ gram inter cropping system in sub-temperate regions of Himachal Pradesh. *Journal of Crop and Weed* 18(2):1–8

ii. Kumar R, Chadha S, Upadhyay RG, Sharma GD and Kanwar S 2021. Evaluation of different enriched composts under protected organic farming in capsicum-pea based cropping system. *Legume Research - An International Journal* 44 (8): 929–935

iii. Nasaratullah,http://www.hjar.in/index.php/hjar/search/authors/view?firstName=Nasratullah&middleName=&lastName=&affiliation=Department%20of%20Organic%20Agriculture%20and%20Natural%20Farming,%20CSK%20Himachal%20Pradesh%20Krishi%20Vishvavidyalaya,%20Palampur-176%20062&country=IN Kumar R, Manuja S, Sharma RP, Sharma GD, Verma S 2021. Evaluation of different components of natural farming in Black Gram (*Vigna mungo* L.) under mid hill conditions of Himachal Pradesh. *Himachal Journal of Agricultural Research* 47(2): 175–179

iv. Pooja, Singh Janardan, Shilpa, Raveena and Nepali Anamika (2021) Influence of silicon in performance of cereals under drought conditions. *RASSA Journal of Science for Society* 3(3): 166–16

v. Rana N, Kumar R, Punam, Sharma GD, Sharma RP and Pareek B 2021. Quality traits under different farming practices in legume-based cropping systems. *Himachal Journal of Agricultural Research* 47 (2): 169–174

vi. Rana N, Kumar R, Punam, Sharma GD, Sharma RP, Pareek B and Upadhyay RG 2021. Performance of different farming practices in legume based cropping systems under mid-hills of H.P Himalays. *Legume Research (Accepted)*

vii. Rana S, Singh J, Kumar R and Chauhan R 2021. Zero budget natural farming-need of the hour. *Just Agriculture multidisciplinary e newsletter* 2(1):1–5

viii. Rizvi RH, Vishnu R, Handa AK, Ramanan S, Yadav M, Mehdi A, Singh RK, Londhe S, Dhyani SK, Rizvi J, Punam, Kumar R and Qaisar N 2021. Mapping of agroforestry systems and Salix species in Western Himalaya agroclimatic zone of India. *Current Science* 121(10): 1347–1351

ix. Sharma T, Singh J, Kaur N, and Shilpa 2021. Effect of organic and natural nutrient sources on productivity and profitability of cowpea (*Vigna unguiculata*) under mid hill conditions of Himachal Pradesh. *Indian Journal of Agricultural Sciences* (Accepted)

x. Shilpa and Singh, Janardan (2021) Conservation Agriculture: A Sustainable Alternative Way for Maintaining Soil Resource Base. *RASSA Journal of Science for Society* 3(1):33–37

xi. Shilpa, Singh J and Pooja 2022. Influence of tillage practices and nutrient sources on growth parameters and their correlation with yield of soybean (*Glycine max L.) Merill*). *Soybean Research (Accepted)*

xii. Shilpa, Singh Janardan, Saini Ankit, Sharma Tarun and Parita (2021) Effect of tillage and fertilizer doses on growth and growth indices of soybean (*Glycine max* L.) under conservation tillage systems. *Environment Conservation Journal* 22 (3): 181–186

xiii. Singh J, Kumar R, Choudhary AK, Shilpa and Rathore S 2021. Agricultural diversification through medicinal and aromatic crops – A review. *Indian Journal of Agronomy* 66 (5th IAC Special issue): S73–S83

xiv. Singh J, Rameshwar, Katna G, Kumar R, Sharma GD, Upadhyay RG, Kumar R, Rana S and Jyoti 2022. Performance of Finger Millet under Organic and Natural Production Systems. *International Journal of Tropical Agriculture* 40 (1-2): 97–103

7.2 Papers presented in conferences/symposia

i. Datt Naveen, Singh Janardan, Rameshwar, Katna Gopal, Kumar Rakesh, Sharma GD, Rana Sheetal, Jyoti and Kumar Raj (2022). Effect of Organic and natural inputs on chemical and microbiological properties of soil. In soybean crop. *In* 1st Agrivision zonal convention on "Natural Farming: A National priority for Human health and ecological restoration" *w.e.f.* 5-6th April, 2022 at Sher-e-Kashmir University of Agricultural Science and Technology of Jammu

ii. Katna G, Singh Janardan, Rameshwar, Kumar Rakesh, Sharma GD, Sharma Neelam, Kumari Jyoti, Kumar Raj and Kulbhushan (2022). Evaluation of different genotypes of wheat, lentil and chickpea under SPNF conditions. *In* 1st Agrivision zonal convention on "Natural Farming: A National priority for Human health and ecological restoration" *w.e.f* 5-6th April, 2022 at Sher-e-Kashmir University of Agricultural Science and Technology of Jammu

iii. Kumar Rakesh, Singh Janardan, Rameshwar, Katna G, Sharma GD, Rana Sheetal and Negi Manoj (2022). Evaluation of natural farming inputs for the management of *Riptortus* bug sp. In soybean crop. *In* 1st Agrivision zonal convention on "Natural Farming: A National priority for Human health and ecological restoration" *w.e.f.* 5-6th April, 2022 at Sher-e-Kashmir University of Agricultural Science and Technology of Jammu

iv. Rameshwar & Sood Pankaj (2022) Natural Farming: A Potential Pathway for Sustainable Agriculture in Western Himalayas. *In* 10th National Seminar on Agriculture and more: Beyond 4.0 " *w.e,f.* 26-28 May, 2022 at Sher-e- Kashmir University of Agricultural Sciences and Technology of Kashmir, Main campus, Shalimar, Srinagar

v. Rameshwar, Singh Janardan, Katna G, Kumar Rakesh, Sharma GD, Sharma Neelam, Kumar Raj and Kulbhushan (2022). Comparative performance of different crops under SPNF and Organic Farming conditions. *In* 1st Agrivision zonal convention on "Natural Farming: A National priority for Human health and ecological restoration" *w.e.f.* 5-6th April, 2022 at Sher-e-Kashmir University of Agricultural Science and Technology of Jammu

vi. Rana S, Datt N, Sharma GD and Kumar R (2021) To study the effect of SPNF inputs on soil chemical and microbiological properties of maize intercropping system. *In* National conference on "India's challenge- contemporary farming to smart farming *w.e.f.* 8-9th April, 2021 at Chandigarh University, Chandigarh.

vii. Raveena, Kumar Rameshwar, Sharma GD, Sharma Raj Pal, Walia Abhishek and Singh Janardan (2022). Influence of natural farming practices on soil health. *In* 1st Agrivision zonal convention on "Natural Farming: A National priority for Human health and

ecological restoration" *w.e.f.* 5-6th April, 2022 at Sher-e-Kashmir University of Agricultural Science and Technology of Jammu

viii. Sharma Tarun, Singh Janardan and Shilpa (2021) Organic pulse production: Need of the hour (A review). National Web Conference on 'Sustaining Pulse Production for Self Sufficiency and Nutritional Security *Abstract*: Pulse WebCon, Feb 09-11, Kanpur p: 11.

ix. Shilpa and Singh Janardan (2021) Climate resilient conservation agriculture practices enhancing productivity of soybean under mid hill conditions of Himachal Pradesh. Virtual National Conference on "Strategic Reorientation for Climate Smart Agriculture" (V-AGMET 2021) March 17-19th, 2021, Punjab Agricultural University, Ludhiana, p: 198-201.

x. Shilpa and Singh Janardan (2022) Performance of black gram genotypes and organic carbon under maize + black gram intercropping system. International Conference on Pulse Research (ICPR-2022), Society for Plant and Agricultural Sciences (SPAS) on the occasion of World Pulses Day (February 10th, 2022). p:145

xi. Shilpa, Singh Janardan and Kaur Navneet (2022) Influence of black gram genotypes and nitrogen levels on performance of maize equivalent yield and available status of soil under maize + black gram intercropping system. National Conference on " Maize for Resource Sustainability, Industrial Growth and Farmer's Prosperity" February 23-25.p: 81

xii. Singh Janardan, Kumar Rakesh, Katna G, Kumar Rameshwar, Sharma G.D., Bhardwaj Neelam, Kumar Raj, Rana Sheetal and Kulbhushan (2022) Productivity and profitability of crops as influenced by natural and organic production systems. 1st Zonal Convention Agrivision-2022 on 'Natural farming: A National Priority for Human Health and Ecological Restoration' held on April 5-6, 2022 at SKUAST, Jammu, J&K (UT). Souvenir and Abstracts, Page 91

7.3 Book Chapters

i. Pooja, Singh Janardan, Shilpa and Raveena (2022) Organic Farming. Modern Concept of Agronomy Vol (1) Vital Biotech Publication ISBN: 978-93-92953-49-1

ii. Pooja, Singh Janardan, Shilpa and Raveena.2022. Effect of climate change on Agriculture Production System. Modern Concept of Agronomy Vol (1)Vital Biotech Publication ISBN : 978-93-92953-49-1

iii. Badiyala Aditi, Kanwar S and Sharma GD. 2021. Evaluation of bioagent and organic products against collar rot of tomato under protected condition. In: Crop Protection-driven food safety and security 2022 (Eds. Abhijeet Ghatak, Ramanuj Vishwakarma, Nishant Prakash and Ranjeet Kumar) International Books and Periodical Supply Service, Pitampura, Delhi: 139–144

7.4 Popular articles

i. Badiyala, Aditi and Singh, Dhanbir. 2021. Eco-friendly approaches for managing major okra insect-pests. Just Agriculture e- Newsletter 2 (2) 8 pages

ii. Badiyala, Aditi and Singh, Dhanbir. 2022. Liquid manures for organic/natural farming. Agriculture and Food e-Newsletter 4(1): 321–324

iii. Badiyala Aditi, Sharma GD and Singh Dhanbir. 2022. Cow based bioformulations for pest management. Agriculture & Food e-Newsletter 4(4): 361–363
iv. Badiyala Aditi and Soni Saurbh. 2022. *Labhkari hain gaaye ke utpadon se nirmit keetnashi sutr.* Giriraj Saptahik 44 (35):5
v. Badiyala Aditi and Singh Dhanbir. 2022. *Gaaye ke utpaadon se nirmit rognashi astra hain labhkari*. Giriraj Saptahik 44 (40):5
vi. Pooja and Singh Janardan (2021)*Shunya budget prakritik kheti*. *Rajshri Sandesh* 3(1):2–3
vii. Pooja and Singh Janardan (2022) Abscisic acid: As a Signaling Agent of Stress. *Agriculture and Environment e-newsletter* 3(3): 58–67
viii. Pooja, Singh Janardan, Shilpa and Raveena (2022) Organic Farming Certification in India. *Just Agriculture multidisciplinary e- newsletter* 2(8): 1–6
ix. Punam and Rameshwar (2021) Pamphlet on "*Krishi vaniki ke antargat har medh pe ped*" pg 1–3, Deptt. Horticulture & Agroforestry, CSKHPKV publication
x. Punam, Rameshwar, Handa AK and Arunachalam A (2021) *Oonche shushk sheetoshan kshetron mein krishi vaniki system dwara chara prabhandan*" pg 1–5, Deptt. Horticulture & Agroforestry, CSKHPKV publication
xi. Raj Kumar and Singh Janardan (2022) Prakritik Kheti. *Rajarshi Sandesh* July-December 3(2):17-20 *Rajarshi Sandesh* 3(1):3–4
xii. Rana Sheetal, Rana Rachana, Singh Janardan, Kumar Rameshwar and Chauhan Rakesh (2021) Zero budget natural farming- need of the hour. *Just Agriculture Multidisciplinary e-newsletter*. 2(1):1–5
xiii. Sharma, Tarun and Singh Janardan (2021) *Phasal utpadan mein phaliyon ka mahtava. Rajarshi Sandesh* 3(1):3–4.

7.5 Brochures

i. Singh, Janardan (2022) Brochure, Department of Organic Agriculture and Natural Farming, CSK HPKV, Palampur
ii. Singh, Janardan (2022) Brochure, Organic Agricultural Society of India, Department of Organic Agriculture and Natural Farming, CSK HPKV, Palampur

7.6 Reports/Bulletin

i. Annual Progress Report of the SPNF project
ii. Self Study Report (SSR) of the University
iii. All other reports desired by the authority from time to time

8. PARTICIPATION IN WORKSHOPS/ SEMINARS/ CONFERENCES / TRAININGS / MEETINGS

Scientists of the department participated in different programmes to improve their professional efficiency. The details of the same are given as under:

Sr. No.	Date	Name of programme and organizing agency	Name of the faculty/staff
1.	25-26th June 2022	International Conference on Agriculture, Horticulture & Plant Sciences" organized by the Tropical Society of India held at New Delhi	Dr. Janardan Singh
2.	18th June 2022	REC meeting organized by the Directorate of Research held at CSK HPKV Palampur	Dr. Janardan Singh Dr. Rameshwar
3.	6th June 2022	Virtual Lecture Series on 'Scope, importance & challenges of Organic & Natural Farming in India' organized by the Organic Agricultural Society of India (OASI), Department of Organic Agriculture & Natural Farming, CSK HPKV, Palampur	Dr. Janardan Singh Dr. Rameshwar Dr. Gopal Katna Dr. Rakesh Kumar Mr. Raj Kumar
4.	26-28th May 2022	10th National Seminar on Agriculture & more: Beyond 4.0" held at SKUAST, Kashmir, Srinagar	Dr. Rameshwar
5.	20-21st May 2022	AGRIVISION-2022 held at NASC Complex, New Delhi	Dr. Rameshwar
6.	10-11th May, 2022	Annual Group Meet (AGM) on *Kharif* pulses of AICRP on MULLARP Pigeonpea and Arid Legumes" organized by the Indian Society of Pulses Research and Development (Kanpur) held at CSKHPKV, Palampur	Dr. Janardan Singh Dr. Gopal Katna
7.	6th May 2022	4th National Conference SVAHE 2022 Approaches for livestock development organized by COVAS held at CSKHPKV, Palampur	Dr. Janardan Singh
8.	4th May 2022	Meeting of Executives, Organic Agricultural Society of India (OASI) in the Deptt. of Organic Agriculture & Natural Farming, CSKHPKV, Palampur through hybrid mode	Dr. Janardan Singh Dr. Rameshwar Dr. Gopal Katna Dr. Rakesh Kumar
9.	20th April 2022	'Crop Day 2022' organized by CSK HPKV, RWRC, Malan, Distt. Kangra	Dr. Janardan Singh
10.	5-6th April 2022	1st Zonal Convention on Natural Farming: A National Priority for Human Health and Ecological Restoration jointly organized by Agrivision at SKUAST-Jammu	Dr. Janardan Singh Dr. Rameshwar Dr. Gopal Katna Dr. Rakesh Kumar
11.	4th March 2022	SAC meeting of KVK, Hamirpur organized by Director Extension Education, CSK HPKV at Bara	Dr. Janardan Singh
12.	19th March 2022	SAC meeting of KVK Mandi organized by Director Extension Education, CSK HPKV at Sundernagar	Dr. Rakesh Kumar
13.	21st March 2022	SAC meeting of KVK Kangra organized by Director Extension Education, CSKHPKV	Dr. Rameshwar

14.	28th March 2022	SAC meeting of KVK Una organized by the Director Extension Education, CSKHPKV	Dr. Rameshwar
15.	1st Feb. 2022	Task force meeting of PK3Y under the chairmanship of Chief Secretary, Agriculture organized by the Executive Director, PK3Y, SPIU held at Shimla	Dr. Rameshwar
16.	6th January 2022	Interaction meeting with Mr Ishizaki Yoshiyuki, Chief Advisor, JICA-TCP, Dr. R. K. Sharma, Expert, JICA on with the faculty and SPNF team to discuss the ongoing activities and progress of natural farming	Dr. Janardan Singh Dr. Rameshwar Dr. Gopal Katna Dr. Rakesh Kumar Mr. Raj Kumar
17.	23–27th November 2021	Agri Innovations to Combat Food and Nutrition Challenges, held at PJTSAU, Hyderabad, Telangana	Dr. Janardan Singh
18.	25th November 2021	2nd meeting for finalization of varieties suitable for state under seed plan with National seed Corporation under the chairmanship of Secretary, Agriculture Govt. of H.P. Shimla	Dr. Gopal Katna
19.	22nd October 2021	Awareness programme-*cum*-workshop on 'Safe use of pesticides and adoption of good agricultural practices for the production of Basmati rice' held at Dhanotu (Rait), Distt. Kangra	Dr. Janardan Singh
20.	23rd September 2021	Review Meeting of the research projects sanctioned under *Prakritik Kheti Khushaal Kisaan Yojna* (PK3Y) at State Projects Implementing Unit (SPIU), Krishi Bhawan, Shimla on	Dr. Rameshwar Dr. Gopal Katna
21.	20th September 2021	Fertilizer Awareness Programme under *Parampragat Krishi Vikas Yojna*" held at RSS Akrot	Dr. Janardan Singh
22.	17th September 2021	Curtain Raiser of International Year of Millets 2023 under the Nutri-cereals Multi-stakeholder Mega Convention, and Poshan Vatika & Tree Plantation Campaign organized in association with the DEE, CSK HPKV, Palampur	Dr. Janardan Singh Dr. Gopal Katna Dr. Rakesh Mr. Raj Kumar
23.	9th-13th August 2021	Training programme on "Organic Farming" under Skill Training for Rural Youth of Distt. Chamba held at FTC Dharamshala organized by Sr. SMS-cum-Liaison Officer, FTC Dharamshala	Dr. Janardan Singh Dr. Rameshwar

9. HONORS, AWARDS AND RECOGNITIONS

i. Dr. Janardan Singh was nominated as **Advisor** by the ASRB, New Delhi for moderation of ARS question papers of Agronomy for recruitment of scientists in the ICAR Institutions held from 7th- 8th October 2021

ii. Dr. Janardan Singh was nominated as a **Member of National Steering Committee** for the 5th International Agronomy Congress on "Agri Innovations to Combat Food and Nutrition Challenges", held from 23rd- 27th November, 2021 at PJTSAU, Hyderabad, Telangana, India

iii. Dr. Janardan Singh was nominated as **one of the members** of Committee constituted by the President, Indian Society of Agronomy, New Delhi for providing 20 topics matching with the various themes of 5th International Agronomy Congress held during 23rd-27th November 2021 for its publication in Indian Farming

iv. Dr. Rameshwar Kumar was nominated as an ***Expert*** in Bihar Public Service Commission for the interviews of Asstt. Director (Agronomy) held at Patna *w.e.f.* 22nd -27th November 2021

v. Dr. Janardan Singh was nominated as **Advisor** of the Selection Committee by the ASRB, New Delhi for conducting the interview of the candidates for Senior Technical Officers in ICAR Institutions held from 8th-11th March 2022

vi. Dr. Janardan Singh received the ***Best Paper Award*** during the 1st Zonal Convention on Natural Farming: A National Priority for Human Health and Ecological Restoration held at SKUAST-Jammu on 5-6th April 2022

vii. Dr. Janardan Singh was bestowed with the prestigious ***Dr APJ Abdul Kalam Scientist Award*** for significant contributions in the field of teaching, research & extension during the 13th International conference on *'Agriculture, Horticulture and Plant Sciences'* organised by the Society of Tropical Agriculture held at New Delhi from 25th- 26th June, 2022

viii. Dr. Janardan Singh was bestowed with the ***ISNS Fellow-2021*** Award for the significant contribution in the field of Agriculture by the International Society of Noni Science, Chennai, Tamil Nadu

ix. Dr. Janardan Singh was nominated as an **External Examiner** in the university panel by the Tamil Nadu Agriculture University (TNAU) for evaluation of M Sc. and Ph D. Thesis

x. Dr. Janardan Singh was nominated as **External Examiner** for the evaluation of M.Sc. Thesis by the Dean and Joint Director (Edn.), IARI, New Delhi

xi. Dr. Janardan Singh was nominated as **External Expert** for the interview of Project Associate-I under the project "Establishment of Demonstration Farms of Aroma Cash Crops in District Kupwara" conducted by the CSIR-Aroma Mission J&K under the project K-5000 (GAP-0212)

xii. Dr. Janardan Singh was nominated as **an External Expert** of Research Advisory Committee by LPU to monitor the progress of Ph.D. Research Scholars of Lovely Professional University, Jalandhar

10. DEPARTMENTAL FACELIFT

- Renovation of old farm building and new building, rooms and halls in terms of white washing, painting, roof gutter and covering of drain channels at Model Organic Farm. Creation of independent Farm Incharge room, class room, farm office, biofertilizer lab, store room etc. with all required facilities

- Creation of facilities for teaching/practical classes of ELP students by providing LCD projector, white board, desk computer, printer, chairs with writing pad, executive table, podium etc.

- Creation of facilities and modernization of the labs by providing vertical blinds, partitioning of labs with pre-laminated boards, aluminum sliding doors, table glasses for working tables and some need based equipment's in the labs

- Creation of RO water drinking facility for students and visitors at Model Organic Farm

- Installation of Solar lights under green initiatives in the main campus of the department and also at each farm of the department

- Infrastructure development by providing approach road to the new building of the department; land leveling; parking facility for faculty, staff, students and visitors; seating benches in front of the building in the department.

- Upgradation of the departmental website and its full contents

- Creation of farm facilities by providing solar lights and got the construction work of bitumen metaled approach road done from University workshop to the ZBNF farm

11. MISCELLANEOUS ACTIVITIES

- One Research project entitled "DUS testing of Buckwheat at HPKV, RSS Sangla" worth Rs.6.45 lakhs (annual grant) sponsored by PPV FRA was implemented in this department

- One Research project entitled *"Efficacy of indigenous cow based bio-formulations as soil inoculants and pesticides in agriculture"* worth Rs. 40.5 lakh sponsored by DBT, New Delhi was implemented in this department

- Dr. Janardan Singh was appointed as Chairman for conducting ICAR UG and PG Counseling at CSK HPKV, Palampur

- Dr. Rameshwar Kumar acted as ***Member*** of committee to prepare a draft document to suggest strategy to address the concerns of the small and marginal farmers through natural farming. One of the terms of reference of the Expert Group to prepare an ambitious action plan for the agriculture sector for the state of Himachal Pradesh

- Dr Janardan Singh and Dr. Rameshwar Kumar attended the **interaction meeting with Hon'ble Governor** regarding organic & natural Farming in the Auditorium of COVAS and submitted the rough draft of medicinal plant project to Governor on 7th February 2022

- Dr. Gopal Katana performed the duty of Supervisor, JOA (IT) exam, CSKHPKV Palampur held at Hamirpur on 21st July 2021

- Dr. Rakesh Kumar performed the duty of Supervisor, JOA (IT) exam, CSKHPKV Palampur held at Solan on 21st July 2021

- Head along with the scientists of the department visited five blocks *viz*. Indora, Rait, Bhawarna, Bhedu Mahadev and Lambagaon in Distt. Kangra from 5th-6th Aug. 2021 and interacted with the 16 farmers practicing natural farming

- Dr. Janardan Singh, Head and Dr. Rameshwar Kumar, Principal Scientist delivered a lecture as Resource Persons during a Training programme on "Organic Farming" under Skill Training for Rural Youth of Distt. Chamba held at FTC Dharamshala *w.e.f.* 9th-13th August 2021 organized by Sr. SMS-cum-Liaison Officer, FTC Dharamshala

- Dr. Gopal Katna and Dr. Rakesh Kumar acted as Member of Organizing committee & Stage Secretary during Curtain Raiser of 'International Year of Millets 2023' under the Nutri-cereals Multi-stakeholder Mega Convention, and *Poshan Vatika* conducted at CSKHPKV, Palampur on 17th September 2021, in which 138 participants including farmer (60) and girls (78) were present

- Dr. Janardan Singh was Member of Gold Medal & Certificate distribution committee during the 16th Convocation held at CSKHPKV Palampur on 23rd August 2021

- Dr. Rameshwar Kumar visited the fields of farmers practicing SPNF at Bilaspur and Mandi blocks on 1st September, Sujanpur, Hamirpur & Naduan areas on 20th September 2021

- Dr. Rameshwar Kumar was nominated as Member of Review Meeting of the Expert Groups for Agriculture Sector on 8th October 2021 at CSKHPKV, Palampur

- Faculty of the department performed the duty of Invigilator for the JOA (IT) exam of Dr. YSP UHF, Nauni, Solan on 24th October 2021

- Dr. Gopal Katna was nominated as Member during the '2nd meeting for finalization of varieties suitable for state under seed plan' with National seed Corporation under the chairmanship of Secretary, Agriculture, Govt. of H.P. Shimla on 25th November, 2021

- Dr. Rameshwar Kumar acted as an Expert in conducting the online interviews of the adhoc Project at IHBT Palampur

- Dr. Rameshwar Kumar was Rapporteur in the *Rabi* Agriculture officer workshop organized on 28th December 2021

- Dr. Rameshwar Kumar was Convener in the Extempore speech "*Him Tarangotsav*" Programme on 29th December 2021 organized by Agrivision, HP, CSKHPKV, Palampur and SCA

- Dr. Rakesh Kumar acted as Nodal Officer, COVID-19 to contain the spread of COVID virus in the boys hostels of the University during 11th -26th January 2022

- Dr. Rameshwar Kumar acted as Convener of Technical committee of one day stakeholder meet of Medicinal Plant sector of HP in University on 17th March 2022

- Dr. Gopal Katana performed the duty of Invigilator, Written test for the post of Police constable on 27th March 2022

- Dr. Gopal Katna and Dr. Rakesh Kumar conducted an Exposure visit of ELP students on Organic Agriculture to PAU, Ludhiana *w.e.f.* 25-27th May 2022

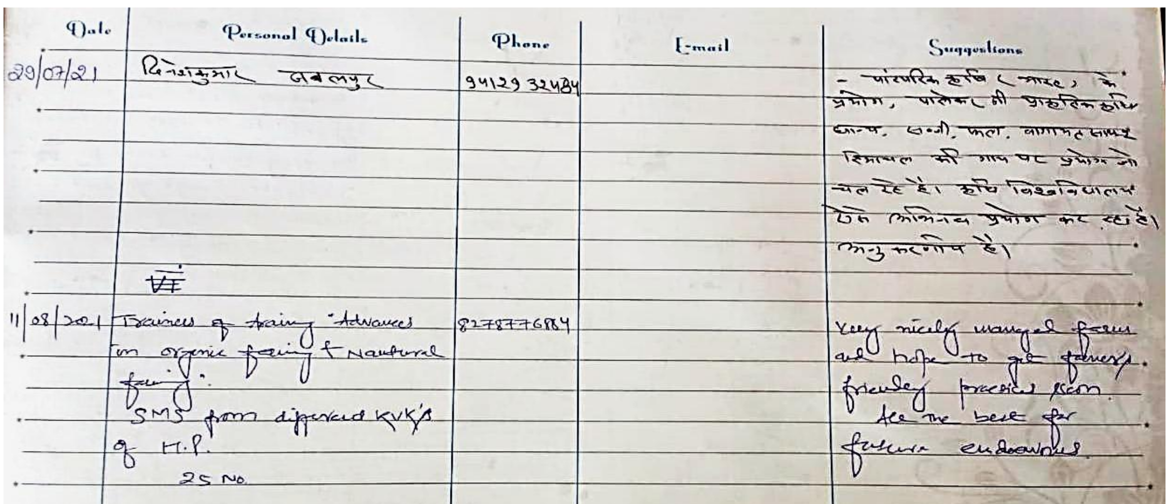
- Dr. Rakesh Kumar attended and presented the Natural Farming Technologies during the National Conference of KVKs-2022 at Dr.YSP UHF, Nauni Solan on 1st – 2nd June 2022

- Dr. Rameshwar Kumar was nominated as Member Secretary of Research Evaluation Committee of the University and conducted REC meeting as Member Secretary on 18th June 2022

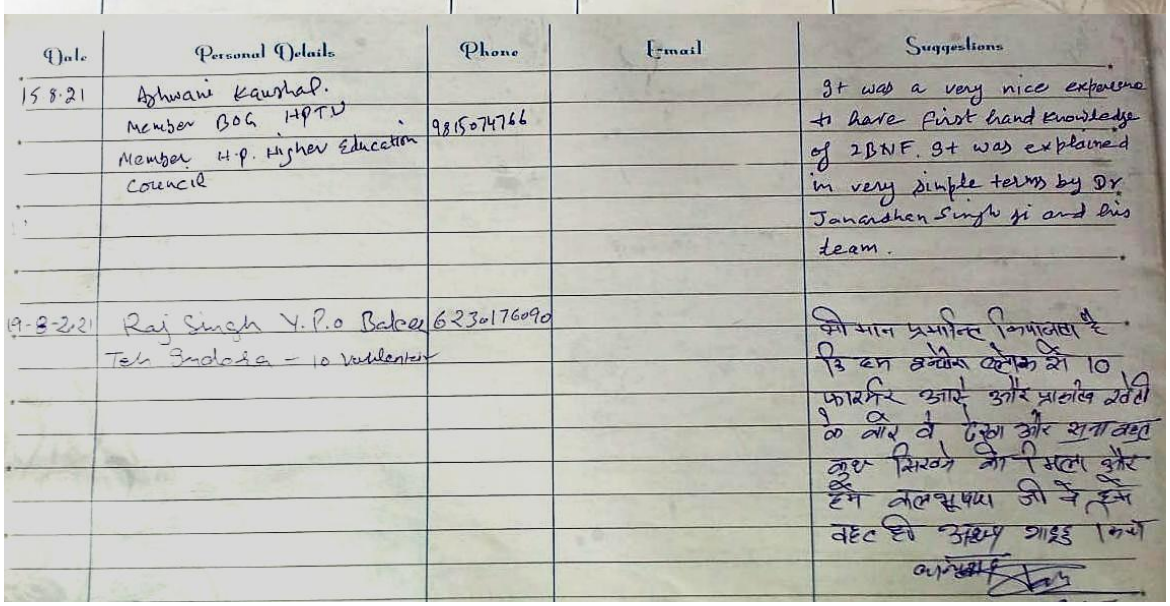
VIP visits conducted

Sr. No.	Name of visitor	Address	Date and Purpose
1.	Sh Rajendra Vishwanath Arlekar	His excellency, Hon'ble Governor and Chancellor, CSK HPKV, Palampur	17th May 2022 Visited ZBNF centre to review the ongoing research activities under SPNF & ZBNF
2.	Mr. Ishizaki Yoshiyuki and Dr. R. K. Sharma	Chief Advisor, JICA-TCP Expert, JICA	6th January 2022 To review the ongoing research activities on natural farming
3.	Dr. S.K. Baldi	Retd. Secretary Finance, Govt. of H.P	26th December 2021 To review the ongoing research activities at ZBNF

Comments and Views of the visitors (VIP, dignitaries, officers, farmers etc.)



Date	Personal Details	Phone	E-mail	Suggestions
29/07/21	दिनेशकुमार जबलपुर	94129 32484		– पारंपरिक कृषि (भारत) के प्रयोग, पालेकर की प्राकृतिक कृषि [illegible] हिमाचल की गाय पर प्रयोग जो चल रहे हैं। कृषि विश्वविद्यालय [illegible] प्रयोग कर रहा है। [illegible] है।
11/08/2021	Trainees of training "Advances in organic farming & Natural farming". SMS from different KVK's of H.P. 25 No.	8278776884		Very nicely managed farm and hope to get farmer's friendly practices from. All the best for future endeavours



Date	Personal Details	Phone	E-mail	Suggestions
15.8.21	Ashwani Kaushal. Member BOG HPTU Member H.P. Higher Education Council	9815074766		It was a very nice experience to have first hand knowledge of ZBNF. It was explained in very simple terms by Dr. Janardhan Singh ji and his team.
19-8-2021	Raj Singh V.P.O Baleer Teh Indora – 10 Volunteer	6230176090		श्रीमान प्रमाणित किया जाता है कि हम [illegible] ब्लॉक से 10 फारमर आए और प्राकृतिक खेती के बारे में देखा और सुना बहुत कुछ सीखने को मिला और हमें [illegible] जी ने हमें बहुत ही अच्छे गाइड किया। धन्यवाद

Date	Personal Details	Phone	E-mail	Suggestions
12.11.2021	Titiksha, Agriculture Extension Officer Distt. Chamba, HP. Deeksha, Agriculture Extension Officer Distt Chamba, HP. (35 farmers)	76500 77318 86268 24640		It was very good experience. Everything was discussed in details. Farmers came to know about various formulations and use of locally available resources under ZBNF. The employees of farm were very co-operative and told everything very well

Date	Personal Details	Phone	E-mail	Suggestions
25.11.2021	Manpreet Singh, (ASI) Chief Agriculture office. Mansa, Punjab 98884-87866 (20 farmers)	98884-87880	—	Experience was good. Farmers will learn more about ZBNF and can go on this field.
6.11.2021	Kamaldeep Singh Project Director (ATMA) Distt. Shahid Bhagat Singh Nagar Chief Agriculture office (14 Farmers)	8720-26517	pdatmashsnagar@gmail.com	Experiment area was well maintained, Farmers gain good knowledge about organic Farming.
7/12/2021	Dr Manish Hood Natural Farmer and Naturopath Doctor Delhi	9581224323	swadhyay health care @ gmail.com	very wonderful Presentation on natural farming, great efforts by department to promote natural farming.

Date	Personal Details	Phone	E-mail	Suggestions
7/01/2022	SANJEEV PARMAR C/o Trainees of CJUN (Shimla & Chamba) training organised at DEE CCK HPKV Plp NO - 50.	6006052477		Farm very well maintained & very well explained during conduct of visit
28/1/2022	Anil Motsalp / ED(Mktg) I/C CMO Noida & NFL officers, and 20 Chandigarh	7821805544		very good Natural & organic farming system for practising at Farmer level.
14/02/2022	Dev Sharma from Rajasthan Jaipur ह: ऑर्गेनिक	9205015128		Nice work done on ZBNF यहां पर भारत की कृषि परम्परा को प्रोत्साहित किया जा रहा है। अन्नदाताओं को जागरूक किया जा रहा है जिससे वह वापस खोई हुई सम्पदा प्राप्त कर रहे हैं।

Date	Personal Details	Phone	E-mail	Suggestions
8/4/22	Visited the SPNF farm and well maintained & keep it up.	9418291195	dixitdp2003@yahoo.co.in	Very good 8/4/22 Director of Research
22/4/22	Visit of trainees of Integrated Agric. organized under CSVN at DEE CSKHPKVV Plp. (No - 25)	60060 52477	-	very well maintained & explained 22/4/22
22/4/22	Visit of trainees of Rampur Khinda under CSVN organized at DEE, CSK HPKV, Plp. (No. - 25)	60060 52477	-	22/4/22
17/05/2022	Honorable Governor (H.P) Sh Rajender Vishwanath Arlekar	-	-	

Date	Personal Details	Phone	E-mail	Suggestions
20/5/22	Visit of farmers of exposure visit cum training organised by Gram Talagum Samiti Sarpanj Samla Distt Solan (H.P) at DEE CSKHPKVVPlp.	60060 52477		very informative 20/5/22
03/06/2022	Visit of Natural farming experiment field is very appreciable and valuable for students. Dr. V.K. Singh (Asso. Prof.) S.V.P.U.A.&T., Meerut.	9412668241		Excellence 03/06/22

Date	Personal Details	Phone	E-mail	Suggestions
25/06/2022	Students (26) of B.Sc.(H) Botany and B.Sc.(Life Sciences) from Shivaji College, University of Delhi along with 5 faculty members and 3 Lab staffs visited in the field. It was part of trip organised under the aegis of DBT star college scheme.	8010247551 9813875558	anurag@shivaji.du.ac.in	It was wonderful exposure and experience for faculty as wells. Students. Students learned about techniques adopted for natural farming. Anurag Kumar 25/06/2022
1/7/22	Students (62) of BSc (Hons) Agriculture from Eternal University Baru Sahib for educational tour with 3 faculty members	9418120633	dranitsaraswat@gmail.com	It was a awesome experience while visiting this place. Students can to know about many things 1/7/22

12. PHOTO GALLERY

12.1 Visit of VIPs at Zero Budget Natural Farming (ZBNF) Centre

His Excellency, Hon'ble Governor, Sh Rajendra Vishwanath Arlekar's visit (17th May 2022)

Sh. S.K. Baldi, *Retd.* Secretary Finance, HP Govt.'s visit (26th December 2021)

Mr Ishizaki Yoshiyuki, Chief Advisor, JICA-TCP & Dr. R. K. Sharma, Expert's visit (6th January 2022)

Sh. Anil Motsarg, ED (Mkt), CMO Noida and NFL officers, Chandigarh's visit (15th March 2022)

Dr. B.N. Tripathi, DDG, Animal Science's visit (6th May, 2022)

Dr. S.P. Dixit, Director of Research's visit (8th April 2022)

12.2 Visit of Officers/farmers/students/NGOs/trainees etc. at ZBNF

Sh. Ashwani Kaushal, Member, BOG, HPTU & Higher Education Council's visit (15th August, 2021)

Farmers from Mansa, Punjab's visit (25th November 2021)

ADOs from Deptt of Agriculture, H.P.'s visit (4th March, 2022)

Farmers from Hamirpur District's visit (7th March, 2022)

Farmers from Hamirpur & Chamba District's visit (10th March, 2022)

Farmers from Samra, Distict Solan's visit (13th March, 2022)

Farmers from Hanumangarh's visit (15th March, 2022)

Sh. Dinesh Kumar from Jabalpur's visit (6thApril, 2022)

Farmers from District Mandi's visit (7th April, 2022)

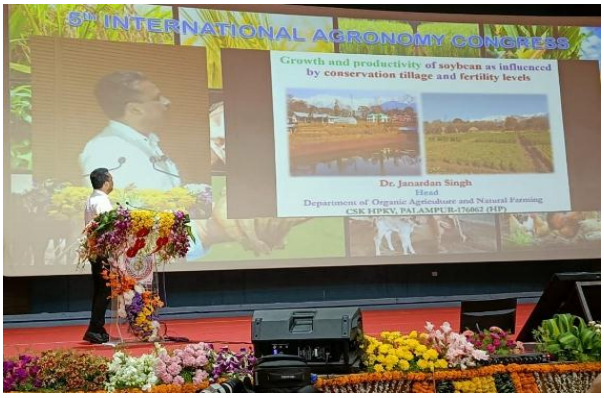
Farmers from Nagrotra Bagwan's visit (22nd April, 2022)

Students from Meerut college's visit (3rd June, 2022)

Students of Shivaji College, University of Delhi's visit (25th June 2022)

12.3. Participation of faculty in conferences/seminars

Faculty of the department attending the 1st Zonal Convention on 'Natural Farming: A National Priority for Human Health and Ecological Restoration' held from 5th to 6th April 2022 at SKUAST- Jammu



Oral presentation & honoring of Dr. Janardan Singh during the 5th International Agronomy Congress held from 23rd to 27th November, 2021 at PJTSAU, Hyderabad, Telangana

Oral presentation by Dr. Janardan Singh during 1st Zonal Convention on 'Natural Farming' held from 5th to 6th April 2022 at SKUAST, Jammu

Dr. Janardan Singh receiving the prestigious Dr APJ Abdul Kalam Scientist Award during International Conference held from 25th to 26th June 2022 at New Delhi

12.4 International Year of Millets and Tree plantation drive

Online inaugural of 'International Year of Millets 2023'

Mrs. Monika Sharma, Councilor, MC, Palampur chairing the programme as Chief Guest

Distribution of plants to the farmers and girls during *Poshan Vatika*

Plantation drive of fruit trees by the Chief Guest, Coordinators, faculty & staff

Curtain Raiser of 'International Year of Millets 2023' conducted under the Chairmanship of Hon'ble Agriculture & Farmers Welfare Minister, Sh. Narender Singh Tomar ji on 17th September 2022

Plantation Drive - 300 plants planted by the Chief Guest, Dr Mandeep Sharma, Dean, COVAS, Dr Janardan Singh, Head, faculty and students at ZBNF Centre on 22nd July 2022

12.5 Farewell function

Farewell function on the eve of superannuation of Dr. R.K. Kataria, Dean, College of Agriculture CSK HPKV, Palampur (28th October, 2021)

Farewell function on the eve of superannuation of Dr. R.G. Upadhyay, Head, Deptt. of Biology & Environmental Sciences, College of Basic Sciences, CSK HPKV, Palampur (28th January, 2022)

12.6 Field days/training camp

Field day at Sangla, Kinnaur (7th November 2021)

Field day at Lari, Lahaul-Spiti (9th November 2021)

Field day at Trilokinath, Lahaul-Spiti (16thApril 2022)

Field day at Lari, Lahaul-Spiti (12th April 2022)

Training programme at Diyar and Sainj valley, Distt. Kullu (28-29th March 2022)

Training progarmme at G.P. Naanj and Kelodhar, Karsog valley, Distt. Mandi (22-23rd December 2021)

12.7 Visit of faculty to farmers'fields of Kangra district






Bhawarna, Bhedu Mahadev and Lambagaon block in Distt. Kangra (6th August 2021)


Gram Panchayat Kelodhar and Naanj, Karsog valley, Distt. Mandi (26th- 27th May 2022)

12.8 Infrastructure developed/facilities created

Creation of facilities in new Office Building

Solar light facility

Separate rooms

Well equipped Soil and Microbiology laboratories

A separate Conference hall, Library & Store room

Library

Renovated old Farm Building

Farm Incharge room **Biofertilizer lab** **Solar lights at main gate**

ELP teaching with all the facilities

Metalling of the approach road from University workshop to ZBNF Centre

12.8 Department in the print media

वैज्ञानिकों ने किया फसलों का निरीक्षण

पालमपुर। आतमा परियोजना पालमपुर के परियोजना निदेशक डॉ. शशि पाल अत्रि, चौधरी सरवण कुमार कृषि विश्वविद्यालय पालमपुर से वैज्ञानिकों की टीम जिसमें प्राकृतिक एवं जैविक खेती के विभागाध्यक्ष डॉ. जनार्धन सिंह, कृषि वैज्ञानिक, कृषि वैज्ञानिक डॉ. रामेश्वर, डॉ. राकेश व राज कुमार ने विकास खंड भेडू महादेव के गांव गुजरेड़ा (वारी) में अमर सिह के खेतों का भ्रमण किया और प्राकृतिक खेती की विधि से बिजी गई मक्की की फसल और सह फसल के रूप में बोई गई सोयाबीन की फसल का निरीक्षण किया। डॉ. जनार्दन सिंह ने खेतों के भीतर जाकर किसानों को प्राकृतिक खेती के सिद्धांतरें की विस्तार से चर्चा की। इस मौके पर डॉ. शशि पाल अत्री, परियोजना निदेशक (आतमां) पालमपुर, उपं परियोजना निदेशक डॉ. अरुण वयास और डॉ. अमित शर्मा नें भी अपने विचार रखे और प्राकृतिक खेती की विधि को अपनाने पर बल दिया।

***Divya Himachal* -7th August 2021**

भवारना : खेतों का निरीक्षण करते परियोजना अधिकारी। (अतुल)

किसान के खेतों का किया भ्रमण

भवारना, 7 अगस्त (अतुल): आतमा परियोजना पालमपुर के परियोजना निदेशक डा. शशि पाल अत्री एवं चौधरी सरवण कुमार कृषि विश्वविद्यालय से वैज्ञानिकों की टीम में शामिल प्राकृतिक एवं जैविक खेती के विभागाध्यक्ष डा. जनार्दन सिह और कृषि वैज्ञानिक डा. रामेश्वर, डा. राकेश और राजकुमार ने विकास खंड भेडू महादेव के गांव गुजरेड़ा बारी में अमर सिह पठानिया के खेतों का भ्रमण किया और प्राकृतिक खेती की विधि द्वारा बोई गई मक्की और सह फसल के रूप में सोयाबीन की फसल देखी। डा. जनार्दन सिह ने खेतों में जाकर किसानों को प्राकृतिक खेती के सिद्धांतों की विस्तार से जानकारी दी तथा प्राकृतिक खेती से संबंधित काफी सुझाव दिए। इस मौके पर डा. शशि पाल अत्री, परियोजना निदेशक आतमा पालमपुर, उप परियोजना निदेशक डा. अरुण व्यास और डा. अमित शर्मा ने भी अपने विचार रखे और प्राकृतिक खेती को अपनाने पर बल दिया।

***Punjab Kesari* -7th August 2021**

कृषि वैज्ञानिकों ने किया खेतों का दौरा

धर्मशाला। आतमा परियोजना पालमपुर के परियोजना निदेशक डॉ. शशि पाल अत्रि, चौधरी सरवण कुमार कृषि विश्वविद्यालय पालमपुर से वैज्ञानिकों की टीम जिसमें प्राकृतिक एवं जैविक खेती के विभागाध्यक्ष डॉ. जनार्धन सिंह, कृषि वैज्ञानिक डॉ रामेश्वर, डॉ राकेश व राज कुमार ने विकास खंड भेड़ महादेव के गांव गुजरेड़ा में अमर सिंह के खेतों का भ्रमण किया।

खेतों का निरीक्षण करते कृषि विशेषज्ञ संवाद

प्राकृतिक खेती की विधि से बिजी गई मक्की की फसल और सह फसल के रूप में बोई गई सोयाबीन की फसल का निरीक्षण किया। डॉ जनार्दन सिंह ने खेतों के भीतर जाकर किसानों को प्राकृतिक खेती के सिद्धांतों की विस्तार से चर्चा की और बताया कि आप स्वयं प्राकृतिक खेती की विधि से तैयार मक्की और रसायनिक विधि से बोई गई मक्की मे फर्क देख सकते हैं। इन्होंने प्राकृतिक खेती से संबंधित काफी सुझाव दिए। इस मौके पर डॉ. शशि पाल अत्री, उप परियोजना निदेशक डॉ. अरुण वयास और डॉ अमित शर्मा ने भी अपने विचार रखे। आतमा परियोजना से डॉ. शीतल सूद और रोहित धीमान भी मौजूद रहे। संवाद

आमदनी बढ़ाने को प्राकृतिक खेती करें किसान

नांज-कैलोधार में कृषि विश्वविद्यालय पालमपुर के सौजन्य से लगाए जागरूकता शिविर

कार्यालय संवाददाता– करसोग

विधानसभा करसोग का किसान फसलों की प्राकृतिक खेती के माध्यम और उसकी विधि अनुसार ही बिजाई करे, ताकि ज्यादा से ज्यादा लाभ प्रास किया जा सके। इसी उद्देश्य को लेकर चौधरी सरवन कुमार कृषि विश्वविद्यालय पालमपुर से जैविक कृषि एवं प्राकृतिक खेती विभाग में जायका द्वारा संचालित परियोजना 'क्षमतावान फसलों पर जागरूकता' कार्यक्रमों के अंतर्गत दो प्रशिक्षण शिविर लगाए गए। शिविर में कृषि विभाग से जुड़े विशेषज्ञ डा. गोपाल कतना तथा डा. राजकुमार द्वारा सभी किसानों को जागरूक किया गया। इस मौके पर करसोग कृषि विभाग से एसएमएस डा. मीना तथा बागबानी विभाग से उद्यान विकास अधिकारी डाक्टर चमेली नेगी ने भी भाग लेते हुए शिविर को सफल बनाने में पूरा सहयोग किया। संबंधित विभागों की ओर से किसानों तथा बागबानों को जो भी जानकारी दी जा सकती है, वह प्रदान की गई। इस दौरान बताया गया कि क्षमतावान फसलों पर जागरुकता तथा जैविक कृषि एवं प्राकृतिक खेती के बैनर तले पहला शिविर नांज क्षेत्र में ममला गांव लगाया गया, जबकि दूसरा शिविर कैलोधार में हुआ। इन दोनों शिविरों में करीब डेढ़ सौ किसानों द्वारा भाग लिया गया, जिन्हें उपरोक्त महत्त्वपूर्ण विषयों पर कृषि विश्वविद्यालय के वैज्ञानिक डा. गोपाल खतना द्वारा क्षमतावान फसलें जैसे की चलाई मरेश एवं बथूआ की खेती, इनके लाभ तथा इनकी विशेषताओं के बारे में विस्तारपूर्वक जानकारी दी गई। इस दौरान किसानों से आग्रह किया गया कि वह इन फसलों की प्राकृतिक खेती के माध्यम से इसकी विधि अनुसार बिजाई करें। कृषि विभाग की ओर से डा. मीना तथा उद्यान विकास अधिकारी डा. चमेली नेगी ने दोनों कार्यक्रमों के दौरान क्षमतावान फसलों की उपयोगिता एवं उनकी उपलब्धियों के बारे में विस्तार पूर्वक जानकारी रखें।

***Amar Ujala*- 24th December 2021**

130 किसानों ने जानी प्राकृतिक खेती

भुंतर। जिला कुल्लू की गड़सा में सैंज घाटी के किसानों के लिए दो दिवसीय प्राकृतिक खेती प्रशिक्षण शिविर का आयोजन किया गया। कृषि विश्वविद्यालय के जायका विभाग द्वारा आयोजित इस कार्यक्रम में किसानों को प्राकृतिक खेती को अपनाने और इसके फायदों के बारे में बताया गया। कृषि विवि के डा. गोपाल कताना तथा राजकुमार द्वारा सभी किसानों को प्राकृतिक खेती करने के बारे में जागरूक किया और किसानों को वैज्ञानिक व उन्नत तकनीक पर जोर देने का आग्रह किया। उन्होंने कहा कि प्राकृतिक खेती से किसान अपनी फसली पर लागत को कई गुना कम कर सकते है और अपनी आमदनी का बढ़ा सकते है। इसके अलावा खेतों को भी बचाया जा सकता है। इस कार्यक्रम में कुल्लू के लगभग 130 किसानों ने भाग लिया।

***Amar Ujala*- 30th March 2022**

पालमपुरः पौधारोपण अभियान के दौरान सामूहिक चित्र में विद्यार्थी। (प्रवीण)

कृषि विश्वविद्यालय पालमपुर में रोपे पौधे

पालमपुर, 22 जुलाई (ब्यूरो): विकासार्थ विद्यार्थी कृषि विश्वविद्यालय पालमपुर द्वारा कृषि विश्वविद्यालय के जीरो बजट प्राकृतिक खेती फार्म में पौधारोपण महाअभियान का आयोजन किया गया जिसमें कृषि विश्वविद्यालय के विद्यार्थियों, शिक्षकों, गैर शिक्षकों व अतिथियों द्वारा विभिन्न प्रकार के पौधे रोपे गए। कार्यक्रम में मुख्य अतिथि मनदीप शर्मा अधिष्ठाता पशु चिकित्सा और पशु विज्ञान महाविद्यालय कृषि विश्वविद्यालय पालमपुर रहे।

कार्यक्रम की अध्यक्षता जनार्धन सिंह विभागाध्यक्ष जैविक कृषि एवं प्राकृतिक खेती विभाग कृषि विश्वविद्यालय पालमपुर द्वारा की गई और विशिष्ट अतिथि प्रदीप कुमार ए.बी.वी.पी. राष्ट्रीय उपाध्यक्ष रहे।

जिला संयोजक अभय वर्मा ने बताया कि विकासार्थ विद्यार्थी द्वारा पूरे देश भर में 1 करोड़ पौधे लगाने का लक्ष्य रखा गया है।

***Punjab Kesari*- 22nd July 2022**