

RESEARCH HIGHLIGHTS



Director of Research
CSK HP Krishi Vishvavidyalaya
Palampur – 176062 (H.P.)

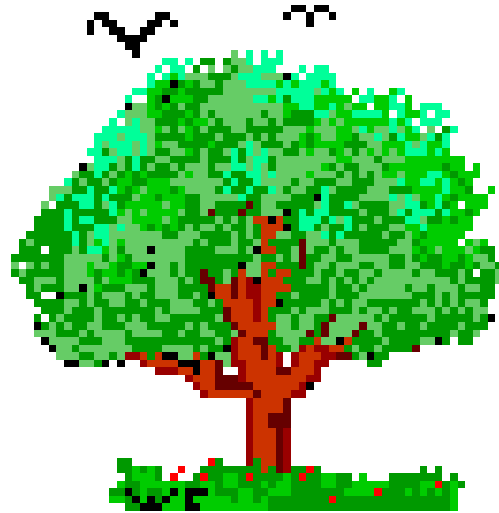
Monthly rainfall during Rabi 2017-18 as compared to Rabi 2016-17 in Himachal Pradesh

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Seasonal total
Actual (mm)									
2017-18	0.3	6.9	48.0	9.2	45.9	37.5	58.5	47.3	253.6
2016-17	5.3	0.0	2.2	157.6	46.3	57.3	87.8	62.0	418.5
Normal (mm)	40.6	19.2	42.9	92.5	92.5	114.2	65.4	65.3	532.6
Departure (%)									
2017-18	-99	-64	12	-90	-50	-67	-11	-28	-52
2016-17	-87	-100	-95	70	-50	-50	34	-5	-21

Research Focus

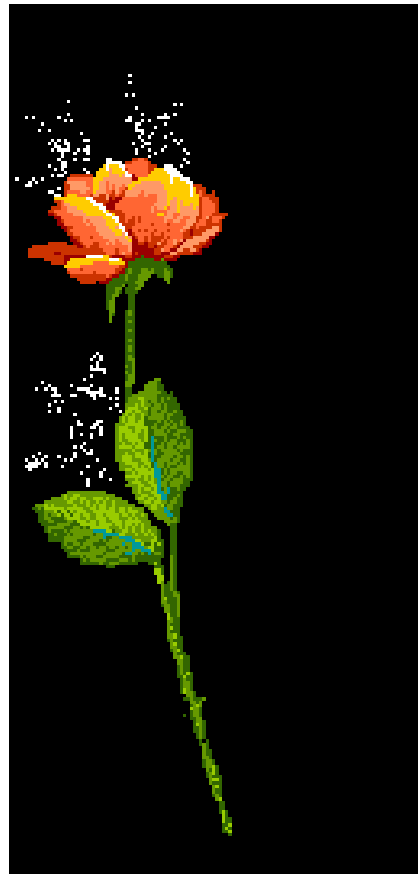
- ✓ Crop Improvement
- ✓ **Crop Production**
- ✓ Crop Protection
- ✓ **Protected Cultivation**
- ✓ Organic and Zero Budget Natural Farming

RESEARCH HIGHLIGHTS





CROP IMPROVEMENT



New wheat variety HPW 373 (Him Palam Gehun 3) (Identified for release by the SVRC)



- ✓ Av. yield 29.0 q/ha
- ✓ Resistant to yellow rust
- ✓ For LOW and MID HILLS under LATE SOWN
CONDITIONS

PROMISING GENOTYPES OF DIFFERENT CROPS



Wheat

➤ HPW 441

- Yellow rust resistant genotype
- Timely sown
- Grain yield potential of 32.0 q/ha (rainfed) and 43.7 q/ha (irrigated)

➤ HPW 442

- Yellow rust resistant genotype
- Timely sown
- Grain yield potential of 31.8 q/ha (rainfed) and 39.5 q/ha (irrigated)

Oil Seed Crops



Gobhi sarson : AKGS 8141



Mustard : AKMS 1002

VEGETABLE CROPS



DPP-SP-6

DPP-SP-6
Profuse Pod Bearing
Long, Well Filled and Lush Green Pods



DPP-SP-22



DPP-SP-22
✓ Profuse Pod Bearing
✓ Long, Well Filled and Bright Green Pods

VEGETABLE CROPS



DPEPP-15-1 Arka Apoorva DPEPP-10-1



Arka Apoorva DPEPP-10-1 DPEPP-15-1



Comparative Performance of Edible Pod Pea/Snap Pea lines at KVK, Berthin



Powdery Mildew Resistant Garden Pea Line 1-2 with Long Dark Green Well Filled Pods

VEGETABLE CROPS



Cabbage Hybrids in comparison to Check KGMR-1

VEGETABLE CROPS



DPTH-1



DPTH-2

Tomato Hybrids



Bacterial Wilt Resistant Bell Pepper Lines



Parthenocarpic Cucumber Line DPCCW-1



β - carotene rich cherry tomato : DCTY-1



Wilt Resistant Chilli line VVGCh-1

Seed Production



Quality Seed Production

(All major Cereals, Pulses, Oilseeds, Vegetables and Fodder
Crops in *Rabi 2016-17*)

Type of Seed	Quantity (q)
Nucleus	10.00
Breeder	668.49
Foundation	100.06
Total	778.55

Breeder and Foundation seed of different crops produced in Rabi 2016-17

Crop	Breeder seed (q)	Foundation seed (q)
Cereals	595.49	48.94
Pulses	16.44	25.20
Oilseeds	27.01	11.05
Vegetables	13.88	9.84
Fodder (Oats)	15.67	5.03
Total	668.49	100.06



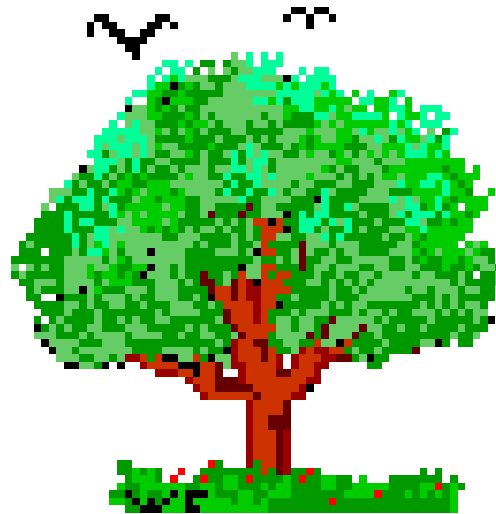
WHEAT
**Nucleus and Breeder Seed
Production**



Seed Production of Gobhi sarson variety GSC-7 at SAREC Kangra during the year 2017-18



CROP PRODUCTION



Cropping System Studies

- ✓ **Rice-palak-cucumber cropping system** gave the highest rice grain equivalent yield (RGEY) of 14.4 t/ha and net returns of Rs. 2, 21,193.
- ✓ **Okra-radish-onion** with RGEY of 14.02 t/ha and **Turmeric-pea-summer squash** with RGEY of 13.5 t/ha were 2nd and 3rd best cropping systems, respectively.

Integrated Farming System Model (IFSM)

One hectare farming system model.

- ✓ Gross returns : Rs. 2, 34,557/-
- ✓ Net returns : Rs. 1, 16,652/-

☞ Integrated Farming System Model (IFSM)

Contribution of different components (Net Returns)

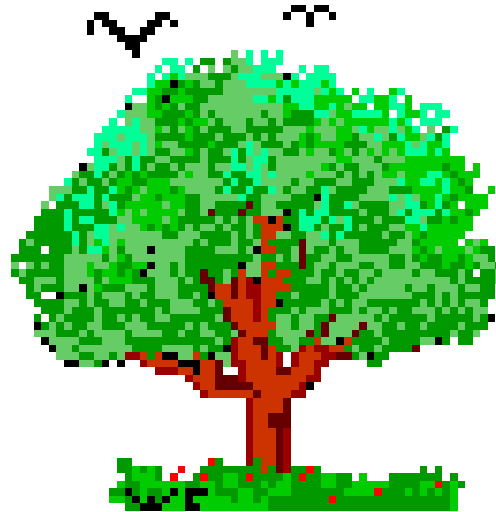
✓ Cropping system	:	<u>41.1%</u>
✓ Horticulture/vegetable	:	10.1%
✓ Dairy farming	:	<u>35.9%</u>
✓ Fodder	:	8.6%
✓ Mushroom	:	4.3%

Production potential feasibility of annual rye grass with berseem

- ✓ Sole rye grass (*Makhan* grass) produced higher green fodder yield followed by rye grass+ berseem sown in 75:25 ratio.
- ✓ Higher crude protein content in **Makhan grass sown with berseem in 50:50 seed ratio**
- ✓ Five forage cuts in rabi season can be obtained if crops are **sown in second fortnight of October.**



NUTRIENT MANAGEMENT



✓ **IPNS based nutrient doses recorded higher productivity of wheat over non-IPNS**

✓ Higher B:C ratio of 2.30 (Chemical fertilizers+FYM) & 2.20 (Chemical fertilizers) in potato was recorded following Soil Test Crop Response (STCR) approach compared to the farmers' practice (1.44) and general recommended dose (1.71).



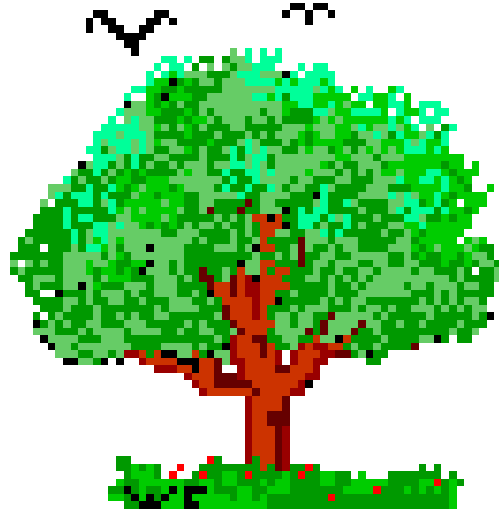
- Optimum dose of boron to enhance cauliflower yields for acid soil (Palampur) was worked out to be 2.72 kg ha^{-1}



Doses tested: 0.5 to 5 kg
Yield enhancement upto 25%



WATER MANAGEMENT



- Under protected conditions, straw berry crop should be irrigated 60 % of pan evaporation and fertigated with 75 % of recommended NPK.
- The highest potato tuber yield, net return and B:C ratio can be obtained by applying drip irrigation @ 60% of cumulative pan evaporation and 75 % recommended dose of NPK



CROP PROTECTION

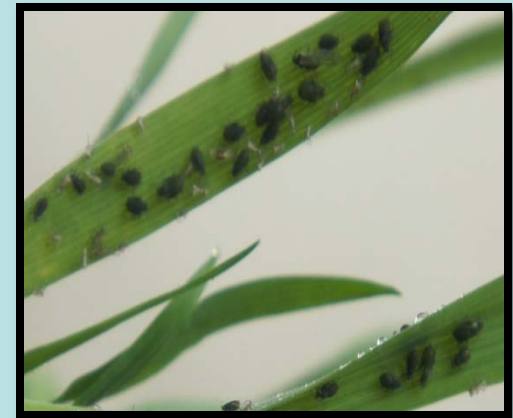


Insect pest Management



~~✎~~ Abundance of wheat aphid and its natural enemies

- ✓ Population buildup of wheat aphid complex (*Rhopalosiphum padi* and *Sitobion avenae*) revealed its peak population (30.4 aphids/shoot) during 3rd week of March.
- ✓ Seven coccinellid beetles species were recorded amongst which *Coccinella septempunctata*, *Hippodamia variegata* and *Coccinella transversalis* were more abundant.
- ✓ Population of coccinellids was higher in the plots treated with *darekastra* and *azadirachtin* compared to synthetic insecticides.



Wheat aphid, *Rhopalosiphum padi*



Coccinella septempunctata



Hippodamia variegata



Coccinella transversalis

Insect-pest fauna of onion in HP

- Ten insect species associated with *rabi* onion were recorded.
- Onion thrips (*Thrips tabaci*) was the most abundant



Damage by *Thrips tabaci* to onion plants

✂ White grub pests associated with different crops

- ✓ ELEVEN white grub species have been identified causing economic losses in potato, pea, cabbage, ginger, maize, rajmash, apple, apricot, walnut, peach and pear.
- ✓ Twelve different insecticides were tested against grubs of *B. coriacea* and *H. longipennis* in potato.
- ✓ Chlorpyrifos 20 EC, acephate 50 + imidacloprid 1.8 SP and clothanidin 50 WDG at recommended doses resulted in 100 per cent mortality among 2nd instar grubs of *B. coriacea*.



B. coriacea



A. lineatopennis



A. dimidiata



Melolontha furcicauda



M. indica



Holotrichia longipennis



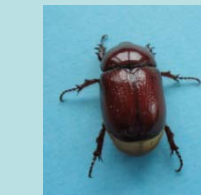
H. sikkimensis



H. lioderes



M. insanabilis



P. dionysius



Lepidiota stigma

Incidence of Tomato pin worm (*Tuta absoluta*)

- ✓ Tomato pinworm (*Tuta absoluta*) distributed widely in low and mid hill regions of the state.
- ✓ Apart from tomato, it was found infesting brinjal, potato and beans under protected and open field situations.
- ✓ **Under protected cultivation**, the pest caused severe damage to tomato crop (80–90% fruit infestation) in some parts of Mandi and Kangra districts
- ✓ **Under open field situations**, fruit infestation varied from 0.5-9.8 per cent.



Damage by pin worm



Efficacy evaluation of insecticides against *Tuta absoluta*

- Under protected and open conditions, flubendamide 480 SC @ 0.012% and indoxacarb 14.5 SC (0.015%) resulted in 45-52 and 38-44 per cent reduction in fruit infestation, respectively.
- Installing 5 pheromone traps per ha for monitoring alongwith foliar application of flubendamide 480 SC @ 0.012% at flowering or azadirachtin (@ 0.00045%) at 15 days interval not only reduced incidence of pin worm *in tomato* but also increased its productivity and profitability under protected and open conditions.



Efficacy evaluation of natural products against red spider mite under protected environment

- ✓ In parthenocarpic cucumber, three organic products namely, *darekastra*, *tamralassi* and vermiwash (@ 10%) applied as foliar spray 10 days after transplanting at 10 days interval were found to be at par to chemical acaricides (spiromesifen 0.02% and fenazaquin 0.01%) with respect to bio-efficacy and crop yield.
- ✓ **Based on two year evaluation,** these products were found suitable for incorporation in mite management programme under protected environment.



Damage by red spider mite

Disease Management

- ✓ The hybrid rice grown in Bheora area of Mandi showed very high incidence (62.5%) of neck blast .
- ✓ Seed treatment with Sedaxane 2.5% w/v + Fludioxonil 2.5 % w/v (50FS) at 3.0 ml/ Kg of seed, resulted in 97.8 % control of loose smut of wheat and 24.7% increase in the grain yield.
- ✓ Fungicides tebuconazole, hexaconazole, propiconazole and nativo were effective in reducing severity of wheat powdery mildew.

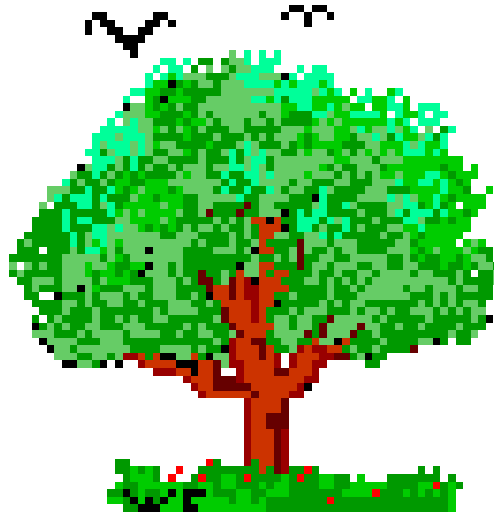
Disease Management

Six rapeseed-mustard genotypes namely YSB-9, PDZ-2, PDZ-3, PDZ-5, PDZ-7, DRMR-1-5 were resistant to white rust disease.



White Rust of Brassica

Weed Management



Weed Management

WHEAT

About 13% increase in WHEAT GRAIN EQUIVALENT YIELD under Conservation Agriculture System following **Zero Tillage along with Integrated Weed Management in both maize and wheat crops.**

PEAS

Early POST EMERGENCE IMAZETHAPYR @ 80 g/ha, EARLY POST IMAZETHAPYR @ 70 g/ha, PRE-EMERGENCE PENDIMETHALIN+ IMAZETHAPYR @ 900 and 800 g/ha and PRE-EMERGENCE IMAZETHAPYR @ 70 and 60 g/ha is effective weed management (???)

LINSEED

PENDIMETHALIN @ 1.0 kg/ha (PRE-EMERGENCE) fb.
METASULFURON METHYL @ 4 g/ha (POST-EMERGENCE) or
ISOPROTURON @ 1.0 kg/ha with METASULFURON METHYL @ 4 g/ha as
POST-EMERGENCE : BEST OPTIONS



Organic Crop Production

☞ Promising Genotypes for Organic Agriculture

FABABEAN

- Tested 12 genotypes. HB-19, NDE-10 & HB-32 were superior to the check HPB-1 (47.41 a/ha) giving 62.50, 54.91 & 54.63 q/ha of yield.

LENTIL

- Tested 13 genotypes. HPLO-1 (12.50 q/ha) and HPLO-2 (10.50 q/ha) were superior **under organic conditions** while **under zero budget natural farming conditions HPLO (8.33 q/ha) and DKC 13-12 (7 q/ha)** performed better.

BUCKWHEAT line Sangla B-444 developed through selection has been proposed as IVT entry this year.

- In IVT/AVT buckwheat trials, Sangla B-464 was the highest yielding among the IVT entries at **NATIONAL LEVEL**.

Nutrient Management through Organic Inputs

TEST CROPS : GARLIC & ONION

- **EVALUATED four organic liquid manures** *viz.* Himsol, Vermiwash, Matka khad & Compost tea at two intervals *i.e.* 15 & 30 days. Application of vermiwash at 15 days interval (6 sprays) produced significantly highest bulb yield of 88.4 q/ha in garlic and 181.9 q/ha in onion followed by vermiwash spray at 30 days interval (3 sprays) which resulted in 74.8 q/ha yield in garlic.

👉 Nutrient Management through Organic Inputs

TEST CROPS : PEA and POTATO

- **Bio-gold and Phosphate Rich Organic Manure (PROM) :**
Both the products were as good as standard organic treatment in recording significantly higher growth, yield attributes and yield in both the crops compared to the farmer's practice and inorganic treatment.



PEA



POTATO



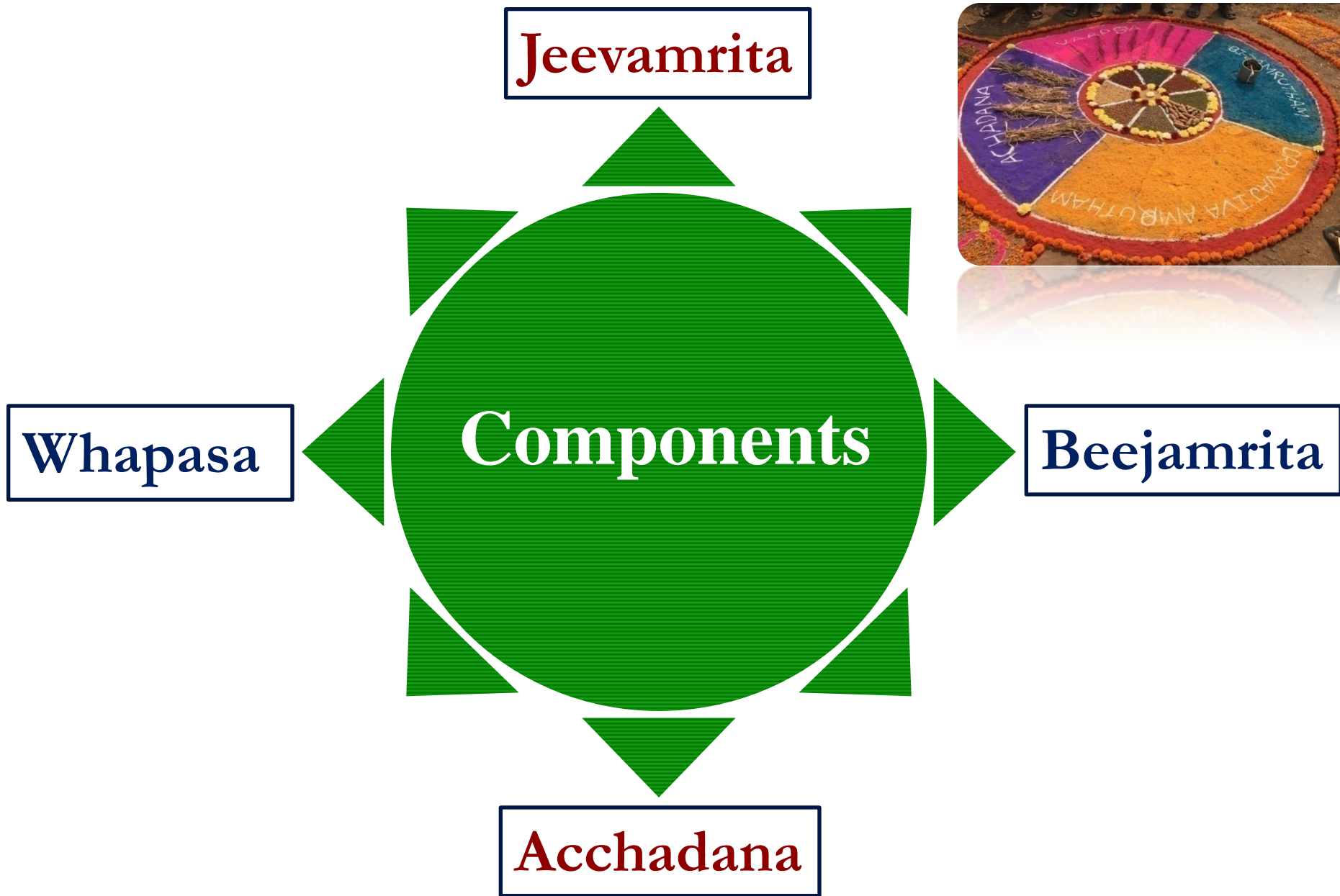
LENTIL



FABABEAN

Performance of different crops under natural Farming conditions

ZERO BUDGET NATURAL FARMING



✓ **RESEARCH EFFORTS in ZERO BUDGET NATURAL FARMING (ZBNF)** initiated in CSK HPKV, Palampur during April, 2016 with organization of 4 days National Workshop on 27-30 April, 2016 under the Chairmanship of His Excellency the Governor of HP and Chancellor, of the University.

✓ Padamshri Subhas Palekar was the key speaker



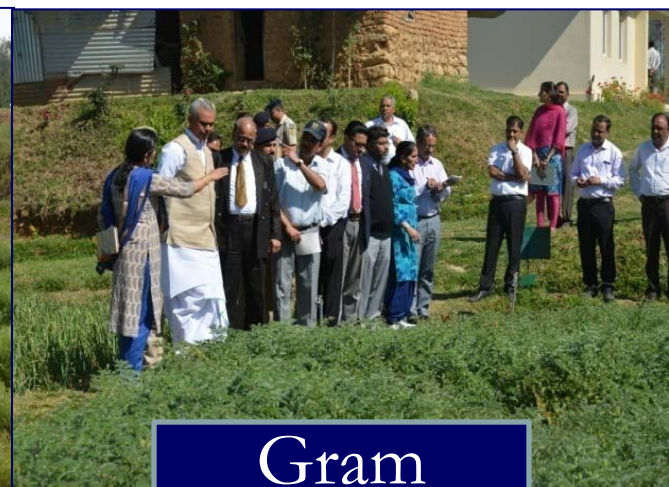
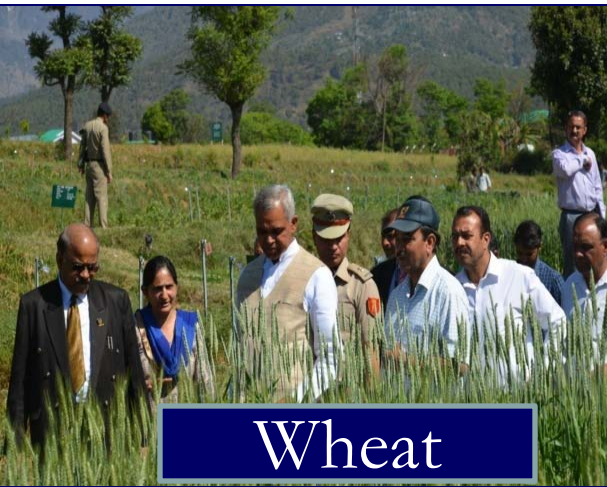
RESEARCH EFFORTS

PULSES : Gram, Lentil and Soybean;

CEREALS : Wheat and Paddy and

UNDERUTILIZED CROPS : *Ogla/ phaphra* (*Fagopyrum sp.*)

✓ grown as TEST CROPS



✓ Gurukul (Kurukeshtra) has the standardised set up of ZERO BUDGET NATURAL FARMING

✓ Hon'ble Vice Chancellor, Scientists and students of this University visited Gurukul (Kurukeshtra) 2-3 times to understand the ZBNF model



👉 Reaching the Farmers for ZBNF

- ✓ FARMERS being educated on ZBNF in almost all the training programmes
- ✓ Documentation of package for ZBNF in HINDI
- ✓ Likely to be made available to the farmers shortly.



- BSc (Agri.) final year students also demonstrate the preparation of various ZBNF inputs to farmers of the adopted villages.
- KVK Una and Kullu are actively engaged in generating and disseminating ZBNF techniques to the farmers.



👉 Inauguration of ZBNF Centre

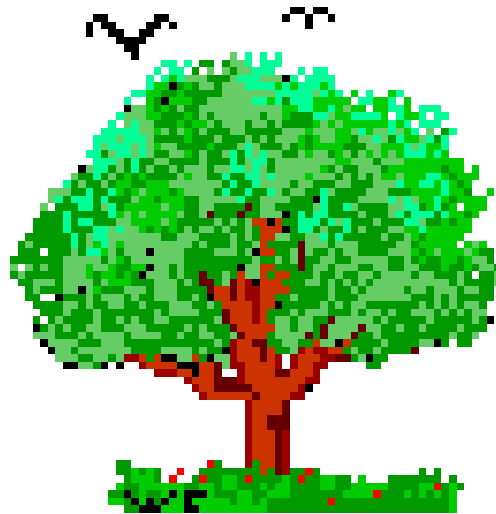
- ✓ His Excellency, The Governor of HP and Chancellor of the University, Acharya Devvrat ji inaugurated **ZBNF** Centre on 29.01.2018
- ✓ Sh. Jai Ram Thakur, Hon'ble Chief Minister of H.P.; Prof. AK Sarial Hon'ble Vice Chancellor, CSK HPKV, Palampur; and a team of Cabinet Ministers, local MLAs were the other dignitaries present on the occasion
- ✓ **The Govt. of Himachal Pradesh** recently **provided financial support** of Rs. 3 crore to the University to strengthen research efforts on ZBNF



On Going Research Projects

Particulars	No. of Projects	Budget Outlay (in Rs. lakhs)
AICRPs	34	1422.00
ICAR Funded Projects	11	510.96
DBT Funded Project	06	236.32
DST Funded Projects	12	341.48
CSIR Funded project	01	3.99
UGC Funded project	01	13.71
Miscellaneous Adhoc Projects	68	1064.54
RKVY Projects	12	508.84
Total	145	4091.84

NEW RECOMMENDATIONS



Proposal for release of Indian mustard variety



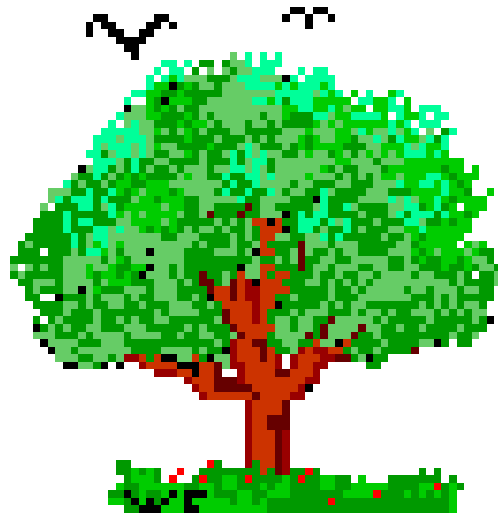
Trombay Him Palam Mustard-172 (THPM-172)



- ✓ Timely sown
- ✓ Irrigated conditions
- ✓ Low & mid hill areas of H.P.



Future Research Priorities



Crop Improvement

- ✓ Continuation of breeding work for development of high yielding and disease resistant varieties of wheat, barley, oats, brassicas, chickpea and important vegetable crops.
- ✓ Development of horticulturally desirable hybrids of cauliflower, cabbage and broccoli by using different genetic mechanisms.
- ✓ Collection, evaluation, maintenance and conservation of germplasm of different vegetable crops.
- ✓ Identification of high yielding lines of minor vegetables like lettuce, fennel, faba bean etc.
- ✓ Nucleus and breeder seed production of different released varieties.

Crop Production

- ✓ Development and validation of On-Station Integrated Farming System Model
- ✓ Identification of need based cropping systems for different agro-climatic conditions.
- ✓ Organic weed management in maize-pea sequence
- ✓ Optimizing nutrient requirements through innovative organic and inorganic fertilizer products in wheat
- ✓ To study the effects of Zn, B and Mo application on soil health and productivity in wheat, cauliflower and tomato
- ✓ To develop target yield based fertilizer prescription equations in garlic

Crop Protection

- ✓ Survey and surveillance of insect pests and emerging pests
- ✓ Management of termites in wheat, cutworms in cabbage, lepidopteran pests in cole crops, pests of tea through biopesticides, natural products and newer insecticides
- ✓ Evaluating impact of neonicotinoids on honey bees
- ✓ Monitoring of diseases of different rabi crops with special emphasis on yellow rust and Karnal bunt of wheat
- ✓ Management of important diseases of rabi crops (cereals, oilseeds, pulses and vegetable crops)
- ✓ Germplasm evaluation of different crops for resistance sources against different diseases

Protected Cultivation

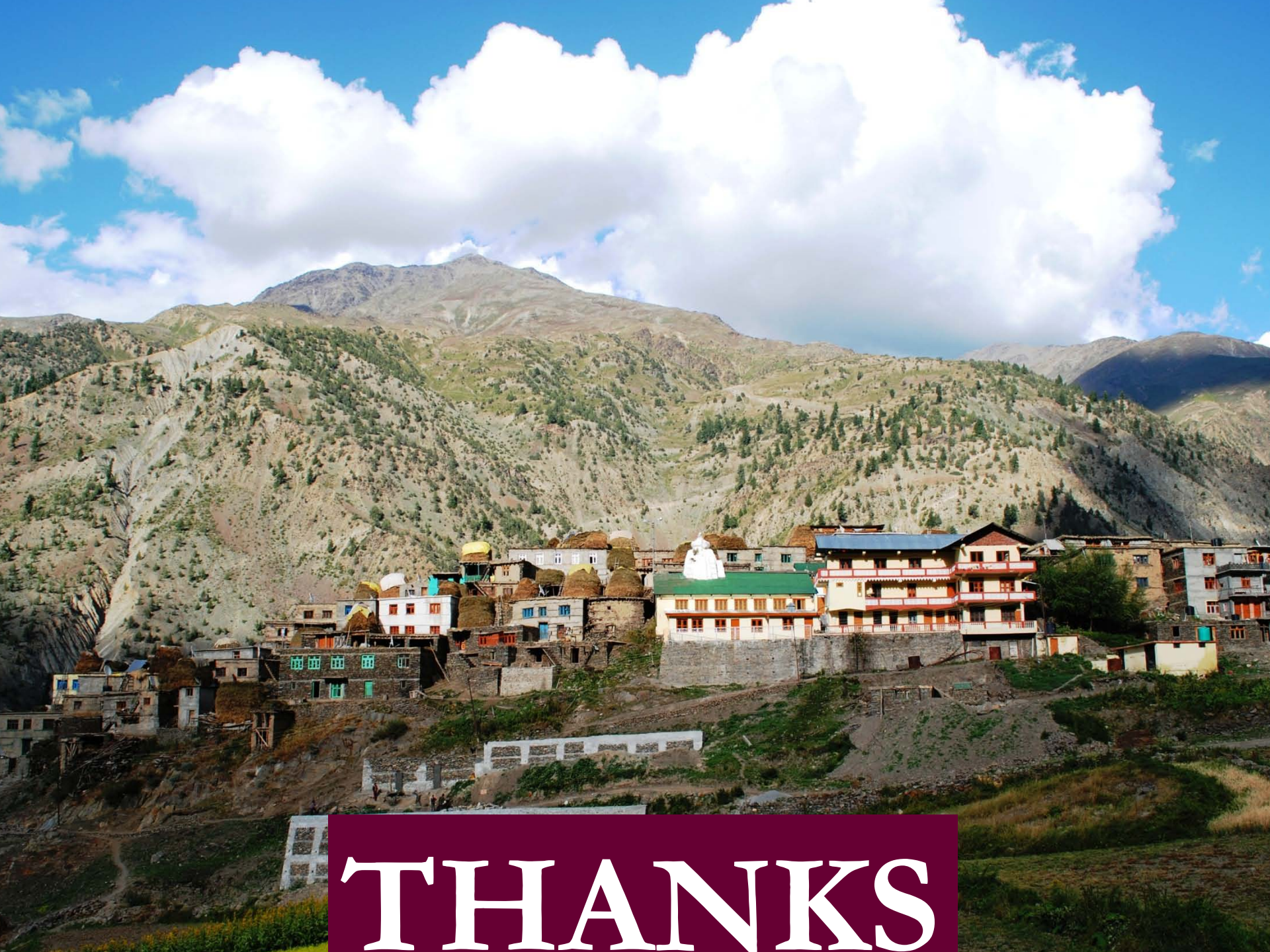
- ✓ Production technology of important vegetable crops for protected environments
- ✓ Management of insect-pests and diseases
- ✓ Evaluation of natural products and bio-pesticides against greenhouse whitefly in cucumber

Organic and Zero Budget Natural Farming (ZBNF)

- ✓ Development & standardization of the cultivation technologies for different crops
- ✓ Evaluation of quality of dung and urine of *Pahadi desi*, Sahiwal, mixed breed and Jersey cows *w.r.t.* the microbial population and nutrient status
- ✓ Management of insect-pest & diseases under ZBNF system.
- ✓ Comparative economics of ZBNF, organic and inorganic farming
- ✓ Effect of different farming practices (including ZBNF) on the population dynamics of insect-pests infesting garden pea

Farm Mechanization

- ✓ Evaluation of Garlic Planter for cultivation of garlic.
- ✓ **DATA BASE** on strength parameters of agricultural workers in Himachal Pradesh.
- ✓ Construction and Evaluation of dry fermentation based 5 m³ biogas plant.
- ✓ Demonstration and ORP of solar gadgets and improved cook stove.



THANKS