ICAR-National Agricultural Higher Education Project

Annual Progress Report: April 2020 to March 2021

Component 1b: Centres for Advanced Agricultural Science and Technology

CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur

pwc

Executive summary

Name of the AU: CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur

Project Title: Protected Agriculture and Natural Farming (PANF)

Executive Summary:

Objective I: Enhancement of academic and research excellence in protected agriculture & Natural farming

- Protected agriculture is an upcoming and alternative production system involving technology intensive practices in Himachal Pradesh. Polyhouses of various designs for different agroecological zones of the state have been standardized. In order to save the conventional energy resources and for creating the real time automated systems, solar panel system of 3-5 km power is erected and made functional during May, 2021. Also, an existing polyhouse is modified with automated environmental control panel which in on the verge of completion. Various small, medium and large natural ventilated polyhouses including plant growth chamber are installed/modified as demonstration units for farmers. During 2020-21, about 2 lakhs nursery seedlings of tomato, capsicum etc., were produced and sold which helps in revenue generation.
- Protected farming involve growing of hybrids, which require heavy fertilization therefore, to evolve sound integrated nutrient management under protected conditions several experiments were performed. Among vegetable crops, tomato hybrid Palam Tomato Hybrid-1, Bell pepper hybrid Mekong and Cucumber hybrid Him Palam Khira-1 performed better under Natural Farming conditions.
- Cauliflower hybrids namely, CMS PU X WE 4 and CMS PU X No.18 showed superior yield performance, under natural farming (NF) conditions which were almost half of the conventional farming (CF).
- Garden pea line DPP-SP-6 produced better yield followed by Him Palam Matar-1 & superseded check Pb-89. The trends were similar under NF & CF.
- Snow pea variety Him Palam Meethi Phali-1 produced the maximum yield followed by Him Palam Meethi Phali-2 which was better than check Meethi Phali under both NF and CF. Yield under NF was about 65% of the CF in both snow and garden peas.
- 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.
- Among field crops, the non-basmati pyramid line HPL19 SPS-2 yielding 42.8 qt/ha and basmati type T8SPS-5 yielding 22.56 qt/ha have been identified as potential lines for cultivation under NF conditions.
- In wheat, the genotypes HPWO-5 (24.72 q/ha), Kanku (23.28 q/ha) were significantly superior to that of other genotypes. The other good yielders were HPWO-4 (20.33q/ha), MCTLH-21(19.77q/ha), HPW-349 (18.22 q/ha), HPW-368 (17.67q/ha).

- Among 15 genotypes of paddy evaluated under Zero budget Natural farming (ZBNF) conditions, genotypes HPR 2720 (32.95 q/ha) followed by HPR 1068 (30.73 q/ha) were found to be highest yielders as compared to the other lines.
- The bioformulations, biofertilizers and compost/liquid manures were prepared for on-farm use and also supplied to different departments, researchers, farmers, students, extension workers etc for revenue generation. In general, about 53.1kg biofertilizers, 22 MT of vermicompost, 3.2 MT of ghanjeevamrit, 15 MT of jeevamrit and 2.3 MT of biopesticides were prepared during 2020-2021.
- For large scale production of organic inputs enriched and fortified compost is required. In this regard, isolation, screening and characterization of indigenous bacterial isolates for large scale production of biofertilizers is needed. So far, a total of 103 microbial isolates were isolated from bulk and rhizosphere soil of cucumber, bell pepper, chilli and tomato. Among the isolates from different crops 20 isolates have shown promising phosphorus solubilizing ability while 51 isolates have shown promising siderophore producing ability and 63 isolates have shown ability to grow on nitrogen free medium.
- For conducting the periodical assessment of soil health, initial composite soil samples from 0-15 cm soil depth were collected from all proposed experimental sites under Protected conditions and Open conditions. Among physico-chemical properties, bulk density, soil pH, EC, organic carbon and cation exchange capacity in experimental sites (both protected and open conditions) varied from 1.29 to 1.32 Mg m-3, 5.6 to 6.2, 28 to 47 µS cm-1, 7.5 to 15.0 g kg-1and 9.8 to 14.6 cmol (p+) kg-1 respectively. Available N, P, K, Ca, Mg, S, Cu, Fe, Mn and Zn in experimental sites (both protected and open conditions) varied from 282 to 408 kg ha-1, 8.5 to 28.2 kg ha-1, 181 to 280 kg ha-1, 2.5 to 3.4 cmol (p+) kg-1, 1.2 to 1.8 cmol (p+) kg-1, 16.4 to 27.2 kg ha-1, 1.96 to 2.66 mg kg-1, 22.46 to 48.36 mg kg-1, 12.70 to 25.40 mg kg-1and 1.94 to 3.50 mg kg-1, respectively. Under protected conditions and open conditions, to determine the crop water use, the discharge rate of gravity fed drip irrigation system for 300 & 1000 inline drippers varied from 2.96 to 3.16 L/hr & 3.72 to 4.12 L/hr at 4 m & 7 m hydraulic head, respectively.
- Integrated management practices for the suppression of insects, disease and nematodes have been evolved with reliance on chemical means under protected environment and open field conditions using organic and bioformulations. Tamarlassi (10%) recorded minimum population of greenhouse whitefly followed by alternate applications of spiromesifen and thiomethoxam, Cow urine (5%) and alternate applications of Vermiwash and Tamarlassi.
- Tomato pinworm, *Tuta absoluta* has emerged as one of the key pests under protected environment. For the management of tomato pinworm amongst the biopesticides and natural products evaluated, *Bacillus thuringiensis* @ 5 ml/l was most efficacious and resulted reduction in blotched leaves by 67 per cent, followed by azadiractin 0.15% (@ 3ml/l) (52%), *Beauveria bassiana* @ 5 g/l (40%) and *Brahmastra* @ 10 ml/l (39%). Studies undertaken on monitoring and mass trapping of tomato pinworm using pheromone baited and light traps revealed use of yellow colour emitting conventional light source (100 w) to be most efficacious when used during dawn and the traps placed on ground. It was having advantage over pheromone traps to attract both male and female moths.

- Mass culturing of the endo-parasitoid *Encarsia formosa* has been standardized. For mass production of *E. formosa*, third and fourth nymphal instars of *Trialeurodes vaporariorum* raised on french bean and tobacco plants with host - parasitoid ratio of 20:1 were found appropriate.
- Mortality of rootknot nematode, *Meloidogynae incognita* increased with the increase in concentration as well as duration of exposure in all the products evaluated. Maximum mortality (40.30%) was recorded with *Dashparni* followed by *Tamaralassi* (37.45%) at 10% concentration after 48 hours. *Tamaralassi* at 10% concentration gave maximum reduction in final nematode population followed by *Darekastra* (10%). Root-knot index at end of crop was found to be less compared to untreated control except cow urine where RKI was equal to untreated control.
- Soil application of bio-agents i.e., *Bacillus subtilis, B. pumilus* and *Purpureocillium lilacinum* and chemicals i.e., Fluopyram, Fluensulfone and Carbofuran (check) was evaluated in cucumber. A new chemical *i.e.,* Fluopyram 400 SC @ 0.125 ml/m^2 was found promising in suppression of nematode population in soil along with enhancement of cucumber yield.
- The pathogen causing different diseases on the crops (tomato; capsicum) grown under protected conditions viz., damping-off, root rot, collar rot, stem rot and wilt diseases caused by species of *Pythium*, *Phytophthora*, *Rhizoctonia*, *Fusarium*, *Sclerotium*, *Sclerotinia* and *Ralstonia* have been isolated and maintained.
- Eighteen *Trichoderma* isolates were evaluated against the *Ralstonia solanacearum* and isolates TI-6 and TI-9 were found to be most effective resulting each in 2.50 cm inhibition zone followed by TH-5 (2.00 cm).Water extract of the botanicals (*Eupatorium* spp., *Euphorbia* spp., Darek (*Melia azedarach*), *Lantana camera* and *Ajuga* spp.) were found ineffective even at 100 per cent concentration whereas alcoholic extract of *Eupatorium*, *Euphorbia* and Darek (*Melia azedarach*) showed inhibition zone at 50% concentration.
- Among the tested eighteen *Trichoderma* spp. bioagent isolates against *Sclerotium rolfsii* causing collar rot of tomato and capsicum, DMA-8 was found most effective with 81.55 per cent mycelial inhibition followed by TH-11 with 79.16 per cent mycelial inhibition.
- Twenty-three bio-agent isolates (22 *Trichoderma* spp. & *Pseudomonas* sp.) were evaluated against *Sclerotinia sclerotiorum* and isolate TI-8 was found most effective antagonist with 69.49 per cent mycelial inhibition followed by isolate TI-11 with the 65.54 per cent inhibition.
- Screening of *Trichoderma* isolates against *Rhizoctonia sp.* and *Pythium* sp. is in progress. Experiments on evaluation of potential bioagents against soil borne disease of tomato and capsicum under poly house conditions are in progress. The selected antagonists identified so far will be evaluated against major pathogens of polyhouse crops.

Objective II Augmenting competence of faculty, skills of post graduate students and fostering institutional reforms

- Under the CAAST project, a total of 17 webinars were conducted in which about 2534 people across the country including scientists, farmers, students, researchers, extension workers and other field functionaries attended the webinar's and got benefitted from it.
- Hydroponic unit and Plant Growth Chamber established, and crop production started under establishment of PANF as national level advanced training center.
- Knowledge Center "Center for Protected Cultivation Technology (CPCT) ICAR-IARI, New Delhi" developed. The following salient findings were observed at the center:

- Identification and evaluation of Parthenocarpic cucumber cv. "Fadia," under integrated nutrient management system during off-season under Northern plains.
- The new variety of Bittergourd (Pusa Rasdar) under integrated nutrient management system (NPK + vermicompost @25:17:26gm +3kg /m2).
- The indeterminate tomato hybrid Pusa Rakhchhit under integrated nutrient management system (NPK and Vermicompost dose).
- Protected farming found suitable for Urban and Peri-Urban area farmers due to offseason and market yard availability.

➢ Four certificate courses viz., Commercial Hybrid Seed Production of Vegetable Crops, Protected Cultivation of Vegetable Crops were developed, Natural and Organic Farming and Communications skills and personality development were developed.

➢ With regard to academic cooperation and research excellence 5 no. of MOU's established with national and international organizations/industries.

➢ 51 research publications in peer reviewed journals were published during 2020-21. There is +40% and +51% increase over 2019-20 in number of ad-hoc projects submitted and sanctioned.

➢ International and national level trainings could not be accomplished due to present scenario.

Objective III: Value addition and marketing strategies for the products of protected and natural /organic agriculture

➢ For generating microbiome data, dung samples of different breeds of cattle for the total viable counts, psychrophilic counts, mesophilic counts were analyzed. These samples were tested for the presence of coliforms and *Escherichia coli*. The total viable counts were found to be highest (>300 crore cfu/gram) in indigenous breeds (Sahiwal, Red Sindhi, Himachali Pahadi) of cattle in comparison to Jersey and crossbred (184.5 crore cfu/gram). The coliform counts were found to be less in indigenous breeds of cattle in comparison to Jersey and crossbred. *E. coli* was detected in indigenous animals only.

➢ For utilizing the year around facility for hybridization work and to accelerate generation advancement in different crops, the "Phytotron facility" is erected and it is expected to be ready possibly by the end of April 2021. Landraces of wheat, mash, red rice, maize and potential crops like Amaranths, Buckwheat, Chenopods, millets and kala zeera collected from different parts of the HP were under evaluation.

➢ Quality and safety evaluation of produce for shelf life revealed that total of 44 samples of Okra, Cucumber, Chilli and Tomatoes grown under different conditions *viz.,* Organic, Natural and Conventional, were procured and analyzed for Proximate & Nutritional constituents. Appropriate packaging materials for conducting shelf-life studies for storage enhancement were also selected. Textural profile and food quality in cold and frozen system management studies are under progress.

➢ The samples of 10 ready to eat raw vegetables yielded Balantidium coli (1/10), coliforms (7/10) and E. coli (2/10) which were collected from different farms and local markets.

➢ Economic evaluation of crops under protected environment testified tomato and cucumber as the most promising crops. The net returns and input use efficiency including farm labour per 100 m^2 area were estimated to be Rs. 10521 & 4.53 in cucumber and Rs. 6962 & 4.79 in tomato.

➢ No market linkage software was development. For revenue generation High tech, Hydroponics for Vegetable nursery, and other vegetables produce sale

Progress made during FY 2020-21 under NAHEP

1.1. Output-outcome monitoring

S. N.	Particulars	Apr'20 to March'21		Remarks (Action plan for areas where improvement is needed)
		Plan	Achievement	
1.	Number of technologies transferred to industry / private sector / national / international organizations	13 (baseline)+ 5=18	27	
2.	Number of students selected in JRF / SRF / ARS	10	18 (12 JRF, 6SRF)	
3.	Number of students who were admitted in foreign universities	10	Nil	
4.	Number of students received National Young Scientist Award	5% of the total PG students	Nil	
5.	Number of students received ICAR's Jawaharlal Nehru thesis Award	5% of the total PG students	Nil	
6.	Number of students awarded at Agri-unifest	5%	-	Activity not conducted
7.	Number of students awarded at Agri uni sports meet	10%	-	Activity not conducted
8.	Number of industry- sponsored projects and positions in cutting-edge areas of agri-science	5	1 (24.73 lac)	
9.	Number of competitive grants from a national/international funding agency	20% over existing	20%	
10.	Number of international trainings undertaken by faculties under CAAST comp	12	0	
11.	Number of national trainings undertaken by faculties under CAAST comp	10	3	
12.	Number of international trainings undertaken by students under CAAST comp	10	0	
13.	Number of national trainings undertaken by students under CAAST comp	10	0	
14.	Number of direct beneficiaries of the project		2534	
15.	Number of female beneficiaries out of total direct beneficiaries		1140	

Observation
<<Please provide the explanation on the progress made against the output-outcome monitoring indicator>> **The number of technologies transferred to industry/private sector/national/international organizations were mainly the varieties released for cultivation under open and protected**

conditions. The total number of students selected in JRF/SRF/ARS were 18 out of which 12 selected as JRF and 6 as SRF. Many activities could not be accomplished due to present prevailing scenarios.

1.2. Input and activity monitoring

Total funds received during 2020-21 by PIU (INR Lakhs)	Rs 560.5
Total funds received till 2020-21 (Cumulative) (INR Lakhs)	Rs 819.9
Total expenditure during the year 2020-21 (INR Lakhs)	Rs 602.17
Total expenditure till 2020-21 (Cumulative) (INR Lakhs)	Rs 613.81

Input / Activity indicator	Sub- head / category	Apr'20 to March'21 Expenditure / input in INR lakhs		Activity elaboration
		Utilization	Planned	
Goods and equipment	Equipment, Plant & Machinery	180.43	277.0	Procurement complete
	Office equipment	5.55	7.0	Procurement complete
	Laboratory equipment	193.30	215.0	Procurement complete
	Furniture & fixtures	9.20	17.0	Procurement complete
	Computers and Peripherals	18.03	17.0	Procurement complete
	Books and Journals	0	5.0	Under process
Civil works	Minor repair and renovation work	0	67.0	Only bills pending for payment
Human capacity building	National level training	0		
	International level training	0	37.0	Difficulty in arranging the International and National trainings, workshop, seminars, expert talks, symposium etc
	Short visit/ seminars	0	7.5	
	Meetings and workshops	3.21	5.0	
Consultancy	National level consultancies	0	47.0	
Recurrent cost / Miscellaneous	Travel	0.76	6.42036	
	Contractual services	94.04	149.2339	
	Operational costs	90.73	430.8577	
	Institutional charges	6.83	29.91	
Total		**602.17**	**1317.922**	

Observation
All Equipment's as STEP Purchase process completed & received. Payment pending reports

1.3. NAHEP outreach and other unique initiatives undertaken

1. **Virtual Classroom inaugurated by Shri Narendra Singh Tomar, Hon'able Union Minister of Agriculture& Farmer Welfare, GOI on dated 9th April,2021**: Under NAHEP Component 2, a virtual classroom has been established to strengthen agricultural education through ICT interventions. Students will be benefitted from lectures delivered through video capture., blended learning and centralized video library of lectures.
2. **Nutritional Garden established & inaugurated by Shri Jai Ram Thakur Hon'able Chief Minister of Himachal Pradesh on 7th February, 2021:** Under Environment Sustainability Plan, the nutritional garden had been established. Fruit trees medicinal & aromatic plants have been planted with participation of Post Graduate students as Graduation ceremony.
3. **Hydroponic & Hi-Tech Polyhouse inaugurated by Shri Virendra Kanwar Hon'ble Minister of Agriculture GOHP on 17th June, 2021 :** Facility developed for advanced trainings/startups on hydroponics and high-tech polyhouse, auto fertigation model etc.

a) Case studies/success stories developed under NAHEP

The project has been initiated recently in this university and faced slow pace due to which till date no success story is available as establishment of modern facilities is under process.

b) Knowledge management and outreach initiatives (development of collaterals, newsletter, social media outreach activities, creation of website, experiential learning workshop, exposure visits,

a. (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,

b.

S.N	Category of the collateral	Brief summary	Snapshot/cover page	Weblink (if any)
1	Experiential learning workshop	Commercial Vegetable Production under Open & protected conditions		
2				
3				
4				
gg.				

c) Unique initiatives undertaken due to Covid-19 disruption

1. Digital infrastructure (Under NAHEP component 2)

- Academic management System implemented, and **263 faculty registered**
- Virtual classroom facility established: **35 Video Lectures Uploaded**
- Online classes of UG & PG students: **MS Team 1005 for Online teaching**
- E-learning facility: **14- content creator and 9 Unit reviewers uploaded**
- NIBPP app= **3206 photographs**
- Fully automated digitized library using RFID which is accessible through internet
- Entrance exam process completely digitized online
- E-governance implementation in university.

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	ı.Digital initiative	Practice before introduction of the initiative	Practice after introduction of the initiative
1.	Webinars/Trainings/Seminars etc	MS Team	Offline	Online
2.	e-learning module	Agri diksha web channel & Youtube	Online	Online
3	Online exams	MS Team		
4.	Academic management System	Academic management system	Online	Student Registration, Fee deposit, course registration etc

Please provide maximum 5 photographs with high quality (minimum 1-2MB) and label with suitable caption. Attach the photographs separately in the mail.

Challenges faced and lessons learned while implementing the project at your AU:

Challenges	
1	Financial Implications: **Pre-auditing bills, processing and payment delay due to pandemic**
2	Protected structures took time for completion
3	Procurements of equipment's- Delayed but completed as per STEP
4	Scientific and office staff working hampered
Lessons learned	
1	Digital communications –Establishing strong digital communications systems
2	Local audit staff are not tuned for such purchase process
3	Delegation of powers -sub-projects for funds allocated

Plan ahead (Key activities) for next reporting period:

1.	Envisaged objective wise activities work plans /experiments planned under several components of the project. The procurement of equipment's is complete and installed which will be used for carrying out research activities component wise.
2.	The field experiments under protected structures and natural farming will be carried out as per the objectives of the project.
3.	For 2021-22, the 20 number of lectures/webinars/ seminars/ experts talks etc., will be organized in collaboration with scientists/teachers of professional eminence and leaders in agro-industry. In addition, 5 no. symposium /workshop will also be organized with persons from public sector/industry/state departments/ foreign consultants etc.
4.	12 No. of International trainings, each for students and faculty planned for 2021-22
5.	To reorient and strengthen practical training component, various advanced trainings and skill certificate courses have been planned for PG students
6.	For collaboration with national and international centers of excellence in education and research, 5 no. of MoU will be signed with different institutes and industry in the target areas.
7.	Wheat haploid and doubled haploid plant developed following *Imperata cylindrica* and maize- mediated approaches of uniparental chromosome elimination for haploid production which are presently placed in pentalevel polyhouse will be transferred to phytotron facility after its completion in next two weeks for subsequent growth and development. Off season cultivation and wide hybridization (interspecific and intergeneric) in field and vegetable crops for enhancing the production, developing new varieties for biotic and abiotic stress resistance, quality improvement, yield enhancement, transfer of sterile cytoplasm for hybrid development, rootstock breeding will be carried out in the phytotron facility. These facilities will be availed by about 30-40 students of different departments for research purpose after its completion in next two weeks.
8.	Centre of excellence ready for Advanced level training to faculty and PG students
9.	Under ESP Nutritional Garden establishment & Flower dome and open environment, clean and green campus Initiatives will be under taken

Inauguration Nutritional Garden by Shri Jai Ram Thakur Hon'ble Chief Minister of Himachal Pradesh, under CAAST, NAHEP ,ESP ,Department of Horticulture, CSKHPKV, Palampur on 7 February, 2021

Teachers Day Plantation Ceremony By Faculty of CSKHPKV, Palampur

Green Ceremony of Deodar Plantation on World Environment day Celebrations

Activities organized under CAAST, NAHEP, CSKHPKV, Palampur

Shri Virender Kanwar ji, Hon'ble Agriculture, Animal Husbandry, Fisheries, Panchayati Raj and Rural Development Minister Inaugurated the Hydroponic Unit Develpoed under CAAST, NAHEP Department of Vegetable Science and Floriculture . CSKHPKV, Palampur on 17th June, 2021

Inauguration of Virtual Classroom and Agri Diksha Web Portal by Shri Narender Singh Tomar, Hon'ble Union Minister of Agriculture & Farmer Welfare of CSKHPKV, Palampur on 9th April, 2021

Farm and Lab facilities developed under CAAST, NAHEP Department of Vegetable Science and Floriculture . CSKHPKV, Palampur