

# ICAR-National Agricultural Higher Education Project

Project Report (up to March 31, 2023)

## Component 1b: Centre for Advanced Agricultural Science and Technology (CAAST)

CSK Himachal Pradesh Agriculture University, Palampur Himachal Pradesh

### Protected Agriculture and Natural Farming



CSK Himachal Pradesh Agriculture University Palampur (India) 176062

**Name of the AU: CSK Himachal Pradesh Agriculture University Palampur**  
**Project Title: Protected Agriculture and Natural Farming**

**Executive Summary:**

**Research**

- Thirteen varieties, including nine varieties of vegetable crops and four cereal crops were notified by Central Variety Release Committee (CVRC) at national level. Six varieties notified by Protection of Plant varieties and Farmers right (PPVFR) and 2 Garden Pea genotypes registered at National Bureau of Plant genetic Resources (NBPGR). Four New Hybrids each of Cauliflower and chilli, one variety each of Tomato, Cucumber, Capsicum, Cherry tomato, Lettuce, snow pea and garden pea for Protected Agriculture (PA) and Natural Farming (NF) developed are showing superior performance for yield and are presently put in on-farm and station trials.
- Three varieties namely, Him Palam Matar-1, Palam Mridula, Palam Tomato Hybrid-1 have been commercialized by signing MOA with private sector companies viz., Welcome Seeds- New Delhi, Durga Seeds- Mandi (HP), Nutranta Seeds, Krishma Seeds -Bilaspur HP and Super Seeds- Hissar)
- CMS based Cauliflower hybrids of mid-late group (DPCafMSPU × DPCafW-4, DPCafMSPU × DPCafW-131, DPCafMSPU × DPCafS121 and DPCafMSPU × DPCaf-18) evaluated as best performer in both under natural farming (NF) and conventional farming (CF) conditions with 50 % yield in NF.
- The real time automated systems, solar empanelled system of 5 kilo watt established to reduce energy cost. Small, medium and large natural ventilated polyhouses including plant growth chamber also installed/modified as demonstration units for PG students research and demonstrations. During 2020-23, about 4 lakhs nursery seedlings of tomato, capsicum etc., were produced and sold which helps in revenue generation.
- In Protected Agriculture, integrated nutrient management technologies worked out for . vegetable crops with best performance of Palam Tomato Hybrid-1, Bell pepper hybrid Mekong and Cucumber hybrid Him Palam Khira-1 under Natural Farming conditions.

- Among the filler crops under protected conditions, newly developed garden pea line DPP-SP-6 followed by Him Palam Matar-1 under NF & CF evaluated and recommended. Similarly, a newly developed genotype of snow pea Him Palam Meethi Phali-1 followed by Him Palam Meethi Phali-2 under both NF and CF. GMS based chilli hybrids developed and four hybrid combinations showed significantly higher yield (both green and red) with 65% reduction in yield under NF of snow and garden peas. The varieties of chilli, cauliflower and garden pea responded better under INM (FYM+ synthetic fertilizers) followed by organic farming while NF showed the lowest yields in chilli and garden pea.
- The natural farming technologies under natural resource environment revealed that
  - Drenching of Jeevamrit 10% at weekly intervals and soil application of vermicompost @ 12.5 t/ha + jeevamrit at 7 days interval recorded highest yield (610.75 q/ha) of tomato (Palam Tomato Hybrid-1) under naturally ventilated polyhouse conditions.
  - In Capsicum var Him Palam Super, highest fruit yield (358 q/ha) was recorded with Vermicompost @ 10t/ha + Biofertilizer (Azospirillum+ PSB) + Jeevamrit 10% sprays at 5 days interval+ other sprays as per SPNF.
  - Inter cropping of okra with soybean, with SPNF recommendation + jeevamrit sprays at 7 days interval recommended. Okra var. Palam Komal under Integrated farming treatment i.e. vermicompost @ 5 t/ha + 50% recommended NPK fertilizer 37.5:25:27.5 registered highest yield (104.7 q/ha).
  - *Ghanjeevamrit* @ 1 tonne/ha as basal + jeevamrit sprays (10%) at 14 days interval produced highest yield (685q/ha) of cucumber var Damini. Application of *ghanjeevamrit* @ 1 tonne /ha + jeevamrit (10%) sprays at 14 days interval recorded highest yield of peas var. PB-89 under naturally ventilated polyhouse conditions. Application of integrated treatment of vermicompost @ 5t/ha + 50% recommended NPK fertilizer 25:30:30 resulted in higher production of peas var HPM-1.
- The cereals and millets varieties evaluated and screened under NF indicated HPR 2720, HPR 1068 and HPR 1156 of Paddy, Sainj local and Jwalapur local of maize, VL 324, followed by VL 149 of finger millets were significantly superior for yield.

- The non-basmati pyramid line HPL19 SPS-2 yielding 42.8 qt/ha and basmati type T8SPS-5 yielding 22.56 qt/ha identified as potential lines for cultivation under NF conditions.
- Eighteen genotypes of wheat, MCTLH-21, Kanku, MCTLH-22 and HPWO-4 were significantly superior to that of other genotypes under natural farming conditions. Among nine varieties of barley evaluated, BHS-380, HBL-316 and HBL-113 were found to be top yielders. In case of lentil, HPLO-2 and DKL-57 were found to be significantly superior, respectively among other genotypes under natural farming conditions.
- The bioformulations, biofertilizers and compost/liquid manures produced for on-farm use and revenue generation. In general, about 195.19kg biofertilizers, 62MT of vermicompost, 4.8 MT of *ghanjeevamrit*, 15 MT of jeevamrit and 2.5 MT of biopesticides were prepared during 2020-2023 that earned revenue of approx. Rs 10 lakh.
- Soil health monitoring with respect to physico-chemical & biological parameters revealed enhanced soil quality under natural farming conditions.
- Standardized the gravity fed based discharge flow rate of drip irrigation system by following organic and IPNS NPK drip fertigation schedules under protected environment. The bio fertigation schedule viz. compost tea and vermiwash@ 7.5 ml /sqm at weekly interval under surface and sub surface drip irrigation system standardized for tomato, cucumber and marigold in protected environment.
- Rain-water model for open or protected conditions with gravity fed drip irrigation developed.
- Novel approaches for the management of insect, mite and nematode pests of important vegetable crops namely, tomato and parthenocarpic cucumber were evaluated. These comprised plant nutrition management with emphasis on nitrogen and potassium application (N and P 100% and K 150% of RDF), bio efficacy evaluation of biorational and natural products in pest management, incorporation of parasitoid, *Encarsia formosa* for the management of greenhouse whitefly under protected environment and standardised mass rearing of predator, *Chrysoperla zastrowi sillemi* under laboratory conditions.

- For the management of root knot nematode, soil drenching of a bioagent, *Bacillus amyloliquefaciens* and a new chemical fluopyram 400 SC (Velum Prime) were found promising in reducing nematode galls and increasing yield in cucumber.
- Thirty-five *Trichoderma* species and 12 bacterial isolates were isolated from the rhizospheres of tomato, capsicum and cole crops. *Trichoderma* isolates TI-6 and TI-9 and Bacterial isolate five were found to be the most effective against *Ralstonia solanacearum*.
- Fortification of manures with bio-agents and evaluation of different delivery systems showed promising results in managing soil-borne diseases in tomato and capsicum. Similarly, eco-friendly disease management techniques using bioagents, botanicals and organic inputs for recommendations against different diseases under protected agriculture.
- Consortium of Microbes-Bioformulation (Twenty isolates- phosphorus solubilizing ability, 51 isolates- siderophore producing ability and 63 isolates)- ability to grow on nitrogen free medium leading to promote germination (70-75%) and yields (30-45%)
- The different samples of dung (Cow, Buffalo and Churi) were evaluated and results revealed highest total viable counts (>300 crore cfu/gram) in indigenous breeds (Sahiwal, Red Sindhi, Himachali Pahari) of cattle in comparison to Jersey and crossbred (184.5 crore cfu/gram). The coliform counts were also less in indigenous breeds of cattle in comparison to Jersey and crossbred. *E. coli* was detected in indigenous animals only.
- Phytotron facility equipped with controlled temperature, photoperiod and humidity is being used for speed breeding maintenance for sustainable utilization for the indigenous germplasm of wheat, mash, red rice, maize and potential crops like amaranth, buckwheat, Chenopodium millets and kalazeera from different parts of HP .
- The shelf life of fresh produce from natural farming extended upto 2 weeks with packaging materials (polystyrene and laminates), ethylene and oxygen absorbers sachets the shelf life further extended to three weeks. Twelve value added products standardized for commercialization and store upto six months from NF.
- A total number of ten ready to eat raw vegetables from different farms, local markets and CSKHPKV farms (cabbage, radish, carrot , coriander leaves, lobia ,okra, cucumber ,

capsicum , chilli , chilli (grown under natural farming), maize , tomato , radish, pea pods out of which 10 % showed Balantidium coli,70% coliforms and 20% E. coli.

- The economics, cost of cultivation was worked out for protected crops and soybean, gram, wheat & maize under Natural farming and Protected Agriculture

### **Academics**

- The ranking of University by ICAR improved from Rank 23 during 2017-18 to Rank 14 during 2020-21 amongst all agricultural institutes and Rank 10 amongst Agricultural Universities.
- Forty-Two PG students (24 MSc, 18 PhD) are pursuing their thesis on thematic area out of which four thesis have been submitted.
- National Trainings to PG students in the Institutes of Excellence benefitted 38 PG students besides 6 inhouse training to benefitted 2567 PG students
- Five faculty and eight PG students undertaken trainings in international institutes for professional excellence.
- Twelve research publications, eight review articles by faculty and PG students after intervention in >7 NAAS rated Journals emanated from CAAST Work only. More than 50 research / review articles were published by the faculty associated with CAAST project.
- Fifteen MoU's with National Institutes of repute for increased visibility through CAAST. About 54 MOUs signed after implementation of the CAAST Project with National and International institutes by the University 2019 to 2023

### **Background:**

In the current scenario and climatic conditions, vegetable crops present a promising opportunity to increase livelihood and entrepreneurship in the state. Agricultural production is vulnerable to numerous uncontrollable climatic factors, with rainfall being the primary factor. In most of the crucial farming agro-ecoregions of the state, rainfall exceeds the ET during the monsoon rainy months, which washes away vital plant nutrients during the kharif crop growing season. During rabi season, it rains very little, and low temperatures stymie plant growth. The cultivation of vegetable crops is impeded by biotic constraints, including insect-pests and diseases, which have been reported to cause a loss of 10-60% in various regions of the state. Currently, vegetable growers rely on synthetic chemical pesticides for pest control. However, the frequent and indiscriminate use of these pesticides has resulted in the development of resistance in pest species, an imbalance in the natural ecosystem, pest resurgence, toxicity to non-target organisms, environmental pollution, and various non-communicable diseases, such as cancer, mental retardation, and reduced fertility. Given the harmful effects of synthetic pesticides, tougher trade regulations, and growing public awareness about environmental quality, there is a pressing need to transition to alternative pest control methods.

Efforts to enhance the efficiency, Protected Agriculture should prioritize year-round cultivation, including the identification of region-specific, remunerative alternate crops during the main season and filler crops during the lean period. The primary obstacle to optimizing the full potential of protected cultivation is the incidence of various biotic stresses, such as insect-pests, diseases, and nematodes. Consequently, concerted efforts are required to develop natural based bio-intensive pest management programs for both existing and emerging pests, resulting in safe and healthy crop yields. Natural farming/organic Agrotechnologies under protected Agriculture has recently attracted the farmers and policy makers and needs to developed technologies suitable in Protected environment for more safe foods. Since protected cultivation is a commercial agribusiness venture with significant initial capital investment, its sustainability is contingent on economic profitability rather than on the volume of production. Therefore, it is necessary to apply economic and business principles to evaluate its efficacy. The Advance centre of Protected agriculture and Natural farming is not only providing usable scientific info ration but also serve as incubation centre for Starups on protected Agriculture and Hydroponics by youths

### **Introduction of the project:**

The ICAR, National Agricultural Higher Education Project in collaboration with World Bank initiated to improve academic excellence in Agricultural universities in various thematic areas. Since 2019, the Centre for Advanced Agricultural Science and Technology (CAAST), NAHEP, ICAR for Protected Agriculture and Natural Farming (PANF) has been granted and operational at Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur. It comprises a multidisciplinary team of experts in various fields including organic and natural farming, vegetable science, plant breeding, soil science, entomology, plant pathology, microbiology, agricultural engineering, agricultural economics, horticulture, food technology, and veterinary public health and epidemiology to address the various research endeavours envisaged under objective

The PANF project has facilitated the development of several infrastructure facilities (More than 6.5 crores ) such as high-tech planting material, production units, high-tech plant growth chambers, hydroponics, phytotron, molecular breeding laboratory, and bioagent production units. Approximately 16 polyhouses and 6 labs have been refurbished, and the lecture theatre and conference rooms have been upgraded with the latest technologies. Moreover, over 105 farm machinery and laboratory equipment have been acquired.

The primary objectives of the project are to improve academic and research excellence in protected agriculture and natural farming through the establishment of environmental control protected structures as demonstration units. This includes producing quality planting material for protected agriculture, evaluating hybrids/varieties under protected and natural resource environments, developing various production and protective inputs, and assessing soil health periodically. In addition, the project aims to isolate, screen, and characterize indigenous bacterial isolates for large-scale production of bioformulations, biofertilizers, and compost/liquid manures. The project also standardizes rainwater harvesting technology for stored water without using electricity and develops integrated pest management strategies that rely on organic and bioformulations. The Phytotron is utilized for off-season hybridization of local landraces and new varieties.

The project has enhanced the competence of faculty, skills of postgraduate students, and fostered institutional reforms. The focus of the Centre is to develop the capacity for the adoption and development of Protected Agricultural and Natural Farming technologies among the students and faculties of CSKHPKV, Palampur through Skill/certificate courses, International/National training webinars, workshops, conferences, symposia, students-industry interphase, guest lectures, exposure visits, and demonstrations on different



thematic areas. Furthermore, the project assures quality and safety evaluation of produce, microbial quality evaluation, development of value-added products, and economic evaluation of crops under protected farming.

The Centre aims to establish CSKHPKV, Palampur as a national level advanced training centre for “Protected Agriculture & Natural Farming.”

**Title:** Protected Agriculture and Natural Farming

**Key objectives:**

- Enhancement of academic and research excellence in protected agriculture and natural farming.
- Augmenting competence of faculty, skill of postgraduate students and fostering institutional reforms
- Value addition and marketing strategies for the products of protected agriculture and natural/ organic farming.

**Intended benefits:**

- Development/Creation of state of art infrastructure facilities including high tech planting material, production unit, high tech plant growth chamber, hydroponics, phytotron, molecular breeding laboratory, bioagent production unit etc
- Development & Evaluation of New Hybrids/Varieties and productions technologies including management of pests and diseases for Protected Agriculture & Natural Farming and dissemination for quality production of vegetable crops.
- Providing continuous technical support to different stakeholders for sustainability of protected cultivation and natural farming
- Speed Breeding for maintaining and preserving localized races and R&D for new varieties using phytotron facility
- Research Facilities for PG student and faculty, Incubation centre on Protected Agriculture, Hydroponics and Natural Farming for startups being adopted by youths of the state
- Fostering linkages amongst institutions across the country to augment quality academic excellence
- Academic and research excellence through international exposure to Faculty & PG Students
- Capacity building of PG students and Faculty in National Institutes and through trainings and seminars
- Post harvest and economic evaluation for recommendations to farmers /other stakeholders
- PANF is serving as National centre of Excellence and incubation centre for new Startups

# 1. Key activities carried out under the project during the entire period

## 1.1. Interventions carried out by AU which helped to improve research effectiveness

Please provide the details about the interventions carried out to make AU reform ready and led to ICAR accreditation. Please write one paragraph for each interventions and/or activities.



Key interventions	Remarks/Photographs
<p><b>Webinars/Expert Talks</b></p>	 <p>Thirty nine webinars benefitted 4284 participants including scientists, farmers, students, researchers, extension workers</p> <p><small>National Training cum webinar on "Diagnosis and management of diseases and insect, mite and nematode pests of vegetable crops in protected agriculture and natural farming"</small></p>
<p><b>National training to PG Students &amp; Faculty</b></p>	 <p>Capacity building for academic Skill Development for students &amp; faculty undertaken in reputed national institutes Benefitted 2605 (PG Students and Faculty)</p>
<p><b>International training to PG Students &amp; Faculty</b></p>	 <p>International exposure and Capacity building for advance technology, Research linkage for academic excellence (US, Australia, England, Taiwan etc.) Thirteen (13) (PG Students and Faculty benefitted</p> <p><small>Director of Research &amp; Dean CSNAU visited University of Melbourne for academic and research collaboration</small></p> <p><small>Dr. Piyvesh Sharma visited Volcani Center, Gilat Regional Agricultural Center and University of Jerusalem, Israel</small></p> <p><small>Mr. Etesh Kaurish visited International Training at World Vegetable Center Taiwan</small></p> <p><small>Mr. Shikhar Verma attended International Training at University of Melbourne Australia</small></p> <p><small>Mr. Shree. Mr. Pappu and Mr. Anshu attended International Training at World Vegetable Center Taiwan</small></p> <p><small>Mr. Khushbhant Kaur visited Central Plant Protection Research Institute Ankara Turkey</small></p> <p><small>Mr. Harshdeep of Oshima Research Institute of Technology Japan</small></p>
<p><b>Certificate Courses</b></p>	<p>Skilled human resource for Entrepreneurship development; Three certificate courses have been developed viz.,</p> <ol style="list-style-type: none"> <li>1. Commercial Hybrid Seed Production of Vegetable Crops,</li> <li>2. Protected Cultivation of Vegetable Crops,</li> <li>3. Pest management under Protected Cultivation</li> </ol> <p>Opportunity to postgraduate students to enhance their skills in the area of Protected agriculture and plant protection through Natural Farming</p>

<p><b>Publications</b></p>	<p>Publication of research outcome in peer review journals, the average NAAS score from 5.65 before 2020 increase to 7.27 (average NAAS score) and with highest NAAS 11.0 after implementation of NAHEP, CAAST.</p>
<p><b>Brain Storming Sessions</b></p>	<p><b>International</b></p> <ul style="list-style-type: none"> <li>• Dr Taisuke Kanao, Yamagata University, Japan visited university w.e.f 22 Oct to 6 Nov, 2022 to work on <i>termitophiles</i></li> <li>• Dr Jan Sobotnik, Czech University of Life Sciences, Prague, Czech Republic visited university from 16.09.2021 to 25.09.2021 to develop collaboration on termite research.</li> <li>• High level delegation of University of Melbourne (Prof Frank R Dunshea and Dr SS Chauhan from School of Agriculture) held discussion for broad programmes like collaborative research projects, faculty interchange programme, student exchange and sandwich programmes.</li> </ul> <p><b>National</b></p> <ul style="list-style-type: none"> <li>• Brain Storming Session on 11.02.2021 to finalize certificate courses on 11.02.2021 (15 experts including Dr. Pritam Kalia from IARI, IVRI, CSKHPKV and private Sector involved and provided commendable suggestions to improve these courses)</li> <li>• Dr T.R. Sharma, Deputy Director General (Crop Science), Dr H.K. Chaudhary, Vice Chancellor, CSKHPKV, Directors of three ICAR institutes namely, Dr S.N. Sushil, Director, National Bureau of Agricultural Insect Resources (NBAIR), Bengaluru (Karnataka), Dr A.D. Pathak, Director, Indian Institute of Sugarcane Research (IISR), Lucknow (UP) and Sanjay Kumar, Indian Institute of Seed Science (IISS), Mau(UP) and statutory Officers and faculty members of CSKHPKV, Participated in a session wherein CSKHPKV signed three MoUs for future collaboration with ICAR.</li> </ul>
<p><b>Development of varieties and hybrids of vegetable crops</b></p>	<p><b>13 (9 Vegetables + 4 Cereals)</b>  <b>Two- Varieties of Garden Peas registered with PPVFRA</b></p> <ul style="list-style-type: none"> <li>• Four-Varieties namely, Him Pala Matar-1 (garden pea), Him Palam Meethi Phali-2 (snow pea), Him Palam Kheera-1 (Parthenocarpic cucumber), Him Palam Cherry Yellow (Cherry tomato) are recommended by CVRC for cultivation in HP.</li> </ul>




- Four CMS based hybrids of cauliflower, 4 GMS based hybrids of chilli, 1 variety each of tomato, cherry tomato, parthenocarpic cucumber, bell pepper, lettuce and snow pea, 2 genotypes of garden pea, cauliflower and chilli are identified as promising ones and are in pipe line for release/recommendation

### 1.2. How the facilitative units helped to enhance learning outcomes

Please provide the details of the facilitative units which helped in enhancing learning outcomes of the students and/or faculties. Please note that we may not need to mention all facilitative units created in the AU here, but focus on those which are open for the students/faculties and other stakeholders.

Facilitative unit	Activity/achievement	Remarks/Photographs
<p><b>High tech Planting Material Production Unit</b> (polyhouse of 250m<sup>2</sup> area with polycarbonate sheet, water boomer irrigation system, cooling and heating system, tray benching system, microprocessor-based control panel with electrical back up system and solar panel) automatic nursery seeding machine</p>	<p>Unit is functional. State of art facility is being used for nursery production of different vegetable crops that resulted in revenue generation.</p>	 <p>Hi-tech Planting Material Unit with Solar System established under PMAF, CAAST, NAHEP, ICAR project in CSKHPKV Palampur (2021)</p>
<p><b>High tech Polyhouse for soilless cultivation of vegetable crops (Hydroponics)</b></p>	<p>Unit is functional. State of art facility is used for developing the technologies for Hydroponic Production System for the following crops Lettuce, Capsicum and Cherry tomato. Awareness among School students (350), College Students, Farmers (150) and Agriculture Officials (21), 2 PG</p>	 <p>High tech Polyhouse for soilless cultivation (Hydroponics) Unit established under PMAF, CAAST, NAHEP, ICAR project in CSKHPKV Palampur (2021)</p>

	<p>students are undertaking their field experiments of Vegetable Lettuce and tomato</p> <p>Skill -upgradation trainings to farmers and students</p>	
<p><b>Phytotron facility and Students Research Park comprising five walks in plant growth chambers and culture room</b></p>	<p>Unit is functional. It is used for Off-season hybridization, Generation advancement in wheat, rice and oat, Micro-propagation of <i>kala zeera(black cumin)</i> using tissue culture approach, Gene pyramiding for yellow rust in wheat, QTL identification for drought tolerance in wheat and quality traits in Oat. 10 PG students undertaking their thesis work in the state of art facility</p>	 <p>Phytotron facility and Students Research Park established under PANF, CAAST, NAHEP, ICAR project in CSKHPKV Palampur (2021)</p> <p>Ten- PG students working for PG research</p> <p>Eight Faculty and Thirty PG students imparted 2- days training on Uses of Phytotron</p>  <p><b>Training on Phytotron</b></p>
<p><b>Installation of soil nutrient-based fertigation system and pressure bomb</b></p>	<p>Unit is functional. Being used for determining the leaf water potential for in DSR for silicon effect on water stress –</p> <p>One Ph.D &amp; 2 MSc students are working on automated fertigation unit for standardization of fertigation schedules in vegetable crops</p>	 <p>Installation of soil nutrient-based fertigation system and pressure bomb under PANF, CAAST, NAHEP, ICAR project in CSKHPKV Palampur (2021)</p>

<p><b>Renovation and installation of natural ventilated polyhouses</b></p>	<p>Evaluation of high-yielding, multiple disease resistant varieties/hybrids of Tomato, Cucumber, Chilli, cauliflower, lettuce, pea etc. under protected environment both natural and conventional farming.</p> <p>Breeder Seed Production of different vegetable crops viz., Cherry Tomato, Cucumber, Capsicum, pea, chilli and cauliflower.</p> <p>6 PG students are undertaking their field experiment on Tomato, Cucumber, and chilli</p>	
<p><b>Molecular Breeding Lab</b></p>	<p>Unit is functional.</p> <p>8 PG students working on molecular breeding in crops like chilli, cauliflower, tomato, pea and cucumber</p>	
<p><b>Bio-agent Production Unit</b></p>	<p>Unit is functional.</p> <p>Production of host insect culture; whitefly and aphid</p> <p>Mass production of biocontrol agents namely; <i>Encarsia formosa</i> and <i>Chrysoperla zastrowi sillemi</i></p> <p>12 PG students using the facility for research accomplishments.</p>	



<p><b>Plant growth chamber</b></p>	<p>Unit is functional. Nursery raising of season vegetable (3 crops) and seed production (Lettuce, tomato and capsicum). Screening pea genotypes for powdery mildew disease and advancing segregating generations.</p>	 <p>Plant Growth Chamber</p>
<p><b>Conference Room</b></p>	<p>Unit is functional in the Department of Vegetable Science and Floriculture</p>	 <p>Conference Room established under PANF, CAAST, NAHEP, ICAR project in CSKHPKV Palampur (2021)</p>
<p><b>Renovation and Upgradation of Lecture theatre</b></p>	<p>Unit is functional in the Department of Vegetable Science and Floriculture Smart Classroom with all facilities</p>	 <p>Renovation &amp; Upgradation of Lecture Theater under PANF, CAAST, NAHEP, ICAR project in CSKHPKV Palampur (2021)</p>
<p><b>Renovation of PG Labs</b></p>	<p>Unit is functional. Created basic infrastructure Six PG labs renovated in the different departments (Vegetable Science, Natural farming, Entomology, Microbiology, Vety. Public Health)</p>	 <p>Renovation of PG Lab under PANF, CAAST, NAHEP, ICAR project in CSKHPKV Palampur (2021)</p>
<p><b>Power Tiller</b></p>	<p>Unit is functional in Vegetable Science e and Natural Farming</p>	 <p>Power Tiller Purchased under PANF, CAAST, NAHEP, ICAR project in CSKHPKV Palampur (2021)</p>
<p><b>Farm machinery and laboratory equipment</b>  (109 nos)</p>	<p>All functional</p>	

1.3. Out-of-box initiatives undertaken by the AU

Please provide the details on out-of-box initiatives undertaken by the AU in one-two paragraph.

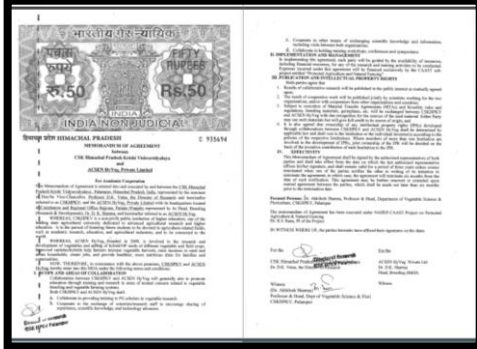
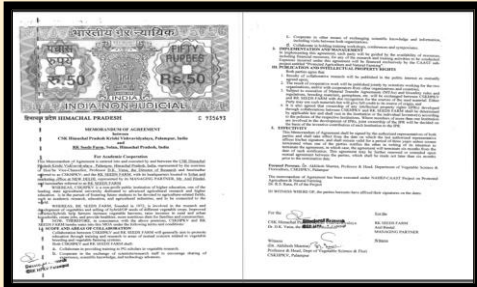

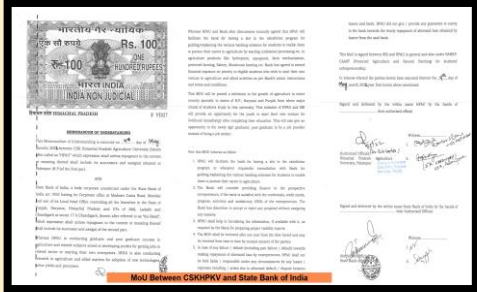
Out-of-box initiative	Activity/achievement	Remarks/Photographs
<p><b>Startups</b></p>	<p>Three No. Start-ups under HIM Rabi on</p> <ul style="list-style-type: none"> <li>• Vertical farming under protected structure (You tube-523 K hits)</li> <li>• Protected Farming</li> <li>• Hydroponics</li> </ul>	
<p><b>Nutrition Garden</b></p>	<p>Under Environment Sustainability Plan, the Nutritional Garden (3250sq m) was established. 356 Fruit trees, medicinal &amp; aromatic plants (31) planted with participation of Post Graduate students as Graduation ceremony</p>	
<p><b>Microbiological waste management</b></p>	<p><b>Pine needle waste management:</b> Microbial interventions have been employed to alter the complex lignocellulosic complexities in the pine needles. Significant</p>	



	<p>changes in functional group of lignin-cellulose complex moieties have been observed based upon FT-IR spectroscopy and SEM analysis</p>	
<p><b>Quiz Competitions</b></p>	<p>Department of Entomology of CSKHPKV, Palampur organized Online quiz competition on 3 and 17 July, 2021 and off line, 27 August, 2022 in which 54 students from three SAUs participated</p>	
<p><b>Taping youth from School for knowledge Outreach</b></p>	<p>High tech polyhouse and hydroponics 150 school students (60 - Sr Sec School Gauna, Hamirpur; 40-Sr Sec School Jaude Amb, Hamirpur;50-Sr Sec School Bara)</p>	

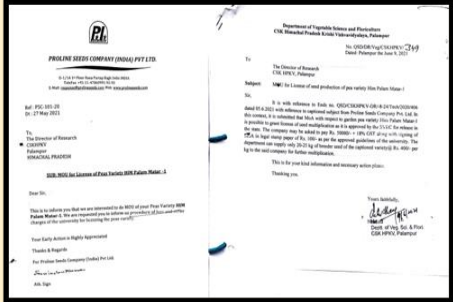
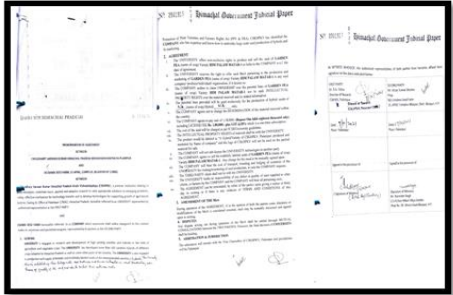


1.4. Collaborations with industry and other HEIs for bringing relevancy


1.5. Please provide the details on relevant collaboration with industry for bringing relevancy and improving research effectiveness in the AU in one-two paragraph.

Collaborations	Activity/achievement/ purpose	Remarks/Photographs
<b>NATIONAL</b>		
ACSEN Hy. Veg Pvt Ltd, Rajpura, Punjab	Academic Cooperation for student exposure; To promote education through training and research to PG students; Knowledge sharing, collaborate in holding symposium, training and conferences etc.	
R.K Seeds Farm, Solan	Academic Cooperation Training to PG students, Knowledge sharing, collaborate in holding symposium, training and conferences etc.	
Agricare Organic Farms, Ludhiana, Punjab	Academic and Research Co-operation in the area of Insect Resources in Agricultural and allied sciences	
SBI, Chief General Manager, Chandigarh	Loans for Agri-Startups, Skill Enhancement; Entrepreneurship for B Sc & PG students	

<p>ICAR-National Bureau of Agricultural Insect Resources (NBAIR), Bengaluru</p>	<p>Promote Academic and Research Co-operation in the area of Insect Resources in Agricultural and allied sciences</p>	
<p>National Fertilizer Limited</p>	<p>Skill Enhancement; Industrial training of BSc &amp; PG Entrepreneurship Development</p>	
<p>Department of Community Medicine Dr. Rajendra Parsad Govt. Medical College, Kangra, Himachal Pradesh</p>	<p>Research and exchange of students; Academic Cooperation Skill Development</p>	
<p>Himalayan Cyber Security System Village Ladana, PO Barwara Dehra Distt Kangra HP</p>	<p>E-waste Management</p>	

<p>Durga Seed farm</p>	<p>Technology Transfer                  Multiplication /Sale of Seed                  Him Palam Matar-1                  Palam Mridula</p>	
<p>Super Seeds (P) Ltd. Hissar (Haryana)</p>	<p>Technology Transfer                  Multiplication /Sale of Seed                  Him Palam Matar-1</p>	
<p>Welcome Crop Science Pvt. Ltd.</p>	<p>Technology Transfer                  Multiplication /Sale of Seed                  Him Palam Matar-1</p>	
<p>S. S. Agri Solutions, Rudrapur, Uttarakhand</p>	<p>Technology Transfer                  Multiplication /Sale of Seed                  Him Palam Matar-1</p>	
<p>Nutranta Seeds Pvt. Ltd</p>	<p>Technology Transfer                  Multiplication /Sale of Seed                  Him Palam Matar-1</p>	

<p>Proline Seed Company India Pvt Ltd</p>	<p>Technology Transfer Multiplication /Sale of Seed Him Palam Matar-1</p>	
<p>Krishma Seed Farms Bilaspur</p>	<p>Technology Transfer Multiplication /Sale of Seed Him Palam Matar-1</p>	
<p><b>INTERNATIONAL</b></p>		
<p>The University of Melbourne, Australia</p>	<p>Training to PG students One PG student collaborated for international training</p>	<p><b>Academic Cooperation</b> The University of Melbourne Prof Frank R. Dunshea, Chair of Agriculture Dr. Surinder Chauhan, Professor</p> 
<p>World Vegetable Center, Shanhuai, Taiwan</p>	<p>Training to PG students Four PG students collaborated for international training</p>	<p><b>Academic Cooperation</b></p> 
<p>University of Wisconsin USA</p>	<p>Knowledge sharing, and exchange of information. One faculty collaborated for 3 months by undertaking international training</p>	<p><b>Academic Cooperation for training only</b></p>

<p>Volcani Centre Israel</p>	<p>Knowledge sharing, and exchange of information. One faculty collaborated for 3 months international training</p>	<p>Academic Cooperation for training only</p>
<p>Michigan State University</p>	<p>Knowledge sharing, and exchange of information</p>	<p>Academic Cooperation <b>Michigan State University, USA</b> Dr Karim Mareedia, Director of international Programme In Agri and Natural Resources</p> 

## 2. Achievements made through CAAST under NAHEP

### 2.1. Output-outcome monitoring

S. N.	Particulars	Oct'2019 to Mar'2023	
		Target	Achievement
1.	% increase in number of technologies commercialized	5 (nos)	240 % (9 varieties/hybrids and 3 technologies)
2.	% increase in faculty research effectiveness	5	20.5 (H index 2019-39 to 2022-47)
3.	Number of direct beneficiaries of the project		7441
4.	Number of female beneficiaries		3033
5.	% increase in JRF / SRF / ARS	5	12 (Compared to 2019) 43 (JRF/SRF/PG scholarships, ICAR), 4 (SRF/UGC), 1 (SRF/CSIR), 3 (ARS), 76 (NET), 2 (Civil Services), 4 (CDS/OTA) and 4 (Others).
6.	% increase in number of students who were admitted in foreign universities	10	(4 Nos)
7.	% increase in PG student placements	10	12 (76 Nos)
8.	Number of industry- sponsored projects and positions in cutting-edge areas of agri-science	10	46 (Rs.2043.81lakh)
9.	Number of faculty training programmes (national) undertaken by AU	15	8
10.	Number of faculty training programmes (international) undertaken by AU	15	5
11.	Number of student training programmes (national) undertaken by AU	10	8 (outside) +6(Inhouse) (Beneficiaries:49+2567=2605)
12.	Number of student training programmes (international) undertaken by AU	20	8-Completed 12 (Approved)

Observation
<p>&lt;&lt;Please provide the explanation on the progress made against the output-outcome monitoring indicator and highlight the key initiatives which attributed to the overall outcome/potential impact of the project-Maximum 2-3 paragraphs&gt;&gt;</p> <ul style="list-style-type: none"> <li>The faculty of the University is striving hard to bring academic excellence in innovative ways. Both the Undergraduate and Postgraduate students are exposed to teaching in smart class rooms equipped with white board and all other modern teaching aids. PG students &amp; faculty are using the facilitative Units established under NAHEP-CAAST to achieve research accomplishments.</li> </ul>

- During the 2020-23, success of students of constituent colleges of the University, who qualified the National level competitive examinations has been appreciably enhanced and resulting in 43 (JRF/SRF/PG scholarships, ICAR), 4 (SRF/UGC), 1 (SRF/CSIR), 3 (ARS), 76 (NET), 2 (Civil Services), 4 (CDS/OTA) and 4 (Others).
- During the 2020-23, 7 Post-graduate students got JRF/SRF (Ph.D.) scholarship and four foreign students were awarded ICAR-SRF under Exchange Programme. Twenty-seven students received national level fellowships namely, INSPIRE, DBT and other fellowships.
- Twenty-seven students qualified ICAR/UGC/CSIR NET examination during the period 2021-22.
- Under CAAST, NAHEP, the faculties/students have been encouraged and sent/being sent for higher training in advance countries/ National lab.
- The State of Art facilities like high-tech laboratory and modern farm equipment's on the thematic area resulted, high rating NAAS publications increased and the highest rating of publication is 20.0 (IF).
- Establishment of Nutrition Garden (16<sup>th</sup> August, 2021) for teaching and demonstration purposes.
- Academic Management System (AMS) facility has been implemented for higher efficiency and quick access. As a step towards Resilient Agricultural Education System, digital contents of about 10% at Under Graduate level have been developed.
- Recently, ICAR has sanctioned a Volunteer Centre under All India Network Project on Agricultural Acarology to the university. The Centre will mainly be focusing on management of mite pests under protected agriculture.



## 2.2. Knowledge Management Collaterals

I. Knowledge Collaterals	Apr'2020 to Mar'2023	CAAST
1. Publications	127 (Associated faculty and PG students)	8
2. Research Articles	67	12
3. Annual Reports	3	3
4. Books	6	6
5. Success Stories	65 International Training -13 National Institutes-49 Starups-3	65
6. Newsletter	-	-
7. Magazines	12	12
8. Blogs	-	5
<b>Annexure-I</b>		
1. Mobile Applications Developed	Nil	
2. Web Applications Developed	2	

III. Number of IPR (Intellectual Property Rights) Registered/Obtained	Apr'2020 to Mar'2023
1. Copyrights	6 (Books and Manuals)
2. Patents	Nil
3. Others	2 Garden Pea varieties Palam Triloki and Palam Sumool in 2021 (Registered with PPVFRA)
<b>Annexure-II</b>	

IV. Dissemination and Outreach	Apr'2020 to Mar'2023
1. No. of Posts on Social Media	15 <a href="https://nahep.icar.gov.in/KMS/OUTForm1.aspx">https://nahep.icar.gov.in/KMS/OUTForm1.aspx</a>
2. No. of Posts on Newspaper	10 <a href="https://nahep.icar.gov.in/KMS/OUTForm1.aspx">https://nahep.icar.gov.in/KMS/OUTForm1.aspx</a>

3. No. of Posts on Magazines	-
4. No. of Unique Promotional or Outreach Collaterals	12 (Working manual of equipments and PPTs) <a href="https://nahep.icar.gov.in/KMS/OUTForm2.aspx">https://nahep.icar.gov.in/KMS/OUTForm2.aspx</a>

### Annexure-III

Capacity building programs to improve the research effectiveness

#### 1. International trainings for students and faculties

Subject areas	Host institutes, period of training	Output of the training
<b>Students</b>		
Ms. Payal Sharma, Ph.D. Vegetable Science Mapping heat stress tolerance in a tomato MAGIC population	Host Institute World Vegetable Centre, Taiwan Period: One month (1 to 31 Oct, 2022)	General Linear Model (GLM), Mixed Linear Model (MLM), Population structure and linkage disequilibrium
Ms. Alisha Thakur, Ph.D. Vegetable Science Mapping Mungbean Yellow Mosaic: virus resistance in Mungbea	Host Institute World Vegetable Centre, Taiwan Period: One month (1 to 31 Oct, 2022)	Modernistic techniques like 'PHENOSPEX' used for plant screening and high throughput field phenotyping under all weather conditions.
Ms. Srishti, Ph.D. Vegetable Science Mapping heat stress tolerance in a tomato MAGIC population	Host Institute World Vegetable Centre, Taiwan Period: One month (1 to 31 Oct, 2022)	<b>Jawahar Lal Nehru Fellowship @Rs 18000/pm</b> after international training Advanced genotyping and image-based phenotyping technologies.
Himanshu Thakur Ph.D., Entomology Molecular characterization of termites and their gut organisms through shot gun sequencing.	Host Institute: Okinawa Institute of Science and Technology, Okinawa, Japan Period: One month (01 December to 31 December, 2022)	DNA Sequencing techniques in Termites Outcome: 1 Publication in Biological Journal of Linnean Society (IF: 2.27) with collaborator duly acknowledged NAHEP Included in PhD research Work
Ekta Kaushik Ph.D., Entomology Host plant resistance techniques for the	Host Institute: World Vegetable Center, Tainan, Taiwan	Screening for resistance to whitefly, Bemisia tabaci, pinworm, (Phthorimaea) in different tomato lines;

management of whitefly, Bemisia tabaci and tomato pinworm, Phthorimaea absoluta	Period: Three months ((13 December, 2022 to 12 March,2023)	Evaluation of host plant resistance on the basis of types of trichomes.
Ms Khushwinder Kaur, Ph.D., Plant Pathology Isolation and characterization of Pseudocercospora griseola populations	Host Institute: Directorate of Plant Protection Central Research Institute Turkey Period: One month (1 to 31 Dec, 2022)	Incorporated as part of Ph.D Work Learned three new isolation techniques for Pseudocercospora griseola, molecular characterization techniques and four new storage methods for Pseudocercospora griseola. trained in biometric software
Mr Akash Deep, Ph.D. Agronomy Modelling of rice cropping system	Host Institute: University of Southern Queensland (Australia) Period: One month (28 Jan to 1March, 2023)	APSIM modelling software included in thesis.
Mr Shubham Verma, Ph.D. Genetics and Plant Breeding Modern phenomics approaches to study different morph-physiological traits conferring drought tolerance	Host Institute: University of Melbourne (Australia) Period: One month (14 Feb to 31 March,2023)	Training on modern equipment's like IRGA, MINI-PAM, SPAD and Thermal camera.
<b>Faculty</b>		
Dr. H.K. Chaudhary	Host Institute: University of Leicester, UK Period: 10 days (7Juy to 27 July, 2022)	Explore possibility of collaboration and identify different laboratories
Dr. S.P. Dixit, Director of Research	Host Institute: University of Melbourne, Australia Period: 7 days (21 to 27 Nov, 2022)	For undertaking cutting edge research in Agricultural Sciences especially on Carbon sequestrations and Nano technologies application in Agricultural Sector
Dr. Mandeep Sharma, Dean COVAS	Host Institute: University of Melbourne Australia	For undertaking cutting edge research in Veterinary Sciences specially to facilitate blended

	Period: 7 days (21 to 27 Nov, 2022)	education delivery and digital content creation in the context of veterinary education.
Dr. Akhilesh Sharma, Professor (Department of Vegetable Science)	Host Institute: University of Wisconsin, Madison, USA Period: 3 months (12 Aug to 15 Nov, 2023)	Four Publication in Plos One and Scientific reports Genotyping using next generation sequencing and fine mapping of multiple plant and fruit traits
Dr. Parveen Sharma, Professor (Department of Vegetable Science)	Host Institute: The Volcani Centre, ARO, Rishon LeZion, Israel Period: 3 months (01Dec, 2022 to 28 Feb 2023)	Modern technologies of protected cultivation and post-harvest in vegetable crops. The training will be beneficial to boost ongoing research of post graduate students for quality publications. Adhoc Project under Indo Israel DST Program (Total 80 lakhs (40+40)
<b>List of beneficiaries along with training details in Annexure-IV</b>		

## 2. National trainings for students and faculties

Subject areas	Period of training, total beneficiaries	Output of the training
<b>Students</b>		
Mite Taxonomy (ICAR-NBAIR, Bengaluru)	Period of training: 2 <sup>nd</sup> to 7 <sup>th</sup> May, 2022 Beneficiaries: 3	Techniques of the collection, preservation, mounting, and identification features of different mites especially, Eriophyid mites
Production and Use of Biological Control Agents including microbials (ICAR-NBAIR, Bengaluru)	Period of training: 2 <sup>nd</sup> to 7 <sup>th</sup> May, 2022 Beneficiaries: 7	Mass production of various biological agents

Molecular breeding and protected cultivation of vegetable crops (ICAR-IIVR, Varanasi)	Period of training: 11 <sup>th</sup> to 16 <sup>th</sup> July, 2022 Beneficiaries: 10	Techniques in advanced tools like molecular breeding and protected cultivation
Advance molecular techniques in agriculture (ICAR- National Bureau of Agriculturally Important Microorganisms (NBAIM), Mau, UP)	Period of training: 20 <sup>th</sup> Oct to 3 <sup>rd</sup> Dec, 2022 Beneficiaries: 1	Techniques in advanced tools like HPLC, SEM, Confocal imaging, PCR, RT-PCR, FTIR, DNA isolation and sequencing etc.
Hands on training on Remote Sensing and GIS using QGIS (NAHEP- CAAST, College of Agricultural Engineering JNKVV Jabalpur)	Period of training: 3 <sup>rd</sup> to 23 <sup>rd</sup> Jan, 2022 Beneficiaries: 1	Techniques in advanced tools Remote Sensing and GIS
Training cum Exposure Visit on Crop Protection for Sustainable Agriculture (International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) Patancheru, Hyderabad, Telangana, India)	Period of training: 14 <sup>th</sup> to 19 <sup>th</sup> December, 2022 Beneficiaries: 14	Techniques in enviro- typing, drone technology, CT imaging, Lysimeter testing, gene editing, trait mapping, Nuclear Magnetic Resonance (NRS) and X-Ray Fluorescence (XRF).
NAHEP sponsored Training on CRISPER based plant Genome editing: Tools and techniques, IARI, New Delhi	Period of training: 11-21 <sup>st</sup> Oct, 2022 Beneficiaries: 2	Practical application and working of CRISPR based Plant Genome Editing Technique
Workshop on Presentation Skills organized by CSIR-	Period of training: 26 <sup>th</sup> Nov, 2021	Knowledge upgradation & Skill enhancement

Indian Institute of Toxicology Research, Lucknow	Beneficiaries: 10	
Hands on Training on Mite Taxonomy at Punjab Agricultural University, Ludhiana	Period of training: 27-31 March, 2023 Beneficiaries: 1	Knowledge upgradation & Skill enhancement
Strategic Plan to Double Income through Protected Cultivation of Vegetable Crops, Department of Veg Sci, CSKHPKV Palampur	Period of training: 31 Aug to 07 Sept, 2020 Beneficiaries: 320	Conducted for strengthening the startups/ entrepreneurs
Training on Texture analyzer (TX-700) handling CSKHPKV Palampur	Period of training: Beneficiaries:200	Knowledge upgradation & Skill enhancement
Training on “Management of biotic and abiotic stresses in protected agriculture” CSKHPKV Palampur	Period of training: 22 to 24 Sept, 2020 Beneficiaries:1432	Strengthening the startups/ entrepreneurs Skill enhancement
National Training cum Webinar on “Diagnosis and Management of Diseases and Insect, mite and nematodes of Vegetable crops in Protected Agriculture and Natural Farming” Dept of Entomology, CSKHPKV Palampur	Period of training: 25 to 26 Feb, 2022 Beneficiaries:182	Knowledge upgradation & Skill enhancement
National Training cum Webinar on “Buzz pollination: Role of bumble	Period of training: 05 March, 2022 Beneficiaries:306	Knowledge upgradation & Skill enhancement MoU signed with NBAIR

bee in pollination of crops in protected agriculture” Dept of Entomology CSKHPKV Palampur		Bangaluru for bumble bee feunal studies in Kangra and HP
Application of Drone Technology Dept of Soil Science CSKHPKV Palampur	Period of training: 13-15 May, 2022 Beneficiaries:158	Knowledge upgradation & Skill enhancement Developmental grant by ICAR - three no Monitoring and forecast of nutrient & water management
Training on “Experimental Design and Analysis through Statistical Software” CSKHPKV Palampur	Period of training:24-30 May, 2022 Beneficiaries:304	Techniques & advanced tools in Statistical Software
Training on Insect Systematics Dept of Entomology CSKHPKV Palampur	Period of training:18-19 June; 01-02 July; 09-10 July,2022 Beneficiaries:45	Knowledge upgradation & Skill enhancement in insect taxonomy
Application of Nano-technology in Crop Pest Management Dept of Entomology CSKHPKV Palampur	Period of training:14-15 Oct,2022 Beneficiaries:60	Knowledge upgradation & Skill enhancement
<b>Faculty</b>		
Strategic Plan to Double Income through Protected Cultivation of Vegetable Crops, Department of Veg Sci, CSKHPKV Palampur	Period of training: 31 Aug to 07 Sept, 2020 Beneficiaries: 39	Knowledge upgradation & Skill enhancement
Training on NABL Accreditation and its benefits for Soil Testing Laboratories	Period of training:30 Sept,2022 Beneficiaries:30	Knowledge upgradation & Skill enhancement

Dept of Soil Science CSKHPKV Palampur		
Application of Drone Technology Dept of Soil Science CSKHPKV Palampur	Period of training: 13-15 May, 2022 Beneficiaries:12	Knowledge upgradation & Skill enhancement Developmental grant by ICAR - three no Monitoring and forecast of nutrient & water management
Milk Vs Plant based Beverages- Bursting all myths DUVASU Mathura	Period of training: 9-12 Dec, 2022 Beneficiaries: 1	Knowledge upgradation & Skill enhancement
National Training cum Webinar on “Diagnosis and Management of Diseases and Insect, mite and nematodes of Vegetable crops in Protected Agriculture and Natural Farming” Dept of Entomology, CSKHPKV Palampur	Period of training: 25 to 26 Feb, 2022 Beneficiaries:11	Knowledge upgradation & Skill enhancement
Training on Insect Systematics Dept of Entomology CSKHPKV Palampur	Period of training:18-19 June; 01- 02 July: 09-10 July,2022 Beneficiaries: 8	Knowledge upgradation & Skill enhancement in insect taxonomy
Training on Smart governance in office system & official procedure	Period of training: 10-12 Oct, 2022 Beneficiaries: 1	Smart governance in office system & official procedure
Training on Achieving zero hunger by 2030 critical role of Agriculture & Allied Sectors	Period of training: 17-27 Aug, 2020 Beneficiaries: 5	Knowledge upgradation & Skill enhancement
Application of Nano- technology in Crop Pest Management Dept of Entomology CSKHPKV Palampur	Period of training:14-15 Oct, 2022 Beneficiaries:10	Knowledge upgradation & Skill enhancement



<p>National Training cum Webinar on “Buzz pollination: Role of bumble bee in pollination of crops in protected agriculture” Dept of Entomology CSKHPKV Palampur</p>	<p>Period of training: 05 March, 2022 Beneficiaries:19</p>	<p>Knowledge upgradation &amp; Skill enhancement MoU signed with NBAIR Bangaluru for bumble bee feunal studies in Kangra and HP</p>
<p><b>List of beneficiaries along with training details in Annexure-V</b></p>		

### 2.3. Input and activity monitoring

	Capital (In Lakhs)	Revenue (In Lakhs)
Total funds sanctioned during 2018-2023 by PIU (INR Lakhs)	605.00	1286.05
Total funds received till March 31, 2023 (Cumulative) (INR Lakhs)	605.00	1286.05
Total expenditure up to March 31, 2023 (INR Lakhs)	605.34	749.66

Input / Activity indicator	Sub- head / category	Apr'2018 to Mar'2023 Expenditure / input in INR lakhs		Activity elaboration
		Utilization	Planned	
<b>Goods and equipment</b>	Equipment, Plant & Machinery	287.30	277.00	List attached in annexure-VI Procurement completed and facilities being used for research by faculty and students
	Office equipment	5.56	7.00	-do-
	Laboratory equipment	209.21	215.00	-do-
	Furniture & fixtures	15.20	17.00	-do-
	Computers and Peripherals	18.03	17.00	-do-
	Books and Journals	4.65	5.00	120 books added in University Library
<b>Civil works</b>	Minor repair and renovation work	65.05	67.00	
<b>Human capacity building</b>	National level training	0	0	
	International level training	47.77	63.00	13 completed and continuing
	Short visit/ seminars	5.24	13.00	Continuing
	Meetings and workshops	9.00	9.00	Continuing
<b>Consultancy</b>	National level consultancies	38.08	87.00	Continuing
<b>Recurrent cost / Miscellaneous</b>	Travel	8.00	12.00	Continuing
	Contractual services	313.36	262.00	Continuing
	Operational costs	282.40	787.00	Continuing
	Institutional charges	46.15	53.05	Continuing
<b>Total</b>		<b>1355</b>	<b>1891.05</b>	

#### Observation

<Please provide the explanation on the progress made against the input and activity monitoring parameters>

Under the Capital head procurements of all the equipment, minor civil works, plant & machinery, etc. have been completed.

Facilitative Units (7 No) established and are being utilized for training/research by students/faculty,

Strengthening and renovation of polyhouses (16 Nos) for research endeavors

Lecture Theatre, Conference room for quality teaching and trainings

Renovation of Labs (6 Nos.)- for effective research

International travel/National training conducted for the faculty (5 No) and students (8No) -for Academic excellence

Forty six (46) webinars and trainings (Offline/Online/Hybrid mode) have been completed with total beneficiaries of 6851.

Increased University visibility as ranking elevated to 14<sup>th</sup> among all and 10<sup>th</sup> amongst SAUs

Quality research publications by PG students and faculty Average NAAS publication in CAAST >NAAS -7.2 (University- 2019 onward 127 research publication NAAS>7 and highest 20.0)

Technologies –Varieties -9 released for HP state through CVRC 2021-22

Two Varieties viz. Garden pea-PALAM Triloki and PALAM Sumool registered with PPVFRA and 10 Varieties in pipe line

Three production technologies recommended in POP for state. Seven are in process of release.

## 2.4. NAHEP outreach and other unique initiatives undertaken

Please provide the brief progress undertaken against the different categories placed below along with the suitable photographs/links/documents etc. Please note that only significant activities/initiatives are to be incorporated in this document.

- a) Case studies/success stories developed under NAHEP (establishment of own enterprise by beneficiary student/high-impact research carried-out by AU under NAHEP/enhanced students learning outcomes due to establishment of modern facilities under NAHEP etc.)

### Illustrative: Success story

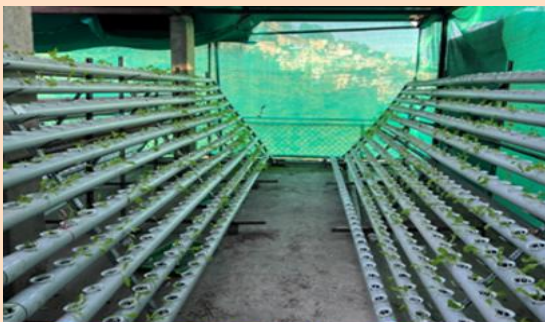


Vertical farming of Strawberry

#### **Vertical Farming of Strawberry under**

**High-Tech Polyhouse:** Smt. Bharti from village Dhoren near Darang in Distt. Kangra, HP.is practicing vertical farming for strawberries. Her team collaborated to build vertical farming systems and farm automation systems to implement precision farming to grow high-value crops. After experimenting for almost 3 years, in year

2021 their team started building for first commercial set up under the name of Hill sprouts. They first built a 2000 m<sup>2</sup> greenhouse under which 10 rows of vertical set up with the length of 200 feet each were built out of mild steel. And specially designed pots for this set up were manufactured on orders. At Hill sprouts Bharti and her team have been growing strawberry, lettuce, Stevia and capsicum. In the first season, she sold strawberry and other produce amounting to Rs six lacs. In addition, around six lacs runners (Young Plants) have been produced by the mother plants and were reserved for planting in the coming season with estimated gross return of Rs 15 lacs.



**Hydroponic Unit at Hanol Hydroagri developed under supervision of NAHEP-CAAST**

**Protected cultivation of vegetables under Hydroponic system:** Sh Saurabh Thakur from village Khalini District Shimla HP, In 2021 he took training of growing vegetables in hydroponics system constructed under NAHEP at CSK HPKV, Palampur University. With support of RKVY-

RAFTAR he established his own hydroponic unit as HANOL HYDROAGRI in Khalini (Shimla). Presently growing lettuce and marketing to hotel industry with annual turnover of Rs 10 lakhs.

**Protected cultivation of vegetables under Natural Farming System:**

Startup by Aditi Singh, Farm Manager, Shraddha Suman, Village Dhanotu, Tehsil Shahpur, District Kangra. Successfully trained in year-round protected cultivation of different vegetables under natural farming conditions under the mentorship of Dr. Sant Prakash, Consultant (Protected Agriculture) NAHEP-CAAST and demonstrated practical training to grow different seasonal vegetables round the year under natural farming system.



**Student Awareness & Agri-Education:** The farmers/agriculture

students/School students/ Army Officers/Agriculture Officials visited the Center of Excellence on Protected Agriculture to get acquainted with various operations like raising of nursery under Hi-tech nursery unit, Hydroponics, automatic nursery seeding machine etc.



**b) Knowledge management and outreach initiatives (development of collaterals, newsletter, social media outreach activities, creation of website, experiential learning workshop, exposure visits,**  
 (provide the details of the documents/articles/reports/modules/social media outreach/ website creation/experiential learning workshop/exposure visits etc. developed under NAHEP along with the suitable photograph of the cover-page and web-link (if available) – brief summary, cover page,

S. N	Category of the collateral	Brief summary	Snapshot/cover page	Weblink (if any)
1	Manuals	Published policy document on “Intellectual Property Rights-Policy guidelines” compiled by Dr H K Chaudhary, Dr Daisy Basandrai and Dr Virender Kumar in collaboration with NAHEP-CAAST and HIMCOST		<a href="https://nahep.icar.gov.in/KMS/KCForm1.aspx">https://nahep.icar.gov.in/KMS/KCForm1.aspx</a>
2	Manuals	Published manual on “Phytotron for Speed breeding and precision agriculture under changing climatic senario” compiled by Dr H K Chaudhary, and Dr VK Sood in collaboration with NAHEP-CAAST		<a href="https://nahep.icar.gov.in/KMS/KCForm1.aspx">https://nahep.icar.gov.in/KMS/KCForm1.aspx</a>
3	Manual	Published manual on Plant-microbe interaction under Protected Agriculture and Natural Farming compiled by Dr Rishi Mahajan in collaboration with NAHEP-CAAST		<a href="https://nahep.icar.gov.in/KMS/KCForm1.aspx">https://nahep.icar.gov.in/KMS/KCForm1.aspx</a>

4	Documents	Published book on Handbook of principles and practices in Natural Farming compiled by Dr GD Sharma & Dr Aditi Badiyala in collaboration with NAHEP-CAAST		<a href="https://nahep.icar.gov.in/KMS/KCForm1">https://nahep.icar.gov.in/KMS/KCForm1</a>
5	Exposure visit	ICAR-NBAIR, Bengaluru 10 Students benefitted	<p>Students going to attend training under NAHEP CAAST on PANF at ICAR NBAIR Bengaluru with HoD, PI and CPI on 28/04/2022</p> 	
6	Exposure visit	ICRISAT Hyderabad 14 PG students benefitted		
7	Exposure visit	IVRI, Varanasi 10 PG students benefitted		
8	Experiential learning workshop	Fifty students of UHF Solan acquainted with various operations like training and pruning in cherry tomato and various other operations like raising of nursery under Hi-tech nursery unit	 <p>Students from UHF Nauni, Solan Visited the Centre of Excellence</p>	
9	Farmers Training Visit	Number of Progressive Farmers Visited the Centre of Excellence: 150		

<p><b>10</b></p>	<p>School Student Awareness for tapping youths</p>	<p>Number of School Students Visited the Centre of Excellence: 150</p>		
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**c) Unique initiatives undertaken**

**1. Digital infrastructure**

(development of digital/smart classroom, virtual reality facility, digital library system, other digital education and administrative infrastructure, Agri Diksha, AMS implementation etc.)

**CSKHPKV Admission Portal:** Inhouse design and development of CSKHPKV Admissions Portal by CO-PI of the project, for admissions in the year 2021.

**CSKHPKV Kisan Portal:** Designed and developed the Kisan Portal of CSKHPKV. The Hon’ble Governor of Himachal Pradesh inaugurated the portal, during the 16<sup>th</sup> Convocation of CSKHPKV on 23-08-2021. This is a mobile friendly, dual language (English-Hindi) portal where farmers can directly submit their farming related queries directly from their fields, to the University and upload relevant photographs pertaining to the query.

The submitted farmer query gets evaluated by a nodal officer, who identifies the subject domain of the query. The nodal officer assigns the query to a Scientist in the University, which appears in the dashboard of the Scientist. The response tendered by the Scientist is available to the public for benefit of other farmers. This portal has been an important milestone in augmenting effective communication between farmer and the University using ICT Tools.

**Virtual class room and Agri Diksha Web portal** established to strengthen agricultural education through ICT interventions



**2. Digital initiatives:**



(Organizing trainings through online, conducting online examinations, administering attendance, developing of web applications, e-learning modules etc.

S.N	Category of the collateral	Digital initiative	Practice before introduction of the initiative	Practice after introduction of the initiative
1	Trainings	Teaching through MS-Team	Offline only	Hybrid Mode-Online and Offline
2	Admission Portal	Web Application	Offline only	Online with payment gateway integration.
3	Kisaan Portal of University	Web Application	Telephone Service or in person interaction	Online farm query with facility to upload images, and resolution information is provided on portal for benefit of everyone.
4	e-Office	GOHP Initiative	Offline	In process
5	Virtual lectures	Agri Web Channel	-	Online lectures

*Please provide up to 15 photographs with high quality (minimum 1-2MB) and label with suitable caption. Attach the photographs separately in the mail.*

### 3. Potential impact of the intervention:

#### Observation

<<Please provide the explanation on potential impact of the intervention in short and long term while illustrating the key initiative/activity. Also, relate how input turned into output → outcome → impact in brief sentence or graphical way. Consider one or two examples/cases etc, >

- The rank of the University in 2017 was 19 and in 2022 enhanced to 14 as per the NIRF from ICAR/MHRD. Majority (About 90%) ICAR seats in UG and PG filled
- Exposure Visits/National Trainings/International training to students helps in enhancing student's academic excellence through overseas opportunities and availing post-doctoral fellowships. One Ph.D student got Jawahar Lal Nehru Fellowship after international trainings. Research publications (12) in high NAAS rating/ IF journal
- The key initiative/activity undertaken under PANF, CAAST resulted in coverage of about 1000 ha area under protected conditions in Himachal Pradesh. Main crop varieties (Parthenocarpic cucumber variety Him Palam Kheeras-1, Bacterial wilt resistant Palam Tomato Hybrid-1, Cherry tomato variety Him Cherry Yellow), filler crop varieties (pea var. Him Palam Matar-1, Snow pea var. Him Palam Meethi Phali-2, cauliflower and chilli hybrids) along with improved package of practices for protected cultivation (Production and pest management) provide confidence among stakeholders as crops earlier damaged due many biotic stresses
- Center of excellence on Protected Agriculture and Natural Farming developed with various facilitative Units for awareness and training to school students/college students/farmers/ extension workers/researchers etc.
- 3 startups initiated in project thematic areas (Vertical farming of strawberry, Protected Agriculture and Hydroponics)
- 9 MOUs for seed multiplication of released variety with private sector companies for readily availability of quality seed (License fee 1 lakhs for variety (8) and 2 lakhs for hybrid (1)
- Availability of Quality nursery of vegetable crops (more than 2.0 lakhs per year)
- First parthenocarpic cucumber variety for protected Cultivation released (Him Palam Khira -1) and another with light green color under evaluation trials
- First Bacterial wilt resistant capsicum variety for protected cultivation under on farm trials and another in tomato

- CMS and GMS based Hybrids in cauliflower (4) and chilli (4) synthesized under PANF CAAST and presently under farm trials
- Bio pesticides and botanicals for management of diseases and pests developed and presently in evaluation trials for recommendations
- Productions technologies for protected Agriculture namely, Drip irrigation schedules for surface and sub surface placement based on climatological data; Fertigation schedules based on bio formulation and INM in Capsicum, Tomato and cucumber; Training and pruning in vegetable crops

#### 4. Challenges faced and lessons learned while implementing the project at AU:

<b>Challenges</b>	
1	Sustainability of Infrastructure developed after project e.g. recurring costs of maintenance of procured equipment.
2	Continuation of Certificate Courses- Academic approval is essentially required for commencement of the courses.
3	Limited employment Opportunity in public and private sectors for students on a larger scale.
4	Implementation of Blended Learning System under NEP-2020 in light of constraints of technology adaptation and lack of infrastructure facilities (higher end computing devices and network infrastructure) at various levels.
5	Globalization of knowledge standards has a consequence on the competence of existing resources competing at Global/ International level.
<b>Lessons learned</b>	
1	Strengthening and upgradation of Digital infrastructure in academic institutions will serve as a primary mitigation measure in crisis scenarios (e.g. COVID pandemic)
2	Blended learning techniques and digital knowledge resources became a new milestone in quality student education.
3	Exposure of students and faculty to the facilities of International and National Institutes uplifts the quality of work and expectations
4	MoU signed with various industry partners serve as an employment opportunity for the students.
5	Collaboration with national institutions for collaborative research and academic excellence serves as a point of contact for students aspiring for higher studies in those institutions.

## 5. Sustainability Plan

### 5.1. Sustainability plan of the AU

- Does the AU have any sustainability plan for to make AU future ready and globally recognized? (Yes / No)
- If yes, details thereof?

1	Funds are being raised through adhoc projects from different funding agencies to meet out research, extension, infrastructure and lab requirements and Grant from State University  1. For Protected Agriculture Adhoc project funded by JICA-40.0 Lakhs 2. Adhoc Project Indo -Israel Joint in DST Program-80.0 lakhs(40+40)
2	Funds generation through testing of varieties/hybrids of crops/vegetables as well as agrochemicals developed by different private sectors/ industry for adoption in state
3	Funds generation through Capacity building and Trainings – Proposed Advanced training on PANF
4	One mega project on Seed Production of Vegetable and other Crops is in operation with financial assistance of Rs. 495.11 lakh from HP Crop Diversification Project, JICA ODA for quality seed production of vegetable and other crops for 2022-2024.
5	Funds by having MoUs with seed producing companies by licensing out seed of the varieties developed by the University for its multiplication and marketing for which license fee of Rs. 1.00 lakh for the crop variety and Rs. 2.00 lakh for hybrid has been fixed.  During last three years, ten such MoUs have been signed with different seed companies like M/S Nutranta Seeds, Durga Seed Farm, Welcome Crop Science, Super Seeds, Krishma Seed Farms etc.
6	Consultancy Programme with 11 agencies (SJVN Foundation, Department of Agriculture, Department of Horticulture, NGOs, and ATMA units of Himachal) worth Rs. 5.57 crores taken up in Agro-techniques and trainings





### 5.2. Sustainability plan for improving internal revenue generation through facilities and infrastructure created under the project

1	Sale of Nursery of Vegetable Crops like tomato, cherry tomato, capsicum, brinjal, cucurbits, cauliflower, cabbage etc. During 2020-23, about 4 lakhs nursery seedlings of tomato, capsicum etc., were produced and sold which helps in revenue generation.
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2	Sale of Bioagents and biofertilizers and natural products like ghanjeevamrit, jeevamrit etc.
3	Bench / training / internships fees for researchers of other University
4	Sale of Breeder Seed of released varieties/ Hybrids
5	Revenue generated from Licensing technologies to private commercial entities.
6	Revenue generated from fees collected from various certificate courses.

## 6. Contribution of each individual in project

### 6.1. Name of Vice Chancellors(s) during project duration and contributions each PI, Co-PI and team along with their photographs


Name	Gender	Designation in AU and contact details (email, mobile)	Role in project (PI/Co-PI/RA/SRF etc.)	Major contribution/output
<b>Project Administration Team</b>				
Prof. H.K. Chaudhary 	Male	Vice Chancellor Office: +91 1894 230521 Resi: +91 1894 230522 e-mail: vc@hillagric.ac.in	Project Leader	Monitoring the work from time to time for its timely completion
Dr Shashi Pal Dixit 	Male	Director of Research E-mail: dr@hillagric.ac.in Contact: 9418291095, 01894230406	Mentor	Monitoring the research work from time to time for its timely completion
<b>Project Execution Team</b>				
Dr Ranbir S. Rana 	Male	Principal Scientist & Programme Director Centre for Geoinformatics Research and Training Contact No.: 9418106167 Email: <a href="mailto:ranars66@gmail.com">ranars66@gmail.com</a> <a href="mailto:rsrana@hillagric.ac.in">rsrana@hillagric.ac.in</a>	Principal Investigator, CAAST NAHEP 7, Nodal Officer NAHEP	Management of project Research work and Scientific inputs to augment the quality of research endeavors  Also, overall acting as Admin and Nodal Officer of NAHEP Comp2 for all 7 components
Dr Akhilesh Sharma 	Male	Principal Scientist (Vegetables) Contact No.: 9816612008 Email: <a href="mailto:assharmaakhil1@gmail.com">assharmaakhil1@gmail.com</a>	Assistant Coordinator (Protected Agriculture), CPI, Nodal Officer (EAP)	Targets of different project activities that resulted into development of different varieties/hybrids of vegetable crops and publications in high impact journals. Civil work execution as EAP.


<p>Dr Parveen Sharma</p> 	<p>Male</p>	<p>Professor  <b>Email:</b>                  parveens01@gmail.com  <b>Contact No.:</b> 9418103265</p>	<p>Component-PI                  Procurement                  Officer</p>	<p>Technologies for Hydroponic Production System, development of varieties for protected cultivation Breeder Seed Production of different vegetable crops viz., Cherry Tomato, Cucumber and Capsicum. Publications in high impact journals</p>
<p>Dr GD Sharma</p> 	<p>Male</p>	<p>Professor, Deptt of Agronomy, CSK HPKV, Palampur  <b>Email:</b>  <a href="mailto:gurbhan_sharma@rediffmail.com">gurbhan_sharma@rediffmail.com</a>  <b>Contact No.:</b> 7018336546</p>	<p>Component-PI                  (Organic &amp; Natural Farming)</p>	<p>Field experimentation on natural farming organizing secretary of webinars on natural farming,                   Associated in Publication of Book</p>
<p>Dr. V.K. Sood</p> 	<p>Male</p>	<p>Principal Scientist &amp; Head (Department of Genetics and Plant Breeding)  <b>[Email:</b>  <a href="mailto:nks1998@rediffmail.com">nks1998@rediffmail.com</a>  <b>Contact No.:</b> 8894026666]</p>	<p>Component-PI                  (Plant Breeding)</p>	<p>Speed Breeding of land races of six crops in Phytotron facility , Students research work and associated in Publication</p>
<p>Dr. Narender Kumar Sankhyan</p> 	<p>Male</p>	<p>Head (Soil Science)[<b>Email:</b>  <a href="mailto:nks1998@rediffmail.com">nks1998@rediffmail.com</a>  <b>Contact No.:</b> 8894026666]</p>	<p>Component-PI                  (Soil Nutrition)</p>	<p>Project activities in Soil health monitoring of Natural , conventional and Protected Agriculture                  Organizer of various webinars, trainings and awareness programmes, Delivered expert lectures in training programs</p>
<p>Dr. Sanjeev K. Sandal</p> 	<p>Male</p>	<p>Principal Scientist (Soil Science) [<b>Email:</b>  <a href="mailto:sksandal@rediffmail.com">sksandal@rediffmail.com</a>  <b>Contact No.:</b> 9418165752]]</p>	<p>Component-PI                  (Water Mangement)</p>	<p>Standardization of gravity fed based discharge flow rate of drip irrigation system                  Standardization of organic and IPNS NPK drip fertigation schedules under protected conditions                  Organizer of various webinars, trainings and awareness programmes</p>
<p>Dr Ajay K Sood</p> 	<p>Male</p>	<p>Principal Scientist (Entomology)                  Email-  <a href="mailto:sood_hpau@yahoo.co.in">sood_hpau@yahoo.co.in</a>  <b>Contact No.:</b> 9418133549</p>	<p>Component PI                  (Entomology)</p>	<p>Planning, execution of the component activities wrt novel approaches for the management of insect and mite pests of tomato and parthenocarpic cucumber. Evolved biointensive pest management technology for integration and validation of plant protection technology. Organised three National Trainings-cum-Webinars as Organising Secretary</p>






<p>Dr Amar Singh</p> 	Male	Principal Scientist (Plant Pathology) Email- <a href="mailto:sood_hpau@yahoo.co.in">sood_hpau@yahoo.co.in</a> Contact No.: 9418133549	Component-PI (Plant pathology)	Planning, execution of the component activities wrt Plant Pathology, New bioformulations for management of diseases for natural farming and Protected Agriculture
<p>Dr Rishi Mahajan</p> 	Male	Assistant Professor (Microbiology) Email- <a href="mailto:rishimahajan@hpkvplp.com">rishimahajan@hpkvplp.com</a> <a href="mailto:rishimahajan@hillagrc.ac.in">rishimahajan@hillagrc.ac.in</a> Contact No.: 7807224569	Component-PI (Microbiology)	Development of crop specific microbial bio-formulations for Capsicum, Cumber, Tomato and Chilli, Core Rhizo-bacterial communities identification using Metagenomics, Microbiological interventions for agro-waste management
<p>Dr Y.S Dhaliwal</p> 	Male	Dean, College of Community Sciences E Mail: <a href="mailto:ysdhaliwal44@yahoo.co.in">ysdhaliwal44@yahoo.co.in</a> Contact No.: 9816082444	Component-PI (Food technology)  Nodal Officer GRM	Planning, and execution of the component activities wrt value addition in the organic farm products and analysis Also technologies for enhancing shelf life of Natural farming products
<p>Dr A.K. Panda</p> 	Male	Professor & Head Department of Veterinary Public Health & Epidemiology [Email: <a href="mailto:akpanda@hotmail.com">akpanda@hotmail.com</a> Contact No: 9418040256]	Component-PI (Veterinary)	Planning and, execution supervision of the component ( Microbial profiling )
<p>Dr S.K Upadhaya</p> 	Male	Professor & Head Horticulture & Agroforestry  [Email: <a href="mailto:sureshupadhaya@rediffmail.com">sureshupadhaya@rediffmail.com</a> Contact No: 9418015729]	Nodal Officer (ESP)	Planning and execution of the component activities of ESP Clean and green campus proposal development
<p>Dr Anup Katoch</p> 	Male	Professor & Head Economics	Component-PI (Economics) Continuing	Planning, and execution of the component activities of Economics of PANF
<p>Dr R.K. Gupta</p> 	Male	Retd. Professor [Email- <a href="mailto:errkgupta@yahoo.com">errkgupta@yahoo.com</a> ]	Component-PI (Agri Econ.) (2Years) Retd	Planning, execution and supervision of the component activities like designing of polyhouse and also associated in procurements



**Component-wise Execution Team**

<p>Dr Surjeet Kumar</p> 	Male	Principal Scientist (Entomology) [Email- <a href="mailto:skumarhpau@gmail.com">skumarhpau@gmail.com</a> Contact No: 9418153087]	Co-PI	Standardised mass rearing of predator, <i>Chrysoperla zastrowi sillemi</i> under laboratory conditions. Organised one National Trainings-cum-Webinar as Organising Secretary
<p>Dr Sharmishtha Thakur</p> 	Female	Assistant Scientist (Entomology) [Email- <a href="mailto:sharmishthathakur@gmail.com">sharmishthathakur@gmail.com</a> Contact No: 8440004220]	Co-PI	Management of root knot nematode, soil drenching of a bioagent, <i>Bacillus amyloliquefaciens</i> and a new chemical fluopyram 400 SC (Velum Prime) were found promising in reducing nematode galls and increasing yield in cucumber.
<p>Dr. Rameshwar Kumar</p> 	Male	Principal Scientist (Agronomy),  [Email- <a href="mailto:drrameshwar@gmail.com">drrameshwar@gmail.com</a> Contact No.:94180 97235]	CoPI (Natural Farming)	Associated in Field experimentation on natural farming organizing secretary of webinars on natural farming, Associated in Publication of Book
<p>Dr. Gopal Katna</p> 	Male	Sr. Scientist (Genetics & Plant Breeding) [Email- <a href="mailto:gkatna@gmail.com">gkatna@gmail.com</a> Contact No.: 94181 55748]	Co PI (Natural Farming)	Conducting trials on wheat and paddy trials under natural farming conditions, data compilation and analysis thereof, author of booklet on natural farming, co-organizing secretary of two webinars on natural farming
<b>Scientific Support Staff</b>				
<p>Dr. Aditi Badiyala</p> 	Female	Research Associate (Ph.D. Entomology), Deptt of Organic and Natural Farming, CSK HPKV, Palampur Email- <a href="mailto:aditibadiyala@gmail.com">aditibadiyala@gmail.com</a> Contact No: 7876747593	RA (Natural Farming)	Effective implementation of research activities and contributed in publications, co-organizing webinars on natural farming
<p>Dr. Bansuli</p> 	Female	RA E mail: <a href="mailto:bansuli777@gmail.com">bansuli777@gmail.com</a> Contact No.:	Research Associate (continuing)	Effective implementation of research activities and contributed in publications
<p>Dr Ruchi Sood</p> 	Female	Research Associate (CGRT) Email: <a href="mailto:ruchisood06@gmail.com">ruchisood06@gmail.com</a> Contact No 9418031353	Research Associate (continuing)	Assisting Principal Investigator in Management of Finance and technical reports, co-organizing webinars and to attend any work assigned from time to time

<p>Dr. Anjali</p> 	Female	<p>JRF (Nutrient Management) [Email: <a href="mailto:anjalidhiman214@gmail.com">anjalidhiman214@gmail.com</a> m Contact No.: 9882544417]</p>	JRF	<p>Associated Handled the soil and plant analysis work in lab (For samples collected under project) Co-organizer of various webinars, trainings and awareness programmes</p>
<p>Ms Diksha Sinha</p> 	Female	<p>JRF [Email: sinha.diksha34@gmail.com Contact No.:8789263058]</p>	JRF	<p>Associated in Plant Pathology, New bioformulations for management of diseases for natural farming and Protected Agriculture and data collection</p>
<p>Ms Ekta Kaushik</p> 	Female	<p>JRF Email: <a href="mailto:Ektakaushiko893@gmail.com">Ektakaushiko893@gmail.com</a> m Contact No: 9459248759</p>	-	<p>Associated in Plant Pathology, New bioformulations for management of insects -pests for natural farming and Protected Agriculture and data collection</p>
<p>Dr. Shilpa</p> 	Female	<p>JRF Email: shilpavij1212@gmail.com Contact No: 8580758814</p>		<p>Natural Farming filed experimentation and data compilation of attributes majorly on Tomato, Cucumber, and Capsicum under Protected Conditions. Lettuce in hydroponic unit and data compilation -Co-organizing Secretaries of National seminars/Webinars and one International Webinar Conducted under the Project Number of</p> <p>Research Articles Published under CAAST: 8</p>
<p>Dr Anila Sharma</p> 	Female	<p>Young Professional-II (microbiology) Email: <a href="mailto:sharma.anila2013@gmail.com">sharma.anila2013@gmail.com</a> m Contact No: 8219746687</p>	Young Professional-II (Continuing)	<p>Assisted in setting up experiments on micro-encapsulated carbon nanoparticles wit plant beneficial bacteria</p>
<p>Mr. Aditya Sood</p> 	Male	<p>YP-I(Veg Sci) E mail: sood.aditya223@gmail.com Contact No.:9805666613</p>	Young Professional-I	<p>Assisted in data recording &amp; compilation, financial management, report compilation and other activities as directed</p>
<p>Mr Neeraj Gill</p> 	Male	<p>YP-I(Veg Sci)  E mail: neerajgill2@gmail.com  Contact No.:7018543960</p>	Young Professional-I	<p>Assisted in Procurement and financial management, report compilation and other activities as directed</p>

<p>Ms Pratibha Dhiman</p> 	Female	<p>YP-I(CGRT)</p> <p>E mail: d.pratibha92@gmail.com</p> <p>Contact No.:9736311283</p>	Young Professional-I	Assisted in recruitments, sanctions, international training, proceedings, supply orders and other activities as directed
<p>Mr Anmol Nag</p> 	Male	<p>YP-I(CGRT)</p> <p>E mail: anmolnag005@gmail.com</p> <p>Contact No.:94590995950</p>	Young Professional-I	Assisted in Agri diksha, webinars, Virtual class room and other activities as directed
<p>Mr Bharat Kumar</p> 	Male	<p>YP-I(CGRT)</p> <p>E mail:bharatdhiman18888@gmail.com</p> <p>Contact No.: 8094969955</p>	Young Professional-I	Assisted in financial management other activities as directed

### NAHEP Component-II Team

<p>Mr Kapil Sharma</p> 	Male	<p>Astt. Prof.</p> <p>Dept. of PSL, COBS</p> <p>E mail: kapil96@gmail.com</p> <p>Contact No.:9418462229</p>	CO-PI	AMS Implementation
<p>Mr. Vaibhav Kalia</p> 	Male	<p>Astt. Prof.</p> <p>CGRT, COBS</p> <p>E mail: vaibhav@hillagric.ac.in</p> <p>Contact No.:9418473248</p>	CO-PI	<p>Web Application Development (Kisaan Portal)</p> <p>Web Development (Admission Portal)</p> <p>AMS Implementation</p> <p>Software Development and support</p>

**6.2. Details of visits of PIU-NAHEP officials at your AU along with photographs (provide list)**

1. Dr Hema Tripathi, National Coordinator (M&E and ESS), NAHEP-ICAR, New Delhi
2. Dr Ravindra Kumar, PI, IG BASU Bihar, NAHEP-ICAR



### Annexure-I

Before 2020 (average NAAS score was 5.65)

Research Publications (PI/CoPI/CAAST)		
S. No.	Citation	NAAS rating
<b>Vegetable Science</b>		
<b>NAHEP-CAAST</b>		
1	<b>Rana C</b> , Sharma A*, Sharma KC, Mittal P, Sinha BN, Sharma VK, Chandel A, Thakur H, Kaila V, Sharma P and Rana V. 2021. Stability analysis of garden pea ( <i>Pisum sativum</i> L.) genotypes under North Western Himalayas using joint regression analysis and GGE biplots. Genetic Resources and Crop Evolution 68: 999–1010	7.88
2.	<b>Thakur A</b> , Sharma A, Sharma P and Rana RS. 2021. An insight into the Problem of bacterial wilt in Capsicum spp with special reference to India. Crop Protection 140 (2021) 105420 Published on line <a href="https://doi.org/10.1016/j.cropro.2020.105420">https://doi.org/10.1016/j.cropro.2020.105420</a>	6.66
3	<b>Shweta</b> , Sood S, Sharma A, Chadha S and Guleria V. 2021. Nanotechnology: A cutting-edge technology in vegetable production. The Journal of Horticultural Science and Biotechnology, DOI: 10.1080/14620316.2021.1902864	7.92
4	<b>Lata H</b> , Sharma A, Chadha S, Kaur M and Kumar P. 2021. RNA interference (RNAi) mechanism and application in vegetable crops. Journal of Horticultural Science and Biotechnology 97 (2): 160-170	7.92
5.	<b>Thakur V</b> , Sharma A, Sharma P, Kumar P and Shilpa. 2022. Biofortification of vegetable crops for vitamins, mineral and other quality traits. The Journal of Horticultural Science and Biotechnology, DOI: 10.1080/14620316.2022.2036254. Link to this article: <a href="https://doi.org/10.1080/14620316.2022.2036254">https://doi.org/10.1080/14620316.2022.2036254</a>	7.92
6.	<b>Shilpa</b> , Sharma P, Thakur V, Sharma A, Rana R. S. and Kumar P. 2022. A status-quo review on management of root knot nematode in tomato. The Journal of Horticultural Science and Biotechnology, DOI: 10.1080/14620316.2022.2034531. Link to this article: <a href="https://doi.org/10.1080/14620316.2022.2034531">https://doi.org/10.1080/14620316.2022.2034531</a>	7.92
7.	Sharma A, Rani M, <b>Lata H</b> , <b>Thakur A</b> , Sharma P, Kumar P, Jayswal DK and Rana RS. 2022. Global dimension of root rot complex in garden pea: Current status and breeding prospective. Crop Protection, 158: 106004 published on line <a href="https://doi.org/10.1016/j.cropro.2022.106004">https://doi.org/10.1016/j.cropro.2022.106004</a>	9.04
8.	<b>Eshanee</b> , Sharma A*, Sharma P, Sharma GD, Manuja S and Rana SS. 2022. Effect of sowing dates on phenological traits, yield and its contributing attributes on snow pea genotypes. Legume Research (Published online DOI: <a href="https://doi.org/10.18805/LR-4817">10.18805/LR-4817</a> )	6.66

9.	Sharma A., <b>Rana C</b> , Thakur H, Sharma KC, Mittal P, Sharma P, Kumar V, Sharma VK and Sinha BN. 2022. Stability of Garden Pea Genotypes based on GGE Biplot and Regression Model. Legume Research (published on line, DOI 10.18805/LR-4903	6.66
10.	<b>Rana C</b> , Sharma A*, Rathour R, Bnsuli, Banyal DK, Rana RS and Sharma P. 2023. In vivo and in vitro validation of powdery mildew resistance in garden pea genotypes. Scientific Reports 13: 2243 DOI 10.1038/s41598-023-28184-0	11.0
11.	Sharma A, <b>Sharma S</b> , Kumar N, Rana RS, Sharma P, Kumar P, Rani M. 2022. Morpho-molecular genetic diversity and population structure analysis in garden pea ( <i>Pisum sativum</i> L.) genotypes using simple sequence repeat markers. PLoS ONE 17(9): e0273499. <a href="https://doi.org/10.1371/journal.pone.027349">https://doi.org/10.1371/journal.pone.027349</a>	9.75
12.	Lata H, Sharma A, RanaRS, Thakur A, Kour M 2023. Heterosis and combining ability vis-à-vis association for green fruit yield and component traits involving male sterile lines in chilli ( <i>Capsicum annum</i> L.) under wet temperate zone of North Western Himalayas Plant Breeding (in press ) May,23 issue	8.52
<b>Associated</b>		
13.	<b>Shiwani K</b> and Sharma A. 2021. Genetics of Quality Attributes and Powdery Mildew Severity in Garden Pea ( <i>Pisum sativum</i> Var. Hortense L.) under Sub Temperate Conditions of North-Western Himalayas. Legume Research 10.18805/LR-4337 published online	7.34
14.	<b>Shiwani K</b> and Sharma A. 2021. Study on gene effects for pod yield and horticultural traits of garden pea ( <i>Pisum sativum</i> var. <i>hortense</i> L.) using trigenic model of generation mean analysis. Indian J. Genet., 81(2): 289-299	5.54
15.	<b>Chauhan A</b> and Sharma A*. 2021. Genetic diversity in edible podded pea ( <i>Pisum sativum</i> var. <i>saccharatum</i> ). Indian J. Plant Genet. Resour. 34 (2): 301-304	9.04
16.	<b>Chauhan A</b> , Sharma A*, Sharma P, Katoch V, Chadha S and Kumari V. 2021. Genetic Variability for Pod Yield and Component Traits in Sugar Snaps ( <i>Pisum Sativum</i> Var. <i>Saccharatum</i> ). Legume Research <b>DOI:</b> 10.18805/LR-4443 <b>Article Id:</b> LR-4443 published online	6.66
17.	<b>Chandel A</b> , Sharma A*, Sharma P, Manuja S, Rana RS and Rana SS.2022. Seeding time, fertility level and genotype influence on productivity, quality and profitability of garden pea ( <i>Pisum sativum</i> ). Indian Journal of Agronomy 67 (1): 30-37	5.55
18	<b>Chandel A.</b> , Sharma A*, Sharma P., Rana S. S., Rana R.S., Shilpa. 2023. Seed yield, nutrient absorption and soil health as influenced by sowing time, fertility and genotypes of garden pea ( <i>Pisum sativum</i> L.). Horticultural Science, XX: 00–00.	7.19
19	<b>Singh J</b> , Sharma A*, Sharma P and Kumar N. 2023. Genetic variability and association studies in mid late and late group of cauliflower	5.54

	(Brassica oleracea L. var. botrytis). Indian Journal of Plant Genetic Resources (Accepted)	
<b>Entomology</b>		
19	<b>Singh, V.</b> , Sharma, G. and Sood, A.K. 2021. Vertical distribution and abundance of aleyrodids of agricultural importance in Himachal Pradesh. Indian Journal of Entomology 83(4): 551-557	5.89
20	<b>Soni, S.</b> , Kumar, S., Sood, A.K. and Rana, R.S. 2021. Modeling of aphid complex and its associated natural enemies in rapeseed-mustard in relation to climatic factors. Journal of Agrometeorology 23(2): 207-212	6.47
21	<b>Kaundal, P</b> and Sood, A.K. Population dynamics of <i>Thrips tabaci</i> Lindeman on onion under mid-hill conditions of Himachal Pradesh. Indian Journal of Entomology 83(2): 198-201	5.89
22	<b>Ghongade, D.S.</b> and Sood, A.K. 2021. Economic injury level for <i>Tetranychus urticae</i> Koch on parthenocarpic cucumber under protected environment in north-western Indian Himalayas. Phytoparasitica 49(5): 893-905.	7.14
23	<b>Sharma, S</b> , Sood, A.K and Ghongade, D.S. 2021. Assessment of losses inflicted by the aphid, <i>Myzus persicae</i> (Sulzer) to sweet pepper under protected environment in north western Indian Himalayan region. Phytoparasitica (Published online <a href="https://doi.org/10.1007/s12600-021-00951-7">https://doi.org/10.1007/s12600-021-00951-7</a> )	7.44
24	<b>Thakur, S</b> and Sood, A.K. 2021. Deterrent activity of natural products to red spider mite, <i>Tetranychus urticae</i> Koch. Indian Journal of Entomology (Published Online Ref. No. e20321 DoI.: 10.5958/0974-8172.2021.00146.2)	5.08
25	<b>Thakur, S</b> and Sood, A.K. 2022. Foliar application of natural products reduces population of two-spotted spider mite, <i>Tetranychus urticae</i> Koch on parthenocarpic cucumber ( <i>Cucumis sativus</i> L.) under protected environment. Crop Protection (DOI: <a href="https://doi.org/10.2139/ssrn.4012411">10.2139/ssrn.4012411</a> )	9.04
26	<b>Deeksha</b> , Ghongade, D.S. and Sood, A.K. 2023. Biological characteristics and parasitization potential of <i>Encarsia formosa</i> Gahan (Hymenoptera: Aphelinidae) on the whitefly, <i>Trialeurodes vaporariorum</i> Westwood (Hemiptera: Aleyrodidae), a pest of greenhouse crops in north-western Indian Himalayas. <i>Egyptian Journal of Biological Pest Control</i> 33(3):13	8.06
<b>Soil Science</b>		
27	Kapoor R and Sandal SK. 2021. Yield, Water Use Efficiency and Economics of Drip Fertigated Broccoli ( <i>Brassica Oleracea</i> Var. <i>italica</i> ). <i>Communication in Soil Science and Plant Nutrition</i> . 52 (22), 2852–2864.	7.58
28	Kapoor R, Kumar A, Sandal S.K, Sharma A, Raina R and Thakur KS. 2022. Water and nutrient economy in vegetable crops through drip	8.28



	fertigation and mulching techniques: a review, <i>Journal of Plant Nutrition</i> , DOI: 10.1080/01904167.2022.2063742	
<b>Plant Pathology</b>		
29	Ramalingam, J., Alagarasan. G., Savitha, P., Lydia, K., Pothiraj, G., Vijayakumar, E., Sudhagar, R., Singh Amar, Kumari, V. and Vanniarajan, C. (2020). Improved host plant resistanceto <i>Phytophthora</i> rot and powderymildew in soybean ( <i>Glycine max</i> (L.) Merr). <i>Scientific Reports</i> .   <a href="https://doi.org/10.1038/s41598-020-70702-x">https://doi.org/10.1038/s41598-020-70702-x</a>	<a href="#">11.0</a>
30	Sharma S., Katoch V. and Banyal, D K. 2021. Review on harnessing biotechnological tools for the development of stable bacterial wilt resistant solanaceous vegetable crops. <i>Scientia Horticulturae</i> 285 (2021) 110158	8.77
31	Bhardwaj, N.R., Banyal, D.K. and Roy, A. K 2021. Prediction model for assessing powdery mildew disease in common Oat ( <i>Avena sativa</i> L.) <i>Crop Protection</i> 146 (2021) 105677	9.04
32	Arora, A., Sood, V. K., Chaudhary, H. K., Banyal, D K., Kumar, S., Rajni D., Kumari, R., Khushbu, A., Priyanka and Yograj, S. 2021. Genetic diversity analysis of oat ( <i>Avena sativa</i> L.) germplasm revealed by agromorphological and SSR markers. <i>Range Management. &amp; Agroforestry</i> 42 (1): 38-48.	6.37
33	Atri, A., Banyal, D. K, Bhardwaj, N. S and Roy A. K 2021. Exploring the integrated use of fungicides, bio-control agent and biopesticide for management of foliar diseases (anthracnose, grey leaf spot and zonate leaf spot) of sorghum. <i>International Journal of Pest Management</i> : <a href="https://doi.org/10.1080/09670874.2022.2039799">https://doi.org/10.1080/09670874.2022.2039799</a>	7.91
34	Banyal, D.K., Bhargava, P and Sharma, B.K. 2021. Bioefficacy of fungicides against Karnal bunt and flag smut of wheat in Himachal Pradesh. <i>Plant Disease Research</i> . 36(1): 85-89.	4.76
35	Basandrai, A. K., Basanrai,D., Amritpal, A., Sharma,B.K. and Singh, H.P. 2021. Multiple resistance sources to yellow rust and powdery mildew in some exotic wheats. <i>Plant Disease Research</i> . 36(1): 52-57.	4.76
36	Bhandhari, D., Singh Amar, Patel J.V. and Banyal D.K. 2021. Biological Management of Colocasia Blight Incited by <i>Phytophthora colocasiae</i> using Native Strains of Antagonists in North Western Himalayas. <i>Indian Journal of Agricultural Research</i> . DOI: 10.18805/IJARE.A-5880 (NAAS Score: 5.2)	5.2
37	Bhardwaj, NR., Atri, A., Rani, U., Banyal D K, and Roy A K.2021. Weather-based models for predicting risk of zonate leaf spot disease in Sorghum. <i>Tropical Plant Pathology</i> . (2021). <a href="https://doi.org/10.1007/s40858-021-00461-1">https://doi.org/10.1007/s40858-021-00461-1</a>	7.34
38	Devi, M., Banyal, D.K., Anudeep B.M. and Sinha, D. 2021 Management of gray leaf spot of tomato caused by <i>Stemphylium lycopersici</i> under protected cultivation. <i>Plant Disease Research</i> . 36 (2): 154-160 DOI No. 10.5958/2249-8788.2021.00025.	4.76
39	Bhardwaj, N.R., Atri, A., Banyal D K., Dhal A. and Roy A K. 2022. Multi-location evaluation of fungicides for managing blast ( <i>Magnaporthe</i>	9.04

	grisea) disease of forage pearl millet in India. Crop Protection. 159: 106019 <a href="https://doi.org/10.1016/j.cropro.2022.106019">https://doi.org/10.1016/j.cropro.2022.106019</a>	
40	Mawar, R., Mathur, M., Rani, U., Banyal, D, K., Awasthi, D. P. and Roy, A. K..2021. Effect of biological and chemical treatments on root rot incidence on cowpea and relationship with climatic parameters. Multilogic in Science. 12: 55-60.	4.51
41	Bhardwaj, NR., Banyal, D. K. and Roy A K. 2022.Integrated management of crown rot and powdery mildew diseases affecting red clover ( <i>Trifolium pratense</i> L.) Crop Protection DOI: <a href="https://doi.org/10.1016/j.cropro.2022.105943">https://doi.org/10.1016/j.cropro.2022.105943</a> . (NAAS rating)	8.57
42	Dhiman, S., Badiyal, A., Katoch, S., Pathania, A., Singh, A., Rathour, R., Padder,B.A., Sharma, P.N. 2022. Insights on atypical adult plant resistance phenomenon in Andean bean cultivar Baspa (KRC-8) to <i>Colletotrichum lindemuthianum</i> , the bean anthracnose pathogen. <i>Euphytica</i> 218:17.	7.90
43	Dhiman, S., Kumari, N., Badiyal, A., Sharma, V. and Sharma, P.N. 2022. Development and validation of a direct PCR based assay for the detection of <i>Colletotrichum</i> species on chili seeds. <i>Seed Science and Technology</i> . 50 (1), 149-161.	6.91
44	Rajput, L. S., Nataraj, V., Kumar, S., Amrate, P. K., Jahagirdar, S., Huilgol, S. N., Chakruno, P., Singh, A., Maranna S., Ratnaparkhe M. B., Borah M., Singh K. P., Gupta S. and Khandekar N. 2022. WAASB index revealed stable resistance sources for soybean anthracnose in India. <i>The Journal of Agricultural Science</i> . <a href="https://doi.org/10.1017/S0021859622000016">https://doi.org/10.1017/S0021859622000016</a>	7.08
45	Rani, R., Negi, P., Sharma, S., Jain, S. 2022. Occurrence of oosporic stage of <i>Pseudoperonospora cubensis</i> on cucumber, in Punjab, India: A first report, <i>Crop Protection</i> , <a href="http://dx.doi.org/10.1016/j.cropro.2022.105939">http://dx.doi.org/10.1016/j.cropro.2022.105939</a> .	9.04
46	Sharma, S. 2022. Molecular indexing against Mandarin viruses and Citrus greening bacterium in Kinnow mandarin nurseries in Punjab. <i>Indian Phytopathology</i> , <a href="https://doi.org/10.1007/s42360-022-00494-9">https://doi.org/10.1007/s42360-022-00494-9</a> .	5.95
47	Sharma, S., Kumar, V. and Pawar, T. 2022. Natural Occurrence of (EuLCV) Euphorbia leaf curl virus Infecting Zinnia in India. <i>Indian Journal of Ecology</i> , 48: 1798-1801.	5.79
<b>Organic and Natural Farming</b>		
48	Sidhu Mankaran Singh, Sharma GD, Kumar Naveen, Chahal Arvind, Rana MC, and Sharma RP. 2020. Herbage yield, nutritive value and soil properties of annual ryegrass ( <i>Lolium multiflorum</i> Lam.) as affected by sowing time and varying levels of nitrogen. <i>Forage Research</i> 46(2): 163-167	4.84
49	Chahal Arvind, Sharma Gurbhan Dass, Kumar Naveen, Sankhyan Narender Kumar, Katoch, Rajan, Rana Mann Chand and Chandel Ravinder Singh. 2020. Impact of different nutrient sources on forage yield, nutritive value and economics of sorghum sudan grass hybrid-oat cropping system. <i>Journal of Plant Nutrition</i> . DOI: <a href="https://doi.org/10.1080/01904167.2019.1643372">https://doi.org/10.1080/01904167.2019.1643372</a>	6.76

50	Rana, Sheetal, Chauhan, Rakesh, Walia, Abhishek, Sharma, G.D. and Dutt, Naveen. 2021. Beneficial microbes in agriculture under abiotic stress conditions: An overview The Pharma Innovation Journal 2021 DOI: <a href="https://doi.org/10.22271/tpi.2021.v10.i1e.5542">https://doi.org/10.22271/tpi.2021.v10.i1e.5542</a> )	5.26
51	Sidhu, Mankaran Singh, Sharma, GD, Chahal, Arvind and Sankhyan, N.K. (2021). Response of annual Ryegrass ( <i>Lolium multiflorum</i> Lam) to sowing dates and Nitrogen fertilization. Indian Journal of Ecology 48(2): 442-445	5.79
52	Gourav, Sankhyan Narender Kumar, Kumar Pardeep, Sharma Gurbhan Dass and Sharma Neelam. 2021. Critical limits of sulphur in relation to the growth and development of French-bean and cauliflower in acidic soils of North Western Himalayas. Communication in Soil Science and Plant Analysis. <a href="https://doi.org/10.1080/00103624.2021.11921194">https://doi.org/10.1080/00103624.2021.11921194</a> : 1-11.	6.2
53	Sharma Devina, Sharma Kanika, Agnihotri R.K., Punam and Rameshwar (2020). In vitro evaluation for acaricidal efficacy of <i>Melia azedarach</i> and <i>Eupatorium adenophorum</i> against <i>Rhipicephalus (Boophilus) microplus</i> ticks of goats. Indian Journal of Small Ruminants 26(1): 86-91	5.25
54	Kumar Rameshwar, Punam and Seth, Meenakshi (2020) Productivity and profitability of legume based cropping systems grown under organic conditions in mid-hills of Himachal Pradesh. Journal of Crop and Weed 16(2): 117-121	5.46
55	Thakur Anjali, Sharma R.P, Sankhyan, N.K & Kumar Rameshwar (2020) Maize grain quality as influenced by 46 years' continuous application of fertilizers, farmyard manure (FYM), and lime in an alfisol of North-western Himalayas. Communications in Soil Science and Plant Analysis 48(18): 2193-2209. <a href="https://doi.org/10.1080/00103624.2020.1854289">https://doi.org/10.1080/00103624.2020.1854289</a>	6.65
56	Meghna, Punam, Kumar Rameshwar and Seth Meenakshi (2020). Effect of soil moisture regimes and sources of nutrients on carbon sequestration potential in rice-wheat cropping system. Journal of Crop and Weed 16(3): 85-90.	5.46
57	Bharti Anupam, Sharma R.P, Sankhyan N.K. and Kumar Rameshwar (2020). Productivity and NPK uptake by maize as influenced by conjunctive use of FYM, lime and fertilizers in an acid Alfisol. Journal of Soil and Water Conservation 20(1): 100-106.	8.21
58	Sharma Neha, Katna G, Saha Archana Joshi and Sharma Kamal Dev 2020. Macro-mutations induced by EMS, gamma-rays and their combined treatments in chickpea ( <i>Cicer arietinum</i> L.). International Journal of Chemical Studies 8(3): 1751-1754.	5.2
59	Boparai Arshvir K, Sood VK, Singh Mohar and Katna G 2020. Genetic variability and inter-relationship studies in advanced interspecific derivatives of chickpea. Agricultural Research Journal 57 (6): 826-831	5.44
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61	Panwar A, Nitesh SD, Sharma Kamal Dev and Katna G 2021. Development and characterization of inter-specific crosses involving	5.23

	cultivated and wild species of chickpea ( <i>Cicer arietinum</i> L.). The Pharma Innovation Journal 10(3): 405-411	
63	Chandel, R. S., Verma, K. S., Rana, Abhishek, Sanjta Suman, Badiyala Aditi, Vashishth Sumit, Kumar Rahul and Baloda, A. S. 2021. The ecology and management of cutworms in India. Oriental Insects. DOI: 10.1080/00305316.2021.1936256	6.33
64	Soni Saurbh, Kumar Surjeet, Singh Ranbir, Badiyala Aditi and Chandel Ravinder Singh. 2022. Aphid parasitoids, <i>Diaeretiella rapae</i> (McIntosh) (Hymenoptera: Braconidae): opportunities for its use in integrated management of aphids infesting rapeseed-mustard in North-Western Himalayas. Crop Protection 151. doi:10.1016/j.cropro.2021.	8.38
<b>Microbiology</b>		
65	Junta, M. K., Gupta, A. K., & Mahajan, R. (2021). Biological control of hairy root ( <i>Rhizobium rhizogenes</i> ) in apple nurseries through <i>Rhizobium radiobacter</i> antagonists (strain K-84 and native strain UHFBA-218). Biological Control, 164, 104762. <a href="https://doi.org/10.1016/j.biocontrol.2021.104762">https://doi.org/10.1016/j.biocontrol.2021.104762</a>	9.86
66	Mahajan, R., Hudson, B. S., Sharma, D., Kolte, V., Sharma, G., & Goel, G. (2022). Transcriptome Analysis of <i>Podocorypha petalodes</i> Strain GGF6 Reveals the Diversity of Proteins Involved in Lignocellulose Degradation and Lignolytic Function. Indian Journal of Microbiology, 1-14. <a href="https://doi.org/10.1007/s12088-022-01037-6">https://doi.org/10.1007/s12088-022-01037-6</a>	7.4
67	Mahajan, R., Verma, S., & Chatterjee, S. (2023). Biodegradation of organophosphorus pesticide profenofos by the bacterium <i>Bacillus</i> sp. PF1 and elucidation of initial degradation pathway. Environmental Technology, 44(4), 492-500. <a href="https://doi.org/10.1080/09593330.2021.1976282">https://doi.org/10.1080/09593330.2021.1976282</a>	9.48
<b>Average NAAS score after implementation of NAHEP</b>		<b>7.27</b>
<b>Books</b>		
1	Diagnosis and Management of Biotic and Abiotic stresses of Vegetable Crops in Protected Agriculture and Natural Farming Edited by Ajay K Sood, Amar Singh, Ranbir S Rana, Ashwini K.Basandrai, N.Sankhyan & Sanjeev Sandal	
2	Application of Nanotechnology in Crop Pest Management Edited by Amar Singh, Ajay K Sood, Ashwini K.Basandrai, Ranbir S Rana, Somya Halan, Diksha Sinha, Ekta Kaushik	
3	Hand book on Principles and Practices of Natural Farming Edited by GD Sharma, Aditi Badiyala, Gopal Katna Rameshwar Kumar, Ranbir Singh Rana	
4	Intellectual Property Rights (IPR) Policy Guidelines Ed By Dr HK Choudhary and Dr VK Sood	
5	Plant microbe interactions under Protected Agriculture and Natural Farming Practical Manual Ed By Dr Rishi Mahajan	
6	Phytotron for Speed breeding and precision agriculture under changing climatic scenario Ed By Dr HK Choudhary and Dr VK Sood	
7	Manual on Hydroponic Farming Ed by Parveen Sharma, Akhilesh Sharma, Ranbir Singh Rana (Hindi/English)	

8	Evaluation Methods for Fresh and Processed Fruits & Vegetables Ed Dr. Ranjana Verma and Dr. Anupama Sandal Dr. Y.S. Dhaliwal, Dr. Ranbir Singh Rana, Dr. Farhan M. Bhatt & Mr. Manohar Lal	
9	Rural Sociology and Education Psychology Dr Anup Katoch, Dr Ranbir Singh Rana	
10	Packaging of Fresh and Processed Food Products Dr. Ranjana Verma and Dr. Anupama Sandal Dr. Y.S. Dhaliwal, Dr. Ranbir Singh Rana Dr. Farhan M. Bhatt & Mr. Manohar Lal	
	<b>Book Chapter</b>	
1	हिमाचल प्रदेश के विभिन्न जिलों में जलवायु और मौसम पूर्वानुमान एवम मिटटी प्रबंधन (नरेन्द्र कुमार सांख्यान, अंजलि व रणबीर सिंह राणा)	
2	Badiyala, Aditi and Sharma, G. D. 2020. Chapter 6- Pest and disease management under natural farming. In: "Effect of Covid Pandemic on Agriculture and Allied Sciences". ISBN: 978-81-935728-8-7. Oura Prakashan & Book Distributors Pvt. Ltd., Lucknow, Uttar Pradesh (book chapter). pp: 34-44.	
3	Kaushik E., Sood A. and Rana R.S. 2021. Advancement in pest management of vegetable crops under protected cultivation. Advances in Agricultural Entomology. AkiNik publications, New Delhi. 29-53	
4	Badiyala Aditi, Kanwar Sangeeta and Sharma, G.D. 2022. Chapter 23- Evaluation of bioagent and organic products against collar rot of tomato under protected cultivation. In: Crop Protection-Driven Food Safety and Security (Abhijeet Ghatak, Ramanuj Vishwakarma, Nishant Prakash and Ranjeet Kumar (eds.)). International Books and Periodical Supply Service, Pitampura, Delhi. pp 139-144	
5	Katna Gopal, Nitesh, S.D. and Sharma Kamal Dev 2020. Chapter 4 - Conventional Cytogenetic Manipulations. In: "Chickpea: Crop Wild Relatives for Enhancing Genetic Gains" ISBN: 978-0-12-818299-4. <a href="https://www.elsevier.com/books-and-journals">https://www.elsevier.com/books-and-journals</a> (book chapter). pp. 63-93.	
6	Mahajan, R., Verma, S., Chandel, S., & Chatterjee, S. (2022). Organophosphate pesticide: Usage, environmental exposure, health effects, and microbial bioremediation. In Microbial Biodegradation and Bioremediation (pp. 473-490). Elsevier. <a href="https://doi.org/10.1016/B978-0-323-85455-9.00013-8">https://doi.org/10.1016/B978-0-323-85455-9.00013-8</a>	
	<b>Popular Articles</b>	
1	Singh Nishant and Kumar Surjeet (2022). चना फली छेदक सुंड़ी: प्रबंधन एवं रोकथाम. Giriraj Saptahik. 23-29 March: 5	
2	Sood, A.K., Verma, K.S., and Sharma, P.C. 2022. "पाली हाउस में उगाई जाने वाली फसलों के प्रमुख कीट एवं उनका एकीकृत प्रबंधन ". Parvatiya Khetibaari 42(4): 13-15.	
3	Badiyala Aditi, Sharma GD and Singh Dhanbir. 2022. Cow based bioformulations for pest management. Agriculture & Food e-Newsletter. 4(4): 361-363	
4	Badiyala, Aditi and Singh, Dhanbir. 2022. Liquid manures for organic/natural farming. Agriculture and Food E-Newsletter 4(1): 321-324	

5	Badiyala, Aditi and Singh, Dhanbir. 2021. Eco-friendly approaches for managing major okra insect-pests. <i>Just Agriculture E Newsletter</i> 2 (2), 8 pages	
6	Saurbh S, Badiyala, Aditi, Gupta, R. and Kanwar, S. 2021. जलवायु परिवर्तन का फसल के कीटों पर प्रभाव. <i>Fasal Kranti</i> 8 (5): 6-7	
7	Badiyala, Aditi and Sharma, G.D. 2021. Panchagavya: an eco-friendly formulation for insect-pest management. <i>Just Agriculture E Newsletter</i> 1 (8): 1-6 (popular article).	
8	Badiyala, Aditi and Sharma, GD. 2021. Pest management under natural farming. <i>Indian Farmer</i> 8(3): 253-258 (popular article).	
9	Badiyala, Aditi and Sharma PC. 202. मधुमखियों का कीटनाशक रसायनों से बचाव. <i>Giriraj Saptahik</i> 43 (31): 5	
10	Katna, Gopal and Sharma G.D. लाल माश एक उपयोगी पारंपरिक फसल. 2021. <i>Giriraj Saptahik</i> Vol. 40, 7 July. p 5 (popular article).	
11	Katna, Gopal, Sharma G.D. and Dhaliwal, Y. S. 2021. Chaulai ke fayde anek. <i>Phal Phool</i> 42 (6): 20-21	
12	Katna, Gopal and Sharma, G.D. 2020. फबा बीन्स की विज्ञानिक ढंग से करें खेती. <i>Giriraj Saptahik</i> , Shimla. Vol. 11, 16 December. p 5	
14	Kumar Rameshwar, Katna Gopal, Sharma G.D, Kumar Rakesh and Upadhyay RG (2021) “कैचुआ खाद (vermicompost) उत्पादन: एक उपयोगी रोजगार”. <i>Pahari Kheti Bari</i> 41(1&2): 23-26.	
	<b>Brouchers</b>	
1	Protected Agriculture & Natural Farming: Activities and Salient Achievements (In Hindi and English)	
2	Protected Cultivation of Vegetable Crops	



# Annexure-III

## Newspaper/Print Media

epaper.jagran.com

### कृषि उच्च शिक्षा परियोजना दे रही प्रोत्साहन

**पालमपुर :** प्रदेश कृषि विश्वविद्यालय में राष्ट्रीय कृषि उच्च शिक्षा परियोजना के तहत संरक्षित कृषि और प्राकृतिक खेती पर उन्नत कृषि विज्ञान और प्रयोगिक केंद्र ने शिक्षाविदों में सुधार और अत्याधुनिक बुनियादी ढांचे के निर्माण के लिए एक बड़ा प्रोत्साहन दिया है। कुलपति प्रो. एचके चौधरी ने बताया कि इस परियोजना के तहत 602.93 लाख रुपये की लागत से उच्च तकनीक रोपण सामग्री उत्पादन इकाई, उच्च तकनीक संयंत्र विकास कक्ष, हाइड्रोलॉजिक इकाई,

फाइटोड्रम सुविधा, आणविक प्रयोगशाला, बायोएजेंट उत्पादन इकाई आदि बनाई गई है। 105 कृषि और प्रयोगशाला उपकरणों को जोड़ने के अलावा, प्रयोगशालाओं, व्याख्यान विक्टर और समलन कक्षाओं को नवीनीकरण तकनीकों के माध्यम से नवीनीकरण किया गया और पालिहाउस का नवीनीकरण कार्य भी किया गया। लगभग 50 स्नातकोत्तर छात्रों को विभिन्न अंतरराष्ट्रीय और राष्ट्रीय संस्थानों के भ्रमण के माध्यम से लाभान्वित किया गया है। (स.स)



Academic management workshop 7-8 February, 20, at CSKHPV, Palampur

ताम विश्वविद्यालय में 602.93 लाख रूप की लागत से अनेक सुविधाओं का किया अणज

### कृषि विवि के लिए लाभकारी सिद्ध हुई राष्ट्रीय कृषि उच्च शिक्षा परियोजना

**कक्षात्मक संरचना-पालमपुर**  
प्रदेश कृषि विवि में राष्ट्रीय कृषि उच्च शिक्षा परियोजना के तहत संरक्षित कृषि और प्राकृतिक खेती पर उन्नत कृषि विज्ञान और प्रयोगिक केंद्र ने शिक्षाविदों में सुधार और अत्याधुनिक बुनियादी ढांचे के निर्माण के लिए एक बड़ा प्रोत्साहन दिया है। इस परियोजना के तहत 602.93 लाख रुपये की लागत से उच्च तकनीक रोपण सामग्री उत्पादन इकाई, उच्च तकनीक संयंत्र विकास कक्ष, हाइड्रोलॉजिक इकाई, फाइटोड्रम सुविधा, आणविक प्रयोगशाला, बायोएजेंट उत्पादन इकाई आदि बनाई गई है। 105 कृषि और

प्रयोगशाला उपकरणों को जोड़ने के अलावा, प्रयोगशालाओं, व्याख्यान विक्टर और समलन कक्षाओं को नवीनीकरण तकनीकों के माध्यम से नवीनीकरण किया गया और पालिहाउस का नवीनीकरण कार्य भी किया गया। लगभग 50 स्नातकोत्तर छात्रों को विभिन्न अंतरराष्ट्रीय और राष्ट्रीय संस्थानों के भ्रमण के माध्यम से लाभान्वित किया गया है। क्षमा विकास कार्यक्रम में प्रतिभागीता के स्तरपर 24 परपरासी, पूर्व पोस्टग्रेजुएट छात्रों को संरक्षित कृषि और प्राकृतिक खेती के विविध विषयों में शोध विषय सौंप दिए गए हैं। अमेरिका, ऑस्ट्रेलिया, इस्त्राल और जापान के प्रमुख संस्थानों में

### मिलकर काम करेंगे एग्रीकेयर आर्गेनिक फार्म व कृषि विवि

**संबंध सहयोगी, पालमपुर :** चौधरी सरसन कुमार हिमाचल प्रदेश कृषि विवि पालमपुर ने एग्रीकेयर आर्गेनिक फार्म लुधियाना के साथ समझौता ज्ञापन पर हस्ताक्षर किए हैं। कुलपति प्रो. एचके चौधरी ने बताया कि समझौते के तहत दोनों संस्थानों के बीच अकादमिक, अनुसंधान व प्रशिक्षण सहयोग होगा। विश्वविद्यालय और एग्रीकेयर फार्म, प्रशिक्षण, अनुसंधान, सूचना

व आर्थिकी के आदान-प्रदान को बढ़ावा देगा। कृषि विश्वविद्यालय पालमपुर के शोध निदेशक डाक्टर शर्मा व एग्रीकेयर आर्गेनिक फार्म की तरफ से अध्यक्ष निदेशक शैमा अरोड़ा ने समझौता ज्ञापन पर हस्ताक्षर किए। उमा सी.वी. विपन सी.वी. और कौट विज्ञान और पाठ्य शोध विज्ञान विभाग के विज्ञानी भी इस मौके पर मौजूद रहे।

मिलना लाग : समझौता ज्ञापन पर हस्ताक्षर के दौरान कृषि विश्वविद्यालय के कुलपति व एग्रीकेयर आर्गेनिक फार्म लुधियाना के अधिकारी

### Four of agri varsity to get training abroad

**OUR CORRESPONDENT**  
PALMPOUR, NOVEMBER 30  
One scientist and three PhD scholars of the agriculture university will undergo advanced training in Israel, Japan, Taiwan and Turkey. They meet Prof HBC Chaudhary, Vice-Chancellor here today.  
Dr Parveen Sharma, professor (Vegetable) will visit Israel from December 1 to February 15. He will undergo an advance training on Protected Cultivation at the Agricultural Research Organisation, Israel. The Vice-Chancellor Dr Parveen Sharma advised the students to learn the state-of-the-art research techniques for the advancement of research work and explore the possibility of post-doctoral training and collaborative research project.  
Prof Chaudhary also interacted with Himanshu Thakur, Khushwinder Kaur and Ekta Kaushik, research scholars, who are also leaving for advanced trainings, and advised them to experience state-of-the-art facilities to augment their PhD research work.  
Himanshu Thakur will work for a month on DNA sequencing techniques in sericulture and their serogermans at Okinawa Institute of Science and Technology, Japan, under the

guidance of Dr Thomas Bourguignon beginning December 1. Principal Scientist, Entomology, Dr Kuldip Singh is his adviser in the university. Dr Kuldip Singh will get one-month hands-on training in organic leafhopper of common bean at the Plant Protection Central Research Institute, Turkey. She will work under the supervision of plant pathologist Dr Sirel Cengizalp, Principal Scientist, plant pathology, Dr Anurag Singh is her PhD adviser in the university. Ekta Kaushik will undergo three-month research internship on 'Evaluation of tomato genotypes resistant to nematode and pin-worm' at the World Vegetable Centre, Taiwan, from December 10 under the supervision of Dr Srinivasan Ramasamy, flagship programme leader on safe and sustainable value chains. Principal Scientist, Entomology, Dr Ajay Sood is her PhD adviser. The scientist and students had been sponsored under the Indian Council of Agricultural Research, National Agricultural Education Project on Centre of Advanced Agricultural Science and Technology on Protected Agriculture and Natural Farming.

### कृषि विवि के विज्ञानी व शोधार्थी विदेशों में सीखेंगे गुर

**वाराणसी, पालमपुर :** उन्नत खेती व जल प्रेशा के विज्ञानी व शोधार्थी अमेरिका, ऑस्ट्रेलिया, इस्त्राल और जापान में उन्नत प्रशिक्षण प्राप्त करने और इसमें लाभ प्रेशा के विज्ञानी को पहुंचाएंगे। कुलपति प्रो. एचके चौधरी ने बताया कि डॉ. एचके चौधरी, प्रोफेसर (सब्जी) एच.शिवराम ने 28 फरवरी 2023 तक इजरायल का दौरा करने और कृषि अनुसंधान संयंत्र में संरक्षित खेती पर उन्नत प्रशिक्षण से लौटेंगे।

कुलपति ने विज्ञानियों को उन्नत खेती के लिए शोध कार्य को बढ़ाने के लिए अत्याधुनिक उपकरण तकनीकों को सीखने और उन्नत खेती के माध्यम से उन्नत प्रशिक्षण प्राप्त करने और इसमें लाभ प्रेशा के विज्ञानी को पहुंचाएंगे। कुलपति प्रो. एचके चौधरी ने बताया कि डॉ. एचके चौधरी, प्रोफेसर (सब्जी) एच.शिवराम ने 28 फरवरी 2023 तक इजरायल का दौरा करने और कृषि अनुसंधान संयंत्र में संरक्षित खेती पर उन्नत प्रशिक्षण से लौटेंगे।



कृषि विश्वविद्यालय पालमपुर के कुलपति प्रो. एचके चौधरी के साथ एच.बी.एम.डी. अक्षय कुमार

### कृषि विश्वविद्यालय के वैज्ञानिक और 3 शोधार्थी प्रशिक्षण के लिए इसराइल, जापान, ताईवान और तुर्की रवाना

पालमपुर, 30 नवंबर (एपी) - एक वैज्ञानिक और तीन पीएचडी छात्रों का एक शोधार्थी जापान, इजरायल, ऑस्ट्रेलिया और तुर्की के उन्नत प्रशिक्षण के लिए अंतरराष्ट्रीय भ्रमण पर निकलेंगे। कुलपति प्रो. एचके चौधरी ने बताया कि डॉ. एचके चौधरी, प्रोफेसर (सब्जी) एच.शिवराम ने 28 फरवरी 2023 तक इजरायल का दौरा करने और कृषि अनुसंधान संयंत्र में संरक्षित खेती पर उन्नत प्रशिक्षण से लौटेंगे।

कुलपति ने विज्ञानियों को उन्नत खेती के लिए शोध कार्य को बढ़ाने के लिए अत्याधुनिक उपकरण तकनीकों को सीखने और उन्नत खेती के माध्यम से उन्नत प्रशिक्षण प्राप्त करने और इसमें लाभ प्रेशा के विज्ञानी को पहुंचाएंगे। कुलपति प्रो. एचके चौधरी ने बताया कि डॉ. एचके चौधरी, प्रोफेसर (सब्जी) एच.शिवराम ने 28 फरवरी 2023 तक इजरायल का दौरा करने और कृषि अनुसंधान संयंत्र में संरक्षित खेती पर उन्नत प्रशिक्षण से लौटेंगे।

### राष्ट्रीय कृषि उच्च शिक्षा परियोजना बनी लाभप्रद

**विशेषज्ञों और विद्यार्थियों को प्रशिक्षण दिखाने के साथ उच्च गुणवत्ता**  
पालमपुर, 20 नवंबर (एपी) - राष्ट्रीय कृषि उच्च शिक्षा परियोजना के तहत संरक्षित कृषि और प्राकृतिक खेती पर उन्नत कृषि विज्ञान और प्रयोगिक केंद्र ने शिक्षाविदों में सुधार और अत्याधुनिक बुनियादी ढांचे के निर्माण के लिए एक बड़ा प्रोत्साहन दिया है। इस परियोजना के तहत 602.93 लाख रुपये की लागत से उच्च तकनीक रोपण सामग्री उत्पादन इकाई, उच्च तकनीक संयंत्र विकास कक्ष, हाइड्रोलॉजिक इकाई, फाइटोड्रम सुविधा, आणविक प्रयोगशाला, बायोएजेंट उत्पादन इकाई आदि बनाई गई है। 105 कृषि और प्रयोगशाला उपकरणों को जोड़ने के अलावा, प्रयोगशालाओं, व्याख्यान विक्टर और समलन कक्षाओं को नवीनीकरण तकनीकों के माध्यम से नवीनीकरण किया गया और पालिहाउस का नवीनीकरण कार्य भी किया गया। लगभग 50 स्नातकोत्तर छात्रों को विभिन्न अंतरराष्ट्रीय और राष्ट्रीय संस्थानों के भ्रमण के माध्यम से लाभान्वित किया गया है। (स.स)

### कृषि विश्वविद्यालय में वर्चुअल वलास रूम

**संरक्षित कृषि विश्वविद्यालय के कुलपति प्रो. एचके चौधरी ने बताया कि डॉ. एचके चौधरी, प्रोफेसर (सब्जी) एच.शिवराम ने 28 फरवरी 2023 तक इजरायल का दौरा करने और कृषि अनुसंधान संयंत्र में संरक्षित खेती पर उन्नत प्रशिक्षण से लौटेंगे।**

कुलपति ने विज्ञानियों को उन्नत खेती के लिए शोध कार्य को बढ़ाने के लिए अत्याधुनिक उपकरण तकनीकों को सीखने और उन्नत खेती के माध्यम से उन्नत प्रशिक्षण प्राप्त करने और इसमें लाभ प्रेशा के विज्ञानी को पहुंचाएंगे। कुलपति प्रो. एचके चौधरी ने बताया कि डॉ. एचके चौधरी, प्रोफेसर (सब्जी) एच.शिवराम ने 28 फरवरी 2023 तक इजरायल का दौरा करने और कृषि अनुसंधान संयंत्र में संरक्षित खेती पर उन्नत प्रशिक्षण से लौटेंगे।



<b>SNo.</b>	<b>Type</b>	<b>Title</b>	<b>Month</b>	<b>Year</b>	<b>Authors</b>
1	Book	Phytotron for Speed Breeding and Precision Agriculture	March	2023	Vinod Kumar Sood, Nimit Kumar, Sawan Kumar, Gaurav Sharma
2	Book	Hindi Manual on Hydroponic Farming	December	2022	Parveen Sharma, Akhilesh Sharma, Ranbir Singh Rana
3	Book	Manual on Hydroponic Farming	November	2022	Parveen Sharma, Akhilesh Sharma, Ranbir Singh Rana
4	Book	Handbook on Principles and Practices of Natural Farming	June	2022	Dr. G.D. Sharma, Dr. Aditi Badiyala, Dr. Gopal Katna, Dr. Rameshwar Kumar, Dr. Ranbir Singh Rana
5	Book	Rural Sociology and Education Psychology	August	2022	Dr. Anup Katoch, Dr. Ranbir Singh Rana
6	Book	Packaging of Fresh and Processed Food Products	July	2022	Dr. Ranjana Verma and Dr. Anupama Sandal Dr. Y.S. Dhaliwal, Dr. Ranbir Singh Rana, Dr. Farhan M. Bhatt & Mr. Manohar Lal
7	Book	Evaluation Methods for Fresh and Processed Fruits & Vegetables	July	2022	Dr. Ranjana Verma and Dr. Anupama Sandal Dr. Y.S. Dhaliwal, Dr. Ranbir Singh Rana, Dr. Farhan M. Bhatt & Mr. Manohar Lal
8	Book	Diagnosis and Management of Biotic and Abiotic stresses of Vegetable Crops in Protected Agriculture and Natural Farming		2023	Ajay K Sood, Amar Singh, Ranbir S Rana, Ashwini K. Basandrai, N. Sankhyan & Sanjeev Sandal

9	Book	Application of Nanotechnology in Crop Pest Management		2023	Amar Singh, Ajay K Sood, Ashwini K. Basandrai, Ranbir S Rana, Somya Halan, Diksha Sinha, Ekta Kaushik
10	Book	Intellectual Property Rights (IPR) Policy Guidelines		2023	Dr HK Chaudhary and Dr VK Sood
11	Brochure	Protected Agriculture and Natural farming Activities & Salient Achievements	February	2022	Compiled By Dr Sant Prakash Published by Dr Ranbir Singh Rana
12	Brochure	Protected Cultivation of Vegetable Crops	February	2022	Parveen Sharma, Akhilesh Sharma Dr Sant Prakash Tech Guidance Dr Desh Raj Chaudhary Published by Dr Ranbir Singh Rana

## ANNEXURE-IV International Trainings

Sr. No.	Name	Institute/ Country Visited	Purpose of Visit	Duration	Period of Training
<b>Faculty</b>					
1.	Dr. H.K. Chaudhary	University of Leicester, UK	Explore possibility of collaboration and identify different laboratories of University of Leicester, UK	10 days	07-07-2022 to 27-07-2022
2.	Dr. S.P. Dixit, Director of Research	University of Melbourne	University of Melbourne for undertaking cutting edge research in Agricultural Sciences especially on Carbon sequestrations and Nano technologies application in Agricultural Sector	7 days	21-11-2022 to 27-11-2022
3.	Dr. Mandeep Sharma, Dean COVAS	University of Melbourne	University of Melbourne for undertaking cutting edge research in Veterinary Sciences specially to facilitate blended education delivery and digital content creation in the context of veterinary education.	7 days	21-11-2022 to 27-11-2022
4.	Dr. Akhilesh Sharma, Professor (Department of Vegetable Science)	University of Wisconsin, Madison, USA	Techniques in resistance breeding with special reference to molecular techniques,	3 months	12-08-2022 to 15-11-2022

5.	Dr. Parveen Sharma, Professor (Department of Vegetable Science)	The Volcani Centre, ARO, Rishon LeZion, Israel	New approaches to extend the shelf life and maintain fruit quality of sweet peppers grown in protected cultivation at	3 months	01-12-2022 to 28-02-2023
<b>PG Students</b>					
6	Ms. Payal Sharma, Ph.D., Department of Vegetable Science	World Vegetable Centre, Taiwan	Mapping heat stress tolerance in a tomato MAGIC population	01 month	01-10-2022 to 31-10-2022
7	Ms. Alisha Thakur, Ph.D., Department of Vegetable Science	World Vegetable Centre, Taiwan	Mapping Mungbean Yellow Mosaic: virus resistance in Mungbean	01 month	01-10-2022 to 31-10-2022
8	Ms. Srishti, Ph.D., Department of Vegetable Science	World Vegetable Centre, Taiwan	Mapping heat stress tolerance in a tomato MAGIC population,	01 month	01-10-2022 to 31-10-2022
9	Mr. Himanshu Thakur, Ph.D., Department of Entomology	Okinawa Institute of Science and Technology, 1919 Tancha, Onnason, Kunigami-gun, Japan	DNA sequencing techniques and evaluation of results of chemical ecology studies on termites conducted in India at	01 month	01-12-2022 to 31-12-2022
10	Ms Khushwinder Kaur, Ph.D.,	Directorate of Plant Protection Central	Training in Isolation and characterization of	01 month	01-12-2022 to 31-12-2022

	Department of Plant Pathology	Research Institute Turkey	<i>Pseudocercospora griseola</i> populations		
11	Ms. Ekta Kaushik, Ph.D., Department of Entomology	World Vegetable Centre, Shanhua, Tainan, Taiwan	Evaluation of selected tomato genotypes for their resistance to <i>Bemisia tabaci</i> and <i>Phthorimaea absoluta</i>	3 months	13-12-2022 to 12-03-2023
12	Mr Akash Deep, Ph.D., Department of Agronomy	University of Southern Queensland (Australia)	Modelling of rice cropping system	01 month	28-01-2023 to 01-03-2023
13	Mr Shubham Verma, Ph.D., Department of Genetics and Plant Breeding	University of Melbourne (Australia)	Modern phenomics approaches to study different morph-physiological traits conferring drought tolerance, and hands on with different techniques at	01 month	14-02-2023 to 31-03-2023

**Annexure-V****In House National Trainings and webinars**

<b>Sr. No.</b>	<b>Title</b>	<b>Speaker(s)</b>	<b>Date</b>	<b>Total Participants</b>	<b>MAL E</b>	<b>FEMAL E</b>	<b>SC</b>	<b>ST</b>
<b>National Trainings (In House)</b>								
1	Training programme on Strategic Plan to double farm income through protected cultivation of vegetables		31-08.2020 to 0.09.2020	316	196	120	34	42
2	Management of biotic & abiotic stresses in protected agriculture	Dr Naved Sabir, Dr S.Kumar, Dr R. Varshney, Dr Vinay Singh, Dr Amar Kumar, Dr SSriram, Dr DK Banyal, Dr PN Sharma, Dr NK Sankhyan, Dr Vikas Sharma, Dr BB Vashisht, Dr SK Sandal	22.09.2020 to 24.09.2020	1432	856	576	153	55
3	One week training programme on "Experimental Design and Analysis through statistical softwares"	Dr Manpreet Singh Kheeva, Dr Navneet Kaur, Dr AS Brar, Dr Sukhpreet Singh, Dr Sukanta Dass, Dr KN Singh, Dr Sudeep Marwah, Dr RC Goyal	24-05-2022 to 30-05-2022	304	177	127	23	9
4	Six days hands on training on Insect Systematics	Dr Rajamani swaminathan, Mrs Tatiana Swaminathan , Dr Vikas Jindal, Dr Geetika Banta, Dr Prasad	18-/19-06.2022;01/02-07-2022;9/10-07-2022	111	57	54	5	9

		Shrikrishna Burange						
5	Application of Nanotechnology on crop pest management	Dr Manish Kumar, Dr Vijaya Kumar, Dr Sanjay Guleria, Dr M kannan, Dr Pranab Dutta; Dr Subash Chander Bhan	14-10-2022 to 15-10-2022	98	45	53	7	6
6	National training cum webinar on "Buzz pollination: Role of bumble bees in pollination of crops in protected agriculture"	Dr Harish K Sharma, Dr RajK Thakur, Dr Kiran Rana	05-03-2023	306	175	131	23	5
<b>Webinars/Brain storming /Seminars</b>								
1	Enhancement of spoken skills in English	Dr Prajya Mishra	12-08-2020	109	67	42	10	3
2	Vegetable cultivation under protected environments	Dr Balraj Singh	28-08-2020	283	155	128	20	8
3	Implementation of new education policy-2020: the way ahead	Dr. H.K. Choudhary	14-09-2020	46	25	21	5	2
4	Laboratory safety standards vis-a-vis new agricultural research and education	Dr. Yogita Kharayat	03-10-2020	62	36	26	6	4
5	Geographical indications: registration and processing and role of HPPIC (HIMCOSTE)	Mr. Shashi Dhar	08-10-2020	49	35	14	3	3

6	Webinar on “Rainwater harvesting and its application through drip irrigation”	Dr. U. S. saikia Dr. R. T. Thokkal, Dr. M. J. Kaledhonkar Dr. R. K. Thakuria	22-12-2021	102	<b>58</b>	<b>49</b>	<b>5</b>	<b>7</b>
7	Webinar on “Soil testing- a vital tool for soil health monitoring and sustenance”	Dr. K.P. Tripathi, Dr. Satish Bhardwaj Dr. Vikas Sharma, Dr. K.M. Manjaiah	08-01-2021	158	<b>91</b>	<b>67</b>	<b>22</b>	<b>7</b>
8	Webinar on “Prospects of natural farming in India”	Dr. Rajeshwar S Chandel	28-01-2021	220	<b>118</b>	<b>102</b>	<b>25</b>	<b>20</b>
9	Webinar (Talk 2) on “Soil-less vegetable cultivation”	Dr. Brahma Singh	05-02-2021	78	<b>40</b>	<b>38</b>	<b>7</b>	<b>4</b>
10	Webinar on “Fertigation Technologies for enhancing crop and water productivity”	Dr. Sanjeev S Sandal, Dr. B. D. Bhakhre, Dr. K. S. Sekhon, Dr. N. K. Sankhyan, Dr. Prabhakar Nanda	10-02-2021	70	<b>33</b>	<b>37</b>	<b>6</b>	<b>6</b>
11	Webinar on “Principles of good laboratory practices”	Dr. A. Ramesh	10-02-2021	89	<b>49</b>	<b>40</b>	<b>8</b>	<b>5</b>
12	Webinar “Bovine Tuberculosis: A zoonosis”	Dr Umesh Kumar Bharti	12.03.2021	8	<b>4</b>	<b>4</b>	<b>1</b>	<b>0</b>



13	Webinar on “Brain Storming Session to finalize Certificate Courses- 1.Hybrid Seed Production 2.Protected Cultivation in Vegetable Crops”	Dr. Brahma Singh Dr. Pritam Kalia Dr. A.S. Dhatt Dr. T.K. Behera Dr. Rajesh Singh Dr. D.K. Singh Dr. Hare Krishna Dr. Indivar Prasad	11-02-2021	14	12	2	0	0
14	Webinar on “Microbial strategies for improving soil health and crop productivity under protected cultivation”	Dr. (Mrs.) Radha Prasanna	10-03-2021	76	30	46	2	2
15	Webinar on “World Environment Day”	Prof.H.K.Chaudhary Dr. S.S. Samant Dr. Hemant Gupta	05-06-2021	117	63	54	7	5
16	Webinar on "World Milk Day"	Dr Anil Kumar Srivastav	01.06.2021	105	67	38	6	3
17	‘National Webinar on Evolution of Statistics.’ National Statistics Day- 2021	Prof. Narinder Kumar	29-06-2021	272	148	124	22	19
18	Webinar (Talk-3) “Global Update of Cucurbits Breeding”	Dr. Narinder Dhillon (Word Vegetable Centre)	14-10-2021	113	65	47	8	12
19	Nano fertilizers: Potential Material for Global Farming	Dr. J.C. Tarafdar	22-10-2021	93	57	36	10	4
20	Soil Quality Management vis-à-vis Climate Change	Dr. K.L. Sharma	23-10-2021	68	40	28	9	4
21	Nutraceutical breeding and biofortification of vegetable crops for health and	Dr. Pritam Kalia	18-10-2021	52	20	32	4	3

	nutritional security							
22	One Health	Dr. Sunil Raina	01-11-2021	98	<b>55</b>	<b>43</b>	<b>7</b>	<b>3</b>
23	Substance Abuse Prevention	Ms. Jyoti Bhardwaj	29-11-2021	100	<b>25</b>	<b>75</b>	<b>12</b>	<b>5</b>
24	Natural Farming: a new paradigm for Climate Resilient Agriculture	Dr. J.P. Saini Dr. Manoj Gupta	03-03-2022	100	<b>64</b>	<b>36</b>	<b>16</b>	<b>4</b>
25	Application of Drone Technology in Agriculture	Col. Arun Sharma	13-05-2022	158	<b>67</b>	<b>91</b>	<b>15</b>	<b>9</b>
26	Recent advances in developing vegetables suitable for protected environment	Dr. Hans Raj Bhardwaj	17-05-2022	109	<b>48</b>	<b>61</b>	<b>7</b>	<b>3</b>
27	Role of Institution for ATMANIRBHAR BHARAT through Innovation and Policy Reforms	Dr. P.K. Ghosh	15-06-2022	247	<b>149</b>	<b>98</b>	<b>34</b>	<b>22</b>
28	Plant Biotechnology Approaches for crop improvement	Dr. R.C. Yadav	20-06-2022	95	<b>52</b>	<b>43</b>	<b>8</b>	<b>17</b>
29	Application of Artificial Intelligence and Remote Sensing in Agriculture	Ms. Chandraballi Karmakar	20-09-2022	90	<b>38</b>	<b>52</b>	<b>4</b>	<b>2</b>
30	International expert talk on 'species diversity and evolutionary history of termitophilous rove beetles'	Dr Taisuke Kanao, Asstt. Prof., Yamagata Univ., Japan	04.11.2022	142	<b>61</b>	<b>81</b>	<b>10</b>	<b>15</b>
31	Curtain Raiser program on role of Radhanath Sikdar in India's Freedom Struggle	Prof. B.C. Chauhan (CUHP Dharamshala )	29.10.2022	75	<b>33</b>	<b>42</b>	<b>6</b>	<b>8</b>

32	Role of Nutrition and Physical Activity for Boosting Immunity	Dr. Kiran Bains, PAU, Ludhiana	07.11.2022	170	27	143	14	11
33	A Global Perspective for Future Food Security- Challenges and Opportunities (International Webinar)	Dr. Dorin Gupta, Melbourne	10.11.2022	96	20	76	20	12
34	Role of Nutrition and Physical Activity for Boosting Immunity	Dr Kiran Bains	07-11-2022	170	27	143	14	11
35	Awareness program on "Soil testing labs under Soil Health Card Scheme"	Dr N Venkateswaran	30-09-2022	60	33	27	5	3
36	Indian Dairy Sector Opportunities for Entrepreneurship development	Dr Hem Raj Khanna	21.03.2023	91	38	53	10	3
37	Brief about the Zoonotic diseases and strategies to prevent and Control	Dr Prabhakar Jha	22.03.2023	73	38	35	4	1
38	Benefits and Challenges to One health Approach in India	Dr Atul Anand	23.03.2023	76	44	32	10	2
39	DST funding scope for faculty and PhD Scholar	Dr Susheela Negi	06-04-2023	150	89	61	12	5
<b>Total</b>				<b>6851</b>	<b>3629</b>	<b>3238</b>	<b>641</b>	<b>383</b>

**Outside National Trainings:**

S. No	Name of Student	Name of Department	Contact No.	Purpose	Place of Training	Date of Training
1.	Yamini Joshi	Entomology	8894881357	National Training on "Crop Protection for Sustainable Agriculture"	ICRISAT Patancheru, Hyderabad	14-19th December, 2022
2.	Tanisha Gupta	Plant Pathology	8350978400	---do---	---do---	---do---

3.	Gaurav Katoch	Plant Pathology	7018678964	---do---	---do---	---do---
4.	Diksha Sinha	Plant Pathology	8789263058	---do---	---do---	---do---
5.	Gaurav Sharma	Genetics and Plant Breeding	9459761751	---do---	---do---	---do---
6.	Ronika	Genetics and Plant Breeding	9805558214	---do---	---do---	---do---
7.	Kavita Kushwaha	Plant Pathology	9606235799	---do---	---do---	---do---
8.	Riya	Plant Pathology	8894489223	---do---	---do---	---do---
9.	Mansi Arora	Plant Pathology	8476029687	---do---	---do---	---do---
10.	Somya Hallan	Plant Pathology	8628932035	---do---	---do---	---do---
11.	Sonali Parwan	Plant Pathology	8627005897	---do---	---do---	---do---
12.	Suresh Kumar Mahala	Entomology	9588827917	---do---	---do---	---do---
13.	Diksha Kharwal	Entomology	9606235799	---do---	---do---	---do---
14.	Akshay Pathania	Plant Pathology	9459761751	---do---	---do---	---do---
15.	Ekta Kaushik	Ph.D. Entomology	9459248759	---do---	---do---	---do---
16.	Divyavani	Ph.D. Entomology	9459083874	National Training on Mite Taxonomy	NBAIR, Bengaluru	2-7 May, 2022
17.	Shyam lal	M.Sc. Entomology	8219482249	---do---	---do---	---do---
18.	Akshita	M.Sc. Entomology	8219387587	National Training "Production and Use of Biological Control Agents including Microbials"	NBAIR, Bengaluru	2-7 May, 2022
19.	Gurpreet	M.Sc. Entomology	7814623306	---do---	---do---	---do---
20.	Nishant Singh	M.Sc. Entomology	8894019842	---do---	---do---	---do---
21.	Ronika	M.Sc. Entomology	9015273595	---do---	---do---	---do---
22.	Sushmita	M.Sc. Entomology	7018918477	---do---	---do---	---do---
23.	Vishrava	M.Sc. Entomology	9805436046	---do---	---do---	---do---
24.	Yashasvi Goswamy	M.Sc. Entomology	7006327299	---do---	---do---	---do---

25	Ankit Kumar	M.Sc. Veg Sci Second Year	8894019842	National Training on Molecular breeding and Protected cultivation of Vegetable Crops	IIVR, Varanasi	28Apr- 11May,2022
26	Ankush Sharma	M.Sc. Veg Sci Second Year	9015273595	---do---	---do---	---do---
27	Himanshu Sharma	M.Sc. Veg Sci Second Year	7018918477	---do---	---do---	---do---
28	Neha Rana	M.Sc. Veg Sci Second Year	9418849802	---do---	---do---	---do---
29	Prhas pathania	M.Sc. Veg Sci Second Year	-	---do---	---do---	---do---
30	Shorya Kapoor	M.Sc. Veg Sci Second Year	9459852180	---do---	---do---	---do---
31	Shriya Walia	M.Sc. Veg Sci Second Year	-	---do---	---do---	---do---
32	Tamanna Sood	M.Sc. Veg Sci Second Year	8350910078	---do---	---do---	---do---
33	Ambika Sharma	M.Sc. Veg Sci Second Year	-	---do---	---do---	---do---
34	Anuradha Sharma	Ph.D. Veg Sci	-	---do---	---do---	---do---
35	Mr Vivek Singh	PhD Plant Breeding		Advance molecular techniques in agriculture (ICAR- National Bureau of Agriculturally Important Microorganism	NBAIM, Mau, UP	20th Oct to 3rd Dec, 2022
36	Mr Tarun	PhD Agronomy		Hands on training on Remote Sensing and GIS using QGIS	NAHEP- CAAST, College of Agricultural Engineering JNKVV Jabalpur	3 <sup>rd</sup> to 23 <sup>rd</sup> Jan, 2022
37	Amit Rana	PhD Plant Breeding		NAHEP sponsored Training on CRISPER based plant Genome editing: Tools and techniques,	IARI New Delhi	11-21 <sup>st</sup> Oct, 2022

				IARI, New Delhi		
38	Priyanka	PhD Plant Breeding		---do---	---do---	---do---
39	Mr Shyam Lal	M.Sc. Entomology	8219482249	Hands on Training on Mite Taxonomy at	Punjab Agricultural University, Ludhiana	27-31 March, 2023
40	Ekta	PhD Entomology		Workshop on Presentation Skills	CSIR-Indian Institute of Toxicology Research, Lucknow	26 <sup>th</sup> Nov, 2021
41	Deepak	M.Sc. Entomology		----do---	----do---	----do---
42	Gurpreet	M.Sc. Entomology		----do---	----do---	----do---
43	Javez Daju	M.Sc. Entomology		----do---	----do---	----do---
44	Nishant	M.Sc. Entomology		----do---	----do---	----do---
45	Nitika	M.Sc. Entomology		----do---	----do---	----do---
46	Ronika	M.Sc. Entomology		----do---	----do---	----do---
47	Sushmita	M.Sc. Entomology		----do---	----do---	----do---
48	Vishrava	M.Sc. Entomology		----do---	----do---	----do---
49	Yashasvini	M.Sc. Entomology		----do---	----do---	----do---
<b>Faculty</b>						
1	Sh Sunder Lal Negi	SVC	-	Training on Smart governance in office system & official procedure	New Delhi	10-12 Oct, 2022
2	Dr Parveen Sharma	Professor	-	Strategic Plan to Double Income through Protected Cultivation of Vegetable Crops	Department of Veg Sci, CSKHPKV Palampur	31 Aug to 07 Sept, 2020
3	Dr Akhilesh Sharma	Professor	-	----do---	----do---	----do---
4	Dr R.S.Rana	Professor	-	----do---	----do---	----do---
5	D R Chaudhary	Professor		----do---	----do---	----do---
6	Dr Ajeet singh	Professor		----do---	----do---	----do---

7	Dr Bhallan Singh Sekhon	Professor		----do--	----do--	----do--
8	Dr D R Chaudhary	Professor		----do--	----do--	----do--
9	Dr Neelam Bhardwaj	Professor		----do--	----do--	----do--
10	Dr Sonia Sood	Professor		----do--	----do--	----do--
11	Dr Suman Sanjta	Professor		----do--	----do--	----do--
12	Dr RK Gupta	Professor		----do--	----do--	----do--
13	Dr Sanjeev Sandal Palampur	Professor		----do--	----do--	----do--
14	Dr Sayeed A H Patel	Professor		----do--	----do--	----do--
15	Dr Suman Kumar, PC KVK Bilaspur	Professor		----do--	----do--	----do--
16	Dr Suresh Upadhyay	Professor		----do--	----do--	----do--
17	Dr Udit Kumar	Professor		----do--	----do--	----do--
18	Dr Vikas Tandon			----do--	----do--	----do--
19	Dr VK Sharma			----do--	----do--	----do--
20	Dr. Ankit Panchbhaiya			----do--	----do--	----do--
21	Dr. Ashish Shigwan			----do--	----do--	----do--
22	Dr. Bhallan Singh Sekhon			----do--	----do--	----do--
23	Dr. Gopal Katna			----do--	----do--	----do--
24	Dr. Mahantesh Kamatyanatti			----do--	----do--	----do--
25	Dr. Mangaldeep Sarkar			----do--	Ekta	----do--
26	Dr. Manoj Deelip Mali			----do--	----Deedo--	----do--
27	Dr. Manoj Kumar Sharma			----do--	----do--	----do--
28	Dr. Mehraj			----do--	----do--	----do--
29	Dr. Muhammad Rabi			----do--	----do--	----do--
30	Dr. Mujtaba Aezum			----do--	----do--	----do--
31	Dr. Ranjit Patil			----do--	----do--	----do--
32	Dr. Sanvar Mal Choudhary			----do--	----do--	----do--
33	Dr. Sayeed A H Patel			----do--	----do--	----do--

34	Dr. SHAIENDRA MANE			-----do---	-----do---	-----do---
35	Dr. Tajamul			-----do---	-----do---	-----do---
36	Dr. Vijaykumar Bodkhe			-----do---	-----do---	-----do---
37	Dr.J.K.Dhemre			-----do---	-----do---	-----do---
38	dr.kc sharma			-----do---	-----do---	-----do---
39	Dr. Sayeed A H Patel			-----do---	-----do---	-----do---
40	Dr.Lavlesh			-----do---	-----do---	-----do---
41	Dr Anupama Sandal	Professor		Milk Vs Plant based Beverages- Bursting all myths	DUVASU Mathura	9-12 Dec, 2022
42	Dr YS Dhaliwal	Professor		Training on Achieving zero hunger by 2030 critical role of Agriculture & Allied Sectors		17-27 Aug, 2020
43	Dr Anupama Sandal	Professor		-----do---	-----do---	-----do---
44	Dr Anjali Sood	Professor		-----do---	-----do---	-----do---
45	Dr Sapna Gautam	Professor		-----do---	-----do---	-----do---
46	Dr Ranjana Verma	Professor		-----do---	-----do---	-----do---
47	Dr. Anil Kumar	Chief Scientist (Agronomy)		NABL Accreditation and its benefits for Soil Testing Laboratories	CSKHPKV Palampur	30.09.2022
48	Dr. Gurudev Singh	Sr. Scientist (Agronomy)		-----do---	-----do---	-----do---
49	Dr. Sanjay Kumar	SMS (Agronomy)		-----do---	-----do---	-----do---
50	Dr. Sushil Dhiman	Scientist (KVK Chamba)		-----do---	-----do---	-----do---
51	Dr. Sanjay Kumar Sharma	Prof. (Soil Science)		-----do---	-----do---	-----do---
52	Dr. Lav Bhushan	ES (Soil Science)		-----do---	-----do---	-----do---
53	Dr. Gopal Katna	Principal Scientist (Plant Breeding)		-----do---	-----do---	-----do---
54	Neha Chauhan	SMS (Soils) KVK Mandi		-----do---	-----do---	-----do---



55	Subhash Kumar	SMS (Soils) KVK Bajaura		----do---	----do---	----do---
56	Dr. Naveen Dutt	Principal Scientist (Soil Science)		----do---	----do---	----do---
57	Dr. Dhanbir Singh	Assistant Soil Chemist		----do---	----do---	----do---
58	Dr. Sant Prakash	Consultant, NAHEP-CAAST		----do---	----do---	----do---
59	Dr. Ibajanai Kurbah	Scientist, KVK Shimla (YSPUHF, Solan)		----do---	----do---	----do---
60	Meenakshi	SMS, KVK Una (Agronomy)		----do---	----do---	----do---
61	Dr. Pankaj Chopra	Scientist HAREC, Kukumseri		----do---	----do---	----do---
62	Dr. G.D. Sharma	Principal Scientist (Agronomy)		----do---	----do---	----do---
63	Dr. Sandeep Manuja	Prof. (Agronomy)		----do---	----do---	----do---
64	Dr. S.S. Paliyal	Associate Director, HAREC Dhaulakuan		----do---	----do---	----do---
65	Dr. S.C. Negi	Consultant, NAHEP-CAAST		----do---	----do---	----do---
66	Dr. Jagriti Thakur	Assistant Professor (Soil Science)		----do---	----do---	----do---
67	Dr. Navneet Jaryal	SMS, KVK Hamirpur		----do---	----do---	----do---
68	Dr. Kanika Baghla	HAREC, Dhaulakuan		----do---	----do---	----do---
69	Dr. R.P. Sharma	Principal Scientist (Soil Science)		----do---	----do---	----do---
70	Ashish Dhiman	Assistant Professor (COCS)		----do---	----do---	----do---
71	Dr. Gourav	Soil Scientist		----do---	----do---	----do---
72	Dr. Sanjeev K. Sandal	Principal Scientist (Soil Science)		----do---	----do---	----do---
73	Dr. Rakesh	Assistant Professor (OANF)		----do---	----do---	----do---
74	Dr. Nilakshi	Assistant Professor (COCS)		----do---	----do---	----do---

75	Dr. Janardan Singh	HOD, OANF		-----do---	-----do---	-----do---
76	Dr. Meena	Soil Scientist		-----do---	-----do---	-----do---
77	Dr. Anil Kumar	Chief Scientist (Agronomy)		Drone Flying Training Program	-----do---	10-12th Oct, 2022
78	Dr. Dhanbir Singh	Assistant Soil Chemist		-----do---	-----do---	-----do---
79	Dr. Sandeep Manuja	Prof. (Agronomy)		-----do---	-----do---	-----do---
80	Dr. Jagriti Thakur	Assistant Professor (Soil Science)		-----do---	-----do---	-----do---
81	Ashish Dhiman	Assistant Professor (COCS)		-----do---	-----do---	-----do---
82	Dr. R.P. Sharma	Principal Scientist (Soil Science)		-----do---	-----do---	-----do---
83	Dr. Suman Sanjta	Assistant Professor (Entomolgy)		-----do---	-----do---	-----do---
84	Dr. Abhishek Guleria	Assistant Professor (Maths)		-----do---	-----do---	-----do---
85	Dr. Bindia Dutt	Assistant Professor (COCS)		-----do---	-----do---	-----do---
86	Dr. Sanjeev K. Sandal	Principal Scientist (Soil Science)		-----do---	-----do---	-----do---
87	Dr. Sushant Bhardwaj	Assistant Professor		-----do---	-----do---	-----do---
88	Dr. Shikha Sharma	Assistant Professor		-----do---	-----do---	-----do---
89	Dr Ajay K Sood	Principal Scientist		Diagnosis and management of diseases and insect, mite and nematode pests of vegetable crop in protected agriculture and natural farming	-----do---	25-26 February & 4-5 March 2022
90	Dr Surjeet Kumar	Principal Scientist		-----do---	-----do---	-----do---
91	Dr K S Verma	Principal Scientist		-----do---	-----do---	-----do---
92	Dr Anjana Thakur	Associate Prof		-----do---	-----do---	-----do---
93	Dr. Sharmishtha Thakur	Assistant Scientist		-----do---	-----do---	-----do---

4	Dr Suman Sanjta	Assistant Scientist		-----do---	-----do---	-----do---
95	Dr Amar Singh	Associate Prof		-----do---	-----do---	-----do---
96	Dr Joginder Pal	Associate Prof		-----do---	-----do---	-----do---
97	Dr Shabnam Katoch	Associate Prof		-----do---	-----do---	-----do---
98	Dr Deepika Sud	Associate Prof		-----do---	-----do---	-----do---
99	Dr Shikha Sharma	Assistant Prof		-----do---	-----do---	-----do---
100	Dr. R.S. Chandel	Principal Scientist	Entomology	Buzz Pollination	-----do---	5 April, 2022
101	Dr S K Sharma	Principal Scientist	Entomology	-----do---	-----do---	-----do---
102	Dr Ajay K Sood	Principal Scientist	Entomology	-----do---	-----do---	-----do---
103	Dr Surjeet Kumar	Principal Scientist	Entomology	-----do---	-----do---	-----do---
104	Dr PC Sharma	Principal Scientist	Entomology	-----do---	-----do---	-----do---
105	Dr K S Verma	Principal Scientist	Entomology	-----do---	-----do---	-----do---
106	Dr Anjana Thakur	Associate Scientist	Entomology	-----do---	-----do---	-----do---
107	Dr. Sharmishtha Thakur	Assistant Scientist	Entomology	-----do---	-----do---	-----do---
108	Dr Suman Sanjta	Principal Scientist	Entomology	-----do---	-----do---	-----do---
109	Dr Rishi Mahajan	Assistant Scientist	Microbiology	-----do---	-----do---	-----do---
110	Dr Virender Kumar	Principal Scientist	Agriculture Economics	-----do---	-----do---	-----do---
111	Dr Sanjay Chadha	Principal Scientist	Vegetable science	-----do---	-----do---	-----do---
112	Dr Sanjeev K Sandal	Principal Scientist	Soil Science	-----do---	-----do---	-----do---
113	Dr Narender Sankhyan	Principal Scientist	Soil Science	-----do---	-----do---	-----do---
114	Dr Akhilesh Sharma	Principal Scientist	Vegetable science	-----do---	-----do---	-----do---
115	Dr Amar Singh	Principal Scientist	Plant Pathology	-----do---	-----do---	-----do---
116	Dr Sant Parkash	Consultant	Vegetable science	-----do---	-----do---	-----do---
117	Dr Praveen Sharma	Principal Scientist	Vegetable science	-----do---	-----do---	-----do---
118	Dr S C Negi	Consultant	Soil Science	-----do---	-----do---	-----do---
119	Dr Ajay K Sood	Principal Scientist		Training on Insect Systematics	-----do---	18-19 June, 1-2 July and 9-10 July, 2022

120	Dr K S Verma	Principal Scientist	Entomology	-----do---	-----do---	-----do---
121	Dr S.D. Sharma	Principal Scientist	Entomology	-----do---	-----do---	-----do---
122	Dr Anjana Thakur	Associate Scientist	Entomology	-----do---	-----do---	-----do---
123	Dr Surjeet Kumar	Principal Scientist	Entomology	-----do---	-----do---	-----do---
124	Dr. Sharmishtha Thakur	Assistant Scientist	Entomology	-----do---	-----do---	-----do---
125	Dr Suman Sanjta	Assistant Scientist	Entomology	-----do---	-----do---	-----do---
126	Dr P S Burange	Assistant Scientist	Entomology	-----do---	-----do---	-----do---
127	Dr Ajay K Sood	Principal Scientist	Entomology	Application of Nano-technology in crop pest management	-----do---	14-15 October, 2022
128	Dr S.D. Sharma	Principal Scientist	Entomology	-----do---	-----do---	-----do---
129	Dr Surjeet Kumar	Principal Scientist	Entomology	-----do---	-----do---	-----do---
130	Dr K S Verma	Associate Scientist	Entomology	-----do---	-----do---	-----do---
131	Dr Anjana Thakur	Principal Scientist	Entomology	-----do---	-----do---	-----do---
132	Dr. Sharmishtha Thakur	Assistant Scientist	Entomology	-----do---	-----do---	-----do---
133	Dr Suman Sanjta	Assistant Scientist	Entomology	-----do---	-----do---	-----do---
134	Dr Amar Singh	Principal Scientist	Plant Pathology	-----do---	-----do---	-----do---
135	Dr Deepika Sud	Principal Scientist	Plant Pathology	-----do---	-----do---	-----do---
136	Dr Shikha Sharma	Assistant Scientist	Plant Pathology	-----do---	-----do---	-----do---

**Annexure-VI**

<b>List of Equipment purchased under Capital Head (F.Y. 2020-21, 2021-22) NAHEP-CAAST Project, CSKHPKV Palampur</b>		
<b>Sr. No.</b>	<b>Equipment/Item Name</b>	<b>Passed Amount</b>
	<b>Equipment, plant &amp; Machinery</b>	
1	Food Waste Compost Machine	494340
2	High-Tech Polyhouse for soilless cultivation	2499000
3	Naturally Ventilated Polyhouse of 250 sqm	798000
4	Plant Growth Chamber	2525100
5	Hi Tech Planting Material Unit	8850000
6	Phytotron	8249200
7	Bio-agent production unit size	329000
8	Strengthening of Polyhouse2	1526500
8	Strengthening of Polyhouse1	89250
9	Power tiller (4000 Installing Charges)	669244
10	Soil Nutrient based fertigation system	898801
11	<b>Spectrophotometer (Expenditure out of savings)</b>	<b>262500</b>
	<b>Office Equipment</b>	
1	Xerox machine	199500
2	Digital Camera 80D	80500
3	high speed high through the printer	149900
4	Video Camera 90D	126000
	<b>Laboratory Equipment</b>	
1	Stereo zoom Microscope	998025
2	Potter Spray Tower	760416
3	BOD Incubator	329280
4	Autoclave	159600
5	Laminar Airflow	121170
6	All glass filtration	61394
7	Pressure Bomb	721350
8	Gradient Thermal Cycler	593250
9	Gel Electrophoresis	292918
10	Millipore water purification System	599970
11	Top Refrigerated Centrifuge	450450
12	Ultra-water Purification System	599970
13	Gel Doc Chemi doc	1397681
14	Micropipette	168000
15	Liquid Nitrogen Container	102270
16	Analytical Balance Model No. ATX-324R	103845
17	Digital Burette	146849
18	Magnetic Stirrer	88673
19	Spectrophotometer	548100
20	IAK Vortex Shaker	61133
21	Automatic Weather Station	388365
22	Installation, Testing and Commissioning of 3 phase power generator	655200
23	Blue Star Refrigeration deep freezer	259350
24	Proflex 96 well PCR System Thermal Cycler	588000
25	Ice Flaking	154980
26	Food Packaging Machine	782250
27	Peeling Unit & Cutting Unit	176968
27	Food Waste Shredder	270375
28	Bio Safety Cabinet	494970
29	Shaking incubator with refrigeration	975000
30	Texture Analyser	1099500
31	Digital Colony Counter	109500
32	Real-Time PCR Detection System	1310000

33	Fluorescence Microscope	787238
34	FT-IR	1500000
35	Solar Lights	537597
36	Plant Canopy Imager and Analyser Model: - CI-110	997500
37	Root Analyzer & Root Scanner	997500
	<b>Furniture and Fixtures</b>	
1	Touch interactive flat panel Display	406875
2	Almirahs	40635
3	Table	104000
4	Chair	97500
5	Conference room table & chair	209580
6	Lecture Theatre Seating, Furniture etc	661082
	<b>Computer &amp; Peripheral</b>	
	HP Laser Printer 14	184800
	UPS (15os. )	60000
1	Desktop (15 nos.)	1128875
	HP Pavilion, hp LaserJet, zebronics UPS	86144
2	Computer, Printer & UPS	343119
	<b>Civil Works</b>	
	Ramps and Toilet for Disabled Person	153550
1	Ramps and Toilet for Disabled Person	971654
2	Renovation/Upgradation of Lecture Theatre (vegetable Science and Floriculture)	594544
3	Renovation of PG Labs 6 no. Under the Project + Deductions (Others)	4718963
	<b>Total (A):</b>	<b>57896793</b>
	Books and Journals	39800
	<b>Total (B):</b>	<b>39800</b>
	<b>Sub Total (C=A+B):</b>	<b>57936593</b>
<b>List of Equipment purchased under Capital Head (F.Y. 2022-23) NAHEP-CAAST Project, CSKHPKV Palampur</b>		
<b>Sr. No.</b>	<b>Equipment/Item Name</b>	<b>Passed Amount</b>
1	Air conditioner @ 5.5 tonnes with accessories	362250
2	Compact bench top cooling microcentrifuges	164388
3	Double Walled Autoclave vertical GMP model	98438
4	Electrophoresis large with power supply and other accessories	174300
5	Laboratory centrifuge medium-high speed	42313
6	Generator @ 62-65 KVA (Backup system) along with accessories	971250
7	Water bath with digital microprocessor control GMP Model	52500
8	Renovation of labs: Public health lab (Biosafety)- lab (Civil work)	66000
9	Books and Journals	425461
10	PAR lights for polyhouse	205692
11	Curtains	34000
	<b>Total (D):</b>	<b>2596592</b>
	<b>Grand Total (E=C+D):</b>	<b>60533185</b>

## Annexure VII

### **The detailed characteristics of the varieties are:**

- 1. Garden pea variety Him Palam Matar-1(DPP-SP-22)** (The Gazette of India 20 July, 2022 Sr No77): Line has been developed by hybridization of ‘Palam Sumool × Palam Priya’ followed by pedigree method of selection. Medium growth habit, flower a week earlier than Pb-89 and about two weeks over Azad P-1; synchronized flowering; ready for first harvest in about 70 days in high hills and 100-125 days in low to mid hills; pods are long (10-12 cm), lush green, and attractive; 8-12 seeds/pod (10 seeds) and fresh seeds are comparatively bold; 2 pods/node; High pod yield potential (120-130 q/ha as off-season summer crop and 140-165 q/ha as main season during winters); moderately resistant reaction to powdery mildew disease; suitable for main season cultivation in low, mid and high hills of Himachal Pradesh. It is also suitable for cultivation as off-season during summer in Lahaul & Spiti and during July/August sown crop in high and mid hills (Mandi & Chamba districts)
- 2. Garden pea variety Him Palam Matar-2(Line-1-2)** (The Gazette of India 20 July, 2022 Sr No78): First garden pea variety harbouring *er<sub>2</sub>* gene exhibiting complete resistance to powdery mildew disease; mid maturity; ready for first harvest in about 75 days in high hills and 110-134 days in low to mid hills. pods are medium long (9-10 cm), green in colour bearing 8-10 seeds/pod. High yield potential (150-160 q/ha), suitable for main season cultivation in low, mid and high hills of Himachal Pradesh.
- 3. Edible pod pea/Snow pea variety Him Palam Meethi Phali-2 (DPEPP-10-1)** (The Gazette of India 20 July, 2022 Sr No76): Line has been developed by hybridization of ‘Pb-89 × DPEPP-2’ followed by pedigree method of selection. Medium tall (60-80 cm), afilla plant (reduces lodging losses); Medium maturity (mid season); Ready for first harvest in about 70-75 days during off-season in high hills and 110-125 days as main season crop in low and mid hills after sowing. Pods are attractive, lush green, medium long (8-10 cm), flat and free from parchment layer. High pod yield potential (80-100 q/ha) about 10-20% higher over Arka Apoorva and 30-40 % over Meethi Phali. Moderately resistant reaction to powdery mildew disease and low incidence of leaf miner on account of afilla plant characteristics. Suitable for main/off-season cultivation in low, mid and high hills of Himachal Pradesh.
- 4. Chilli variety Him Palam Mirch-1(DPCh-27)** (The Gazette of India 20 July, 2022 Sr No 6): Line has been developed by hybridization of ‘Pusa Jwala × Surajmukhi’ followed by pedigree method of selection. Fruits are medium long (6-7 cm), slender (fruit width 0.95 cm), bright green, attractive and pungent. Cluster bearing fruit habit as that of ‘Surajmukhi’

but comparatively longer in size. Plants erect in growth and medium tall (50-55 cm). Flowers in 45-50 days after transplanting and ready for first harvest in 60 days, a week earlier than 'Surajmukhi'. High fruit yield potential (120-140 q/ha) about 20% higher over 'Surajmukhi'. It shows tolerance to bacterial wilt and also showed low incidence of fruit rot. Suitable for cultivation in low and mid hills of Himachal Pradesh. Also, suitable for cultivation during rainy season due to its erect plant and fruit bearing characteristics that is beneficial to handle fruit rot/anthracnose disease.

**5. Chilli variety Him Palam Mirch-2 (DPCh-38)** (The Gazette of India 20 July, 2022 Sr No7): Line has been developed by hybridization of 'LCA-436 × Pant C-1' followed by pedigree method of selection. Plants erect in growth and medium tall (55-70 cm); Fruits are long (8-9 cm), broad (fruit width 1.15 cm), bright green, attractive and pungent. Single erect bearing fruit habit. Flowers in 45-50 days after transplanting and ready for first harvest in 60 days, a week earlier than 'Surajmukhi'. Harvest duration is 40-60 days depending upon the prevailing climatic conditions. High fruit yield potential (130-160 q/ha) with average fruit yield of 140 q/ha about 40% higher over 'Surajmukhi'. It shows tolerance to bacterial wilt and also showed low incidence of fruit rot. Suitable for cultivation in low and mid hills of Himachal Pradesh. It is suitable for cultivation during rainy season due to its erect plant and fruit bearing characteristics that is beneficial to handle fruit rot/anthracnose disease.

**6. Parthenocarpic Cucumber Variety 'Him Palam Kheera-1' (DDPCG1)** (The Gazette of India 20 July, 2022 Sr No48): This is the first parthenocarpic cucumber variety recommended for cultivation in Himachal Pradesh under protected environment. It is a selection from segregating material. Fruits are dark green in colour, cylindrical in shape and straight, attractive and crispy. Fruits mature for first harvest in 42-45 days after planting. Moderately resistant (MR) to Downey mildew and Powdery Mildew diseases. Average fruit yield 750-900 q/ha under protected conditions. Recommended for cultivation in all agro-climatic zones of Himachal Pradesh under protected conditions.

**7. Cherry Tomato Variety 'Him Palam Cherry Yellow' (DDCTY1)** (The Gazette of India 20 July, 2022 Sr No13): This is the first recommendation of yellow colour cherry tomato for protected cultivation. Beta-carotene rich, fruits are yellow in colour, oval shaped, sweet and attractive, cluster bearing habit (19-20 fruits/cluster). Indeterminate growth habit with average yield of 500-600 q/ha.

**8. Radish variety Him Palam Mooli 1 (DPR-1)** (The Gazette of India 20 July, 2022 Sr No52): It is developed through selection from a local land race "Nadauni". It is a medium maturing variety which mature in 60-70 days after sowing under normal sown condition.



Roots are purple (Anthocyanin rich), white fleshed, very long (20-25 cm) with top length 40 cm, bear around 12-15 leaves, average root weight 250-300g, average marketable yield 460-480 q/ha including leaves. The roots are crispy in taste and remain non-pithy for a long time. It is recommended for sowing in low and mid hills of the state.

9. **Onion Variety Him Palam Shweta (DPWO-1)** (The Gazette of India 20 July, 2022 Sr No38): This is the first white coloured variety of onion for the state and developed through selfing and massing method of the original seed material (EC 218534). Attractive white colour bulbs, round shape and narrow neck bulbs, more shelf life; low post harvest losses, higher total soluble solids [TSS], Average bulb yield is 270q/ha. It is suitable for low and mid hills of Himachal Pradesh.