



# PDFSR



हर कदम, हर डगर  
किसानों का हमसफर  
भारतीय कृषि अनुसंधान परिषद

*Agrisearch with a human touch*

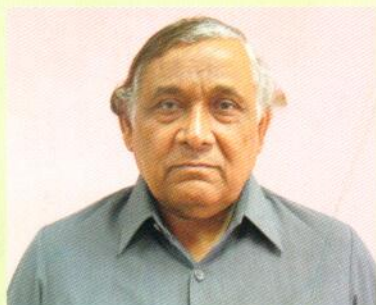
## Newsletter

**Project Directorate for Farming Systems Research  
(Indian Council of Agricultural Research)  
Modipuram, Meerut-250 110, Uttar Pradesh**

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### Congratulations



Dr B. Gangwar, Project Director was bestowed with Fellow of NAAS w.e.f. 1<sup>st</sup> January, 2014 in recognition of his pioneering work on formulation of technologies related to rice-based cropping systems in Andaman & Nicobar Islands. He has also developed diversified cropping systems for the Indo-Gangetic plains for obtaining higher input use efficiency and net returns to farming community. The development of multi-enterprise based location-specific IFS models would immensely help large number of small and marginal farmers in different parts of country. The award was conferred to him in Annual General Body meeting of NAAS held at Delhi on 6<sup>th</sup> June, 2014.

### PDFSR Annual Day

The Directorate celebrated its Annual Day on 23<sup>rd</sup> February, 2014. Dr. H. S. Gaur, Vice-Chancellor, SVBPUAT, Modipuram, Meerut was the chief guest and Dr A.K. Mathur, Acting Project Director, PDC, Meerut also graced the occasion. Dr H.S. Gaur, in his address, emphasized the need for co-ordinated effort among the agricultural institutions located in the Meerut and precisely pinpointed the advantages of co-ordinated effort in research, teaching and extension. In his lecture, he called upon the scientists to develop farming system models which can cater to the needs of small and marginal farmers in the light of declining per capita agricultural land in the country.



Earlier, Dr B. Gangwar, Project Director, PDFSR welcomed Dr. H. S. Gaur and in his address, he categorically stated the importance of farming system approach for productivity and profitability of 86% of small and marginal farmers of the country. He also elaborated the past year achievements and new research thrust viz., research on secondary agriculture (processing and value addition) and carbon accounting in farming system initiated by the Directorate. Mr Raj Kumar, a ICAR awardee progressive farmer also shared his experiences and raised the problems being faced by small and marginal farmers. Friendly sports, quiz competitions and cultural programmes were also organized during the day and prizes were also distributed to the winners of various events. The programme was concluded with vote of thanks by Dr. Prem Singh, Pr. Scientist, Coordinated the Annual Day.



## 65<sup>th</sup> Republic day

The Directorate celebrated 65<sup>th</sup> Republic Day on 26<sup>th</sup> January 2014. On the occasion, Dr B. Gangwar, Project Director hosted the national flag and addressed the staff. He narrated the achievements of Directorate especially in farming systems research and called upon all the staff to join hands together to achieve the target of raising the living standards of small and marginal farm holders. The event was attended by the children's, family members and staff of the Directorate.



## हिंदी कार्यशाला

निदेशालय में दिनांक 06.06.2014 को पूर्वाह्न 11.00 बजे मुख्य सभागार में एक दिवसीय हिन्दी कार्यशाला का आयोजन किया गया जो कि हिन्दी भाषा की दशा एवं दिशा के बारे में जानकारी तथा कार्यालय कार्यों में हिन्दी भाषा को बढ़ावा देने पर आधारित थी। इस कार्यशाला में डा० दीपक शर्मा, प्रोफेसर (संस्कृत) श्री वेंकटेश्वरा विश्वविद्यालय द्वारा मुख्य प्रवक्ता के रूप में दैनिक कार्यों में हिन्दी के प्रयोग से संबंधित विभिन्न महत्वपूर्ण जानकारियां दी गईं, जिसके लिए डा० कामता प्रसाद, प्रधान वैज्ञानिक / (कार्यकारी परियोजना निदेशक) ने भी हार्दिक सराहना की। उपस्थित सभी अधिकारियों एवं कर्मचारियों ने हिन्दी के प्रयोग के प्रशिक्षण / जानकारी को ग्रहण कर हिन्दी के दैनिक कार्यों में अधिक से अधिक प्रयोग करने का संकल्प लिया। कार्यशाला में निदेशालय के अधिकारियों एवं कर्मचारियों के अलावा मेरठ में स्थित केन्द्र सरकार के अन्य कार्यालयों से पधारे कई अधिकारियों ने भी अपनी उपस्थिति दर्ज की तथा अपने विचार रखे। कार्यक्रम का संचालन श्री सुशील कुमार सिंह, वरिष्ठ प्रशासनिक अधिकारी द्वारा किया गया।



## New Initiatives

### Strengthening Inter-Institutional Linkages

As a follow up action on the recommendation of interaction meeting of Director's of all the Divisions during 15 & 17 July 2013 at NASC, New Delhi, PDFSR developed Statement of Understanding (SoU) with 6 ICAR institutes, 5 AICRPs and 1 Zonal Project Directorate during January to June, 2014 for partnership in knowledge, technology, material and resource sharing for IFS research which is being carried out across the country through 74 centres (on-station and on-farm) under the aegis of AICRP on IFS. The brief of the SoU developed with various institutes

Institute/AICRP/ZPD	Date of signing SoU
IGFRI, Jhansi (including AICRP on Forage crops)	03 January, 2014
NRCAF, Jhansi (including AICRP on Agroforestry)	04 January, 2014
DWM, Bhubaneswar (including AICRP on Water Management)	08 January, 2014
CIFA, Bhubaneswar	09 January, 2014
ZPD, Kolkata	25 January, 2014
DPR, Hyderabad (Including AICRP on poultry)	24 April, 2014
DOR, Hyderabad (Including AICRP on oilseeds)	25 April, 2014



SoU developed between PDFSR, Modipuram and CIFA, Bhubaneswar

## Regional Workshop for North-Eastern Region, Jorhat

Two days regional workshop on "Strengthening Partnerships and Refined Methodology for On-station Experiments on AICRP on Integrated Farming System" was held at Jorhat on 26-28 May, 2014 in joint collaboration of PDFSR, Modipuram and AAU, Jorhat. Dr K.M. Bujarbaruah, Hon'ble Vice Chancellor, AAU, Jorhat (Assam) presided over the inaugural session of the workshop. In his chairman's remarks, Dr. Bujarbaruah stressed on harvesting the solar energy by setting the inter-related activities for well being of the small and marginal farmers of the country. The first beneficiary of the IFS is the environment, second is farmers, third beneficiaries are scientists and ultimately the biosphere- he opined. The Chairman urged upon the Scientists for refining the refined models and also to evaluate the B:C ratio plus criteria in IFS. Hon'ble Vice Chancellor also urged upon the house to work for development of a systematic farming system for *Char* areas or IFS model without paddy crop.



Dr. B. Gangwar, Project Director PDFSR, Modipuram in his inaugural address opined that IFS has been focused frequently in country level is particularly designed for small and marginal farmers. So far as environmental quality is concerned, integration of different enterprises is very important as the waste materials produced in the system has been utilized within the system itself- he quoted. In his lecture, Dr. A.K. Gogoi, ZPD, ICAR Zone-III stressed on using bio-mulch (using weeds), GPS/remote sensing technologies and commodity based farming system approach. In his opening remarks, Dr. G.N.

Hazarika, Director Research, AAU, Jorhat acknowledged Dr B. Gangwar for providing necessary support to AAU, Jorhat and also pointed out the importance of IFS in present day context. Subsequently the dignitaries on dais released some publications.

In the interface meeting with partner institutions for IFS the discussion and finalization of partnership work-plan was done with partner institutes viz., DWSR, Jabalpur, AICRP on Nematodes, CIFA, Bhubaneswar, DWM, Bhubaneswar, IGFRI, Janshi and NRC on Pig, Guwahati. Besides this, Dr B.K. Bhattacharyya, Head, CIFRI, Guwahati Centre also proposed a new collaborative work on *"Fish-based Integrated Farming System in Floodplain Wet-lands of NE Region"*.

In addition to this, a separate session on 'Refined Methodology for On-station Experiments of AICRP on IFS' was held in which the common deficiencies in reporting data, observation schedules for development of IFS model, guidelines for preparation of data sheet for organic farming experiments and information schedule for field experiments were worked out. The meeting came to an end with vote of thanks from Dr N. Ravisankar, Pr. Scientist, PDFSR, Modipuram.

### Regional Workshop for Eastern Region, Patna

A three days regional workshop on "Strengthening Partnerships and Refined Methodology for On-station Experiments on AICRP on IFS" under AICRP-IFS was held at Patna on 9-11 June, 2014 in joint collaboration with PDFSR, Modipuram and ICAR-RCER, Patna. Nodal officers, Scientists from state universities/ICAR institutes from five states (Bihar, Jharkhand, Chhattisgarh, Orissa and Madhya Pradesh) and Project Co-ordinators of different KVKs of Bihar and Jharkhand participated in the workshop. The workshop was inaugurated by Hon'ble Agricultural Minister, Sh Narendra Singh,

Government of Bihar. In his inaugural speech the minister emphasized the need of developing ideal IFS models for small and marginal farmers of Bihar with technologies of efficient water management in agriculture. He called upon scientists to develop skill of state level officers for effective implementation and management of IFS, so that income of farmers may be enhanced.



In his introductory remarks, Dr B.P. Bhatt, Director, ICAR- RCER, Patna stressed on need and effective implication of IFS for small and marginal farmers in the present scenario where land holdings are decreasing day by day due to land fragmentation. Dr R.N. Singh, Director, BAMETI emphasized on developing the technical skill of District Agricultural Officers regarding IFS so that farmers can get benefited and the livelihood of poor farmers can be ensured. Dr B. Gangwar, Project Director, PDFSR, Modipuram while briefing the agenda of workshop gave emphasis on strengthening partnerships between different research organizations and to develop refined methodology for on-station experiments. He also informed the house about ongoing activities of IFS at Modipuram as well as throughout the country.

In technical sessions, participants from various institutes shared their experiences. Dr P.P. Chakrabarti, PS, CIFA shared his experience on livelihood development for the people of Bali Island, Sunderban through aquaculture based IFS. Dr Inder Dev, PS & Nodal officer, NRCAF, Jhansi, described agro-forestry based farming system. Dr V.P. Singh, PS, DWSR, emphasized weed as a resource for preparation of vermi-compost and can also be used as

mulch. Dr U. Rajkumar, PS, DPR, Hyderabad, gave concept of poultry based farming system for one and two acres of land holding. He stressed upon the importance of vaccination for sustaining rural poultry farming and suggested *Vanraja* and *Grampriya* as the most suitable improved poultry breed for IFS.

As the Chairman of the technical sessions Dr B. Gangwar, remarked that there is need of refinement of existing IFS model and development of region specific (District/Block/Village) IFS model. He pointed out that farming system for each district has to be developed and social acceptance of the model should be one of the key factors. Component research can be done in the farming system model itself and the researches should be identified and included in the IFS research. He stressed upon sharing of technique and advised that if any technique is developed, due acknowledgement, due credit and due sharing is to be done and the work should be reported in the Annual Report.



In technical sessions, the common deficiencies in developing schedules for recording and reporting of IFS data, kind of data generation, their synthesis, analysis and to draw conclusion was discussed. A presentation on "Synthesis of IFS model from secondary data" and "OFR experimental methodology under AICRP on IFS" was made by Dr N. Ravisankar.

Dr B. Gangwar further suggested for study of some key process within IFS system viz., (1) Nutrient

budgeting (2) Mineralization study (3) C- accounting (4) Weed biomass (5) C-flux etc. He also enriched participants' knowledge by some key information regarding climate resilient crops and informed that 25% substitution of chemical fertilizer with FYM always yield better, whatever the climatic factor may be. He also advised that only those IFS models should be integrated on the farmers' fields which are equally beneficial in on-station as well as on-farm research and also has social acceptability. At the end of the workshop Dr. Ravisankar, Pr. Scientist, PDFSR, Modipuram proposed vote of thanks.

## Meetings

### 27<sup>th</sup> Meeting of IRC

The 27<sup>th</sup> meeting of Institute Research Committee (IRC) of the Directorate was held during 17-20 February, 2014 at PDFSR, Modipuram in which review of action taken report of 26<sup>th</sup> IRC, review of results of on-going institute funded projects, proposals of new projects and observational trial were discussed. The meeting was chaired by Dr B. Gangwar, Project Director, PDFSR and attended by all the members of IRC.

The meeting started with introduction of nine new members who have joined after the 26<sup>th</sup> IRC. Dr N. Ravisankar, Member Secretary, IRC while welcoming the Chairman and all the members of IRC presented the brief achievements of the PME cell. Important achievements includes web publication of Vision-2050, preparation of performance Indicator for the Directorate as per ICAR guidelines, timely publication of Annual Report and Newsletter of the Directorate and implementation of the "E-Publishing and Knowledge Systems in Agriculture (EPKSA)" under NAIP component-I.

Dr B. Gangwar, Chairman, IRC in his opening remarks congratulated all the newly joined members of IRC and asked them to come up with the innovative

research proposals in farming systems perspective as guided by QRT and RAC. While briefing the QRT recommendations, he shows satisfaction on the possibility of PDFSR to be upgraded as IIFSR. Chairman also pointed out that the Directorate has signed SoUs with 10 ICAR institutes, 6 AICRP's and 1 zonal unit of KVK for strengthening inter-institutional linkage.

In the concluding remarks, Dr B. Gangwar, Project Director and Chairman, 27<sup>th</sup> IRC felt that the farming system approach of conducting research is really a challenge but will lead to more productive and useful results. He was very happy that all the new projects approved in the IRC are in farming systems perspective taking in consideration the RAC and QRT recommendations. He also shows the road map for farming systems research and urged all the scientists to work hard and devote themselves to the cause of farming systems research. The meeting was ended with vote of thanks proposed by Member Secretary, IRC.

### First meeting of Seventh RAC

The 1<sup>st</sup> meeting of 7<sup>th</sup> Research Advisory Committee (RAC) of PDFSR was held on 15-16 April, 2014 at Modipuram under the chairmanship of Dr I.P. Abrol, Ex-DDG (NRM) ICAR. Dr V.S. Korikanthimath, Ex-Director, ICAR-RC, Goa, Dr D.K. Marothia, President, National Institute of Ecology, Raipur, Dr Shivendra Kumar, Ex-Head, ICAR-RC for Eastern Region, Regional Centre, Ranchi, Dr Arun Varma, Ex-ADG, Animal Science, ICAR, Dr A.K. Yadav, Ex-Director, NCOF, Ghaziabad, Dr Rajbir Singh, Pr. Scientist (Agronomy), NRM Division, ICAR HQ and Dr B. Gangwar, Project Director, PDFSR participated in the meeting as members. The meeting started with welcome to Chairman and members of RAC by Dr B. Gangwar and with release of few publications brought out by the Directorate. Thereafter, Project Director presented a brief account of major research achievements of the Directorate including AICRP on IFS and NPOF during past one year. Dr N. Ravisankar, Member Secretary presented the action taken report on the recommendations of last RAC meeting with satisfactory response of Chairman and members of RAC.



The Chairman and the members of the RAC expressed their critical views during the presentations of research progress by the concerned scientists/programme facilitators. Further, the Committee deliberated on the on-going research programmes *vis-à-vis* the mandate of the Directorate. Taking in note the recommendations of last QRT (2007-12) the Committee recognizes that change in mandate of the Directorate from cropping systems research to farming systems research involves a basic shift in the conceptual framework of how research agenda needs to be defined, prioritized and addressed. Based on the shift in mandate and recommendations of last QRT the committee suggested that the overall guiding factors for PDFSR will be i) Systematic characterization of existing farming systems in various agro-climatic regions, ii) Identification of farming constraints, iii) Collective, compatible and convenient farm interventions, iv) Convergence of resources for making a self-reliant farm, v) Auditing of input-output, vi) Assessing the impact of interventions on employment generation, productivity enhancement, sustainability of natural resources and vi) Capacity building and demonstrations of farming systems in participatory mode. The meeting ended with a vote of thanks to the Chairman, members of RAC and the invitees of RAC meeting by Dr N. Ravisankar, Member Secretary RAC.

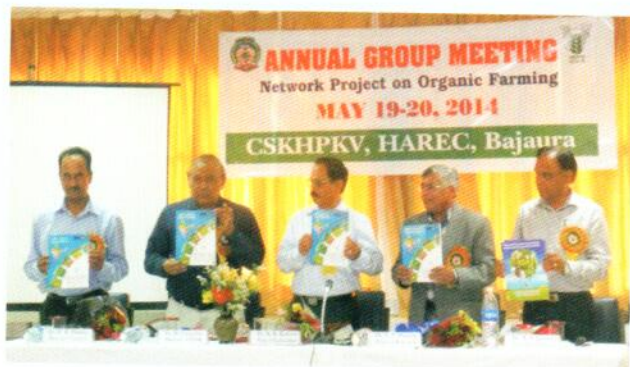
### Nine-th Annual Group Meeting of NPOF

The Directorate is operating a Network Project on Organic Farming (NPOF) from 2004 with 13 co-operating centers representing 9 agro-climatic regions, 13 NARP zones and 12 states. The 9th Annual

Group Meeting of NPOF was organized during 19-20 May 2014 at Hill Agricultural Research and Extension Centre (HAREC), Bajaura, Kullu (HP). The group meeting was inaugurated by Dr K.K. Katoch, Hon'ble Vice Chancellor, CSKHPKV by lighting of lamp followed by *Saraswati Vandana* by students and release of publications brought up by PDFSR.



Dr K. K. Katoch, emphasized that farmers should adopt organic farming as a way of life as the impact of climate change can be minimized through organic farming. Dr B. Gangwar, Project Director, PDFSR while delivering the Project Director's report, highlighted the achievements of NPOF. He said, with the increasing awareness about the safety and quality of foods, long term sustainability of the agricultural system and accumulating evidences of being equally productive, the organic farming has emerged as an alternative system of farming which not only addresses the quality and sustainability concerns, but also ensures a profitable livelihood option. Dr S.P. Sharma, Director Research, CSKHPKV by giving a brief account of history of organic farming in India stressed



that organic farming has emerged as off-shoot of ill effects of green revolution technologies and diminishing natural resources.

The Principal Investigators from all the 13 centers participated in the meeting and discussed the results and future plan. In the subsequent proceedings of the meeting review of results of experiments conducted at 13 centers during 2012-13 and 2013-14 were taken up besides finalizing the work plan for 2014-15 which also includes geo-referenced characterization of organic clusters in participatory mode. The meeting was concluded with vote of thanks proposed by Dr N. Ravisankar, National PI, NPOF.

### Brainstorming on IFS Modeling

A brainstorming session on IFS modeling was held on 3<sup>rd</sup> June, 2014 under the chairmanship of Dr. A.K. Sikka, DDG (NRM). In his address, he emphasized the importance of IFS modeling and also informed that there is a need to work closely with international organizations to learn more about modeling tools. Dr Santiago Lopez-Ridaura, CIMMYT, Kenya delivered a seminar on "Modeling Approached for Farming Systems Research" and highlighted the importance of system approach in farming system modeling and also explained the methodology adopted in case study of farming systems technologies of Vaishali district of Bihar as an example. Dr N. Subash, Sr. Scientist (Agromet), PDFSR gave a presentation on the ongoing work of IFS modeling at PDFSR and Dr V.K. Singh also made a presentation on the results of National Fellow project. Dr M. L. Jat and Dr Tek Sapkota form CIMMYT were also attended the meeting.



## Kisan Gosties

- To make awareness among the farmers about efficient water use under different cropping system of East Ganga Canal, a *Kisan Gosthi* was organized at Gosepur village of Bijnor district on 14<sup>th</sup> February, 2014.
- In order to create farmer's awareness on efficient water use for their livelihood improvement in Agra Canal, a *Kisan Gosthi* was organized at Kosi-Khurd village of Mathura district on 11<sup>th</sup> March, 2014.
- To make awareness on IFS approaches to enhance livelihood security of the farmers in East Yamuna Canal command, a *Kisan Gosthi* was organized at Mehrampur village of Baghpat district on 24<sup>th</sup> April, 2014.
- In order to make aware about improved farming and enhanced livelihood of the farmers, a *Kisan Gosthi* was organized at Koteshwar cluster of New Tehri District on 18<sup>th</sup> May, 2014.
- To create farmer's awareness on IFS approaches for improving livelihood, a *Kisan Gosthi* was organized at Kandisaud village of New Tehri district on 20<sup>th</sup> May, 2014.

About 200-300 farmers were participated in each *Gosthi* and during the meetings vegetable kits for summer and rainy season kitchen gardening was also distributed among the farmers.



## Research Highlights

### Agroforestry systems for carbon neutral farm households

R. S. Yadav, Anil Kumar and N.K. Jat

Emission of Green-House Gases (GHG) from farm households in the Meerut district was assessed by using standard methodology. The assessment of GHG emission took into account the emission of three GHGs viz., CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O. CH<sub>4</sub> and N<sub>2</sub>O emission was converted into CO<sub>2</sub> equivalent (CO<sub>2</sub>e) by Global Warming Potential (GWP) of 1 for CO<sub>2</sub>, 21 for CH<sub>4</sub> and 310 for N<sub>2</sub>O. The study also took carbon sequestered by trees on the farms and households into account for net emission of GHGs in the farm households. The operational boundary of the study consisted of agricultural soils, livestock production, paddy cultivation, farm operations, crop residue burning and farm families (excluding the electricity consumed). From the assessment, total mean emission of GHGs from farm households in the western plain of U.P. was found to be 9.76 t farm household<sup>-1</sup> year<sup>-1</sup> with net emission of 6.16 t farm household<sup>-1</sup> year<sup>-1</sup>. Among different categories of emission sources in the district, livestock contributed 58.2% of total CO<sub>2</sub>-e emissions followed by agricultural soils (22.5%) by N application in crops, farm families (11.4%), farm operations (5.78%), residue burning (1.35%) and paddy cultivation (0.800%).

By adopting agroforestry with additional trees of 273 farm household<sup>-1</sup> with an average size of holding of 2.07 ha makes the farm households in the Meerut district 'carbon neutral'. In other words, it is advocated that by planting 132 trees more ha<sup>-1</sup> or having 209 trees ha<sup>-1</sup> by each farm households in the Meerut district, farm households can be carbon neutral. At block level, planting 318, 334, 216 and 227



additional trees farm household<sup>-1</sup> makes the farms carbon neutral in Hastinapur, Rajpura, Sardhana and Rohta block, respectively. Further, by adopting minimum balanced fertilization, better livestock management, reducing farm operations and adopting energy efficiency measures by farm families can make the farm households 'carbon negative' by 1.18 t CO<sub>2</sub>-e farm household<sup>-1</sup> year<sup>-1</sup> in the district.

### Gender Perspective in Pre-dominant Farming systems of Meerut District

Nisha Verma, M.P. Singh, M.P.S. Arya, Poonam Kashyap and Amit Nath

To know the role of small, marginal and landless women in pre-dominant farming systems a survey was conducted in the villages of Meerut district. Crop (sugarcane-ratoon-wheat)+ livestock and horticulture (vegetables)+ livestock were found the major farming system in the district. Gender analysis of crop based farming system show that 80% of women farmers are involved in intercultural operations like weeding, hoeing, thinning and gap filling. Around 70% of them are involved in de-topping of sugarcane, 70% in harvesting of crops like wheat, rice, moong, urad, lentil etc. In the district livestock rearing is found a female dominated activity. Around 70% of farm women are involved in collecting fodder, 80% of them are doing livestock rearing activities like feed preparation, feeding, watering and milking. Cowdung collection and cowdung cake preparation activities are being performing by 100% of women cultivators. Among the landless women, 80% are involved in rice transplanting and farm activities as labour and rest 10% in making baskets from the woods locally known as *kapasi* in which their male counterpart helps in collecting the wood from the forests and selling of finished basket. In vegetable based farming system, involvement of women cultivators belongs to small and marginal landholding families was found more. Around 65% of women were involved in sowing and transplanting activities, 80% of them are involved in weeding, thinning and gap-filling and 85% are involved in picking and harvesting of

vegetables. Eighty percent of women are independently doing vegetable production in their backyard gardens. Ninety percent landless women are performing weeding and picking operations as labour. However, none of them were found involved in marketing of farm produce and taking any decision regarding farm activities and it was due to socio-cultural barriers, lack of education, lack of market awareness, poor access of women to information, less training opportunities. Drudgery in farming and allied operations faced by woman are mainly in activities like weeding, sugarcane de-topping, rice transplanting and transporting cow dung etc.

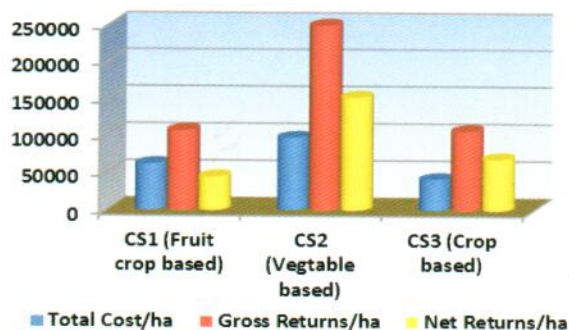


### Economic Evaluation of Horticulture based Farming Systems

Poonam Kashyap, Kamta Prasad and Harbir Singh

To develop horticultural crop based model for improving profitability, enhancing productivity and nutritional security of small and marginal farmers of western plain zone of Uttar Pradesh field experiments were conducted at PDFSR, Modipuram. Three modules, viz. fruit crop based (CS-1, 0.3 ha), vegetable crop based (CS-2, 0.22 ha) and field crop based (CS-3, 0.4 ha) were evaluated under this project. Among the modules, vegetable based system has been found most remunerative in terms of net returns. In the second year of its establishment, the net returns per ha from the vegetable based system (CS-2) was found

to be Rs. 151640 ha<sup>-1</sup> followed by crop based system (Rs. 68765 ha<sup>-1</sup>) followed by fruit crop based system (CS-1) (Rs. 44660 ha<sup>-1</sup>). The higher returns from vegetable based system were mainly due to contribution by cash crops. Fruit based system gave lowest net returns per ha as there was no return from fruit plants in initial years. Returns obtained from the system were achieved from the intercrops only. In the CS-1, the highest productivity was achieved by radish (26.5 t ha<sup>-1</sup>) followed by carrot (19.85 t/ha). In case of CS-2 the highest productivity was achieved by bottle gourd (20.71 t ha<sup>-1</sup>) followed by potato (20.14 t ha<sup>-1</sup>). In case of CS-3 the highest productivity was achieved by sugarcane (39 t ha<sup>-1</sup>) followed by wheat (5.5 t ha<sup>-1</sup>).



### Conservation agriculture practices for rice-wheat system

N. K. Jat, R. S. Yadav, Sudhir Kumar and Krishna Kumar

In response to declining trends in productivity of traditional rice-wheat cropping system in India, the conservation agriculture technologies can be a suitable option in Indo-Gangetic Plains. The non-puddled-zero till rice-wheat production system with residue retention, legume intervention and weed control through effective herbicides can sustain its potential productivity and profitability while enhancing the soil health. The cultivation of direct seeded rice under zero tillage in *kharif* followed by zero till wheat in *rabi* with inter-row mulching of rice straw (@ 5.0 t ha<sup>-1</sup>) and growing of moong in summer and using stover for surface mulching in direct seeded

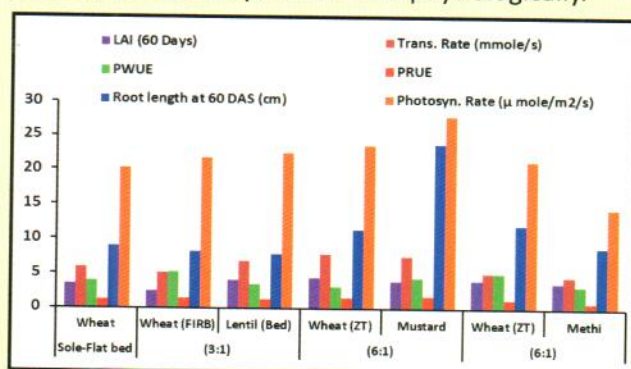
rice under zero tillage proved a suitable option for higher economic yield and soil fertility. Further, the weeds should be effectively managed by applying glyphosate (@1.5 kg a.i ha<sup>-1</sup>, PP) + pendimethlin (@ 1.5 kg a.i. ha<sup>-1</sup>, PE) + bispyribac (@25 g a.i. ha<sup>-1</sup> at 25 DAS) in direct seeded rice and sulphosulfuran + metsulfuron (@ 25+2 g a.i. ha<sup>-1</sup> at 30 DAS) in wheat. By growing rice (PRH-10) - wheat (HD- 2967) – summer moong (Pusa Vishal) under zero tillage with applying rice residue mulch in wheat with herbicidal weed control results 64.6 q ha<sup>-1</sup> grain yield of rice with Rs.74, 507 ha<sup>-1</sup> as net return and 52.8 q ha<sup>-1</sup> of grain yield of wheat with Rs.67,045 ha<sup>-1</sup> as net return with 6.3 q ha<sup>-1</sup> additional grain yield of moong. This cropping sequence under conservation agriculture practices gives system productivity (Rice Equivalent Yield) to the extent of 125.5 q ha<sup>-1</sup>, system net return of Rs. 1, 35,060 ha<sup>-1</sup> and Rs. 370 ha<sup>-1</sup> day<sup>-1</sup> profitability with a perceptible improvement in soil health in terms of higher soil organic carbon, available N, P, K, Zn and dehydrogenase activity at the end of cropping cycle.

### Physiological evaluation of bio-intensive complementary cropping systems

Sudhir Kumar, B. Gangwar, M. Shamim and O.K. Tomar

Physiological evaluation of the effect of bio-intensification in wheat intercropped with different crops grown during *rabi* 2012-2013 showed that bio-intensification brings more intensive competition among crops which ultimately affects the physiological parameters. Among different combinations, the highest LAI (4.41), transpiration rate (7.86 mmole s<sup>-1</sup>), photosynthetic rate (23.6 μ mole m<sup>-2</sup> s<sup>-1</sup>) and photosynthetic radiation use efficiency (PRUE) (1.5) of wheat was recorded under wheat (ZT) + mustard (6:1). However, highest Photosynthetic Water Efficiency (PWUE) (5.21) was observed under wheat (FIRB) + lentil (bed) in 3:1 ratio followed by wheat (ZT) + methi in 6:1 ratio. Bio-

intensification of crops of higher and lower canopy help in increasing the PWUE as lower canopy crops makes a cover over the soil to reduce the evapotranspiration losses of water. The small canopy crops like *methi* and lentil showed higher LAI in the initial stages of growth but later due to shading effect of wheat canopy their LAI starts decreasing. The PRUE, an indicator of efficient radiation use by crops, showed that wheat (ZT) + mustard in 6:1 ratio showed higher values due to their higher LAI and transpiration rate. Results indicate that for bio-intensification, combination of almost equal canopy size crops like wheat and mustard performs well physiologically.



### Weed and sheath blight incidence influenced by resource conservation module in rice

Chandra Bhanu and V.P. Chaudhary

Study was undertaken to assess the effect of zero-tilled rice on the infestation of weeds and sheath blight disease in rice variety Pusa Sugandha-5. Higher weeds biomass (126.3 g m<sup>-2</sup>) was recorded in zero-tilled rice as compared to conventionally tilled transplanted rice (8.59 g m<sup>-2</sup>). Zero-tilled rice was besides infested with perennial weed species like *Cynodon dactylon* and *Eleusine indica* found severely infested with sheath blight caused by the fungus *Rhizoctonia solani* as compared to conventionally tilled transplanted rice. The relative incidence, lesion height and sheath blight index (71.7%, 80.8% and 60.0%, respectively) were higher in zero-tilled rice when compared to transplanted rice (25.8%, 71.2% and 18.4, respectively). Higher infestation of

perennial weed species like *C. dactylon* aggravated the sheath blight index in zero tilled rice by facilitating its horizontal spread within the crop. Other weed species like *Paspalum distichum*, *Sorghum halepense*, *Echinochloa glabrescens* and *Dactyloctenium aegyptium* were also found to harbor the sheath blight pathogen (*Rhizoctonia solani*) in the rice field. Hence, the long term sustainability of resource conservation modules like zero-tilled rice may depends upon integrated weed, pests and disease management strategies.

### Long-term yield variability in rice-wheat system under different nutrient practices

N. Subash and B. Gangwar

Long-term yield variability trends in rice-wheat cropping system under different nutrient management practices was analysed by comparing yield data of rice and wheat under 12 different treatments of combinations of inorganic (chemical fertilizer) and organic sources (FYM, green manure, and crop residue) of nutrients with farmers' practices. All the treatments at Palampur, Kalyani and Navsari showed increasing yield trend of rice-wheat system. The increase at Palampur ranged from 0.091 for farmers' practice to 0.023 t ha<sup>-1</sup> year<sup>-1</sup> for supply of 0.25 N through green manure. However, at Navsari, a trend for greater increase to the tune of 0.100 t ha<sup>-1</sup> year<sup>-1</sup> was observed with application of 0.5 N through FYM. At Sabour and Jabalpur, all treatments except control showed trends for increasing yield. It was noted that all treatments with the recommended dose of fertilizer either through inorganic sources or in combination with FYM, crop residue or green manure showed highly significant (P<0.01 to 0.1) trends for increasing yield at these locations. In Faizabad, trends for increasing yield were seen with application of the recommended dose of fertilizers either through inorganic sources or in combination with FYM/ crop residu/green manure along with the farmers' practice treatment. At Ludhiana and Kanpur,

N application through FYM treatments showed increasing yield trends while all other treatments showed decrease in yield trends. Application of the recommended dose of fertilizers through inorganic nutrient sources showed a trend for decreasing yield at both sites, with a significant ( $P < 0.05$ ) decrease of  $0.055 \text{ t ha}^{-1} \text{ year}^{-1}$  in Ludhiana<sup>1</sup>.

### Processing and value addition of fruits and vegetables

Amit Nath, D. Dutta, Nisha Verma, P. Kashyap, J.P. Singh and B. Gangwar

**Banana chips:** Organically grown green bananas (cv. Grand Naine) harvested at mature stage and washed with clean water and peeled with SS knife. Peeled fruits were sliced in to 3-5mm thickness and dipped in 1% brine solution along with 150ppm solution of potassium metabisulphite (KMS) for 15-20 minutes. After draining the brine solution the slices should be dried under sun for 1-2 hrs. Fry the dried slices in edible refined oil for 3-5minutes till it reached bright yellowish and crisp texture. After cooling the final products should be packed in 200 gauge polypropylene bags.



Banana Chips

**Potato flakes and chips:** Freshly harvested potato (Cv. Chipsona) were washed with clean water and peeled with SS knife. Peeled potatoes were sliced at 3-5mm thickness with the help of manual slicer and dipped in 1% brine solution along with 150ppm potassium metabisulphite (KMS) for 15-20 minute. Drained the brine solution from the slices followed by drying under sun for 1-2 hrs for preparation of potato chips

or dried under sun for 15-18 hrs for preparation of dehydrated flakes. These slices were fried in edible refined oil for 3-5minutes till it reached bright yellowish and crisp texture. After cooling the flakes and chips were packed in 200 gauge polypropylene bags.



Potato Flakes

**Carrot Tuity-Fruity:** Freshly harvested carrots were washed with clean water, peeled and sliced into three different thickness of sizes viz., 4x10x10 mm (Length x breadth x width), 6x10x10 mm, 8x10x10 mm, 10x10x10 mm, 12x10x10 mm, and 5x10x10 mm, halve circular (5mm width) and circular (5mm width). These slices were subjected to different temperatures of blanching i.e. 5 min, 10 min, 15 min, 20 min and 25 min. Blanched slices were then subjected to boiling in 50% sugar syrup for 30 minutes. Different quality parameters viz., hardness, colour and sensory were evaluated. Among different treatments, carrot slices of 10x10x10 mm followed by 15 minutes blanching recorded maximum sensory score (8.2) and also medium soft texture.



Carrot Tuity Fruity

## Success Story

### Integrated Farming System for Problem Zone (NARP) of Kerala

OFR centre, AICRP on IFS,  
Thiruvalla (Kerala)

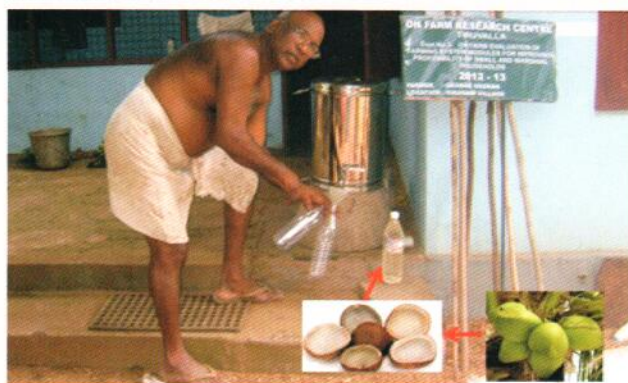
Farmers undertake cultivation of an array of crops consisting of tree crops, annuals and biennials on the same piece of land in the problem zone (NARP) of Kerala. Sh George Veeran is a progressive small farmer coming under the Special Problem Zone of NARP located at Niranam Grama Panchayat of Pulikeezhu Block. He is having a total area of two hectares consisting of garden land and wetland covering one hectare each. In the garden land, coconut based farming system is followed. There are 100 bearing coconut palms within the age group of 25 to 35 years producing 8000 nuts each year. Intercropping with nutmeg is followed in coconut garden. Nutmeg is planted on mounts to overcome the problems of inundation of water during monsoon. The wetland is located six feet below mean sea level which is typical Kuttanad Ecosystem. A single crop of rice is being cultivated in the wetland. His livestock consist of two milch animals of Holstein Friesian breed and backyard poultry of 25 birds. Traditional marketing avenues are being followed to sell the farm produce.

**Intervention through On-Farm Research of AICRP on IFS:** Interventions were made to crop, livestock and value addition modules of farming system. Apiculture was introduced as an optional module. As part of improving the productivity of coconut, mineral nutrition with magnesium was advocated and implemented. Intensification of space and time in coconut was undertaken through intercropping with banana. To overcome the abnormal fruit fall in nutmeg, mineral nutrition with borax was practiced. Initially, the health and sanitation of the cowshed was not up to the mark. The farmer was advocated to use cow mats so that the problem of mastitis in his cows can be prevented and health and sanitation of the animal can be improved.

New marketing avenues were pursued to exploit the higher retail sale price of coconuts through value



addition by milling the copra and packing the oil in small plastic bottles.



Two Azolla units were set up to reduce the feed cost of the concentrate for milch cows. The farmer has positively reacted to the technical advices.



Optimum utilization of available farming system resources like land, water and solar energy resulted in higher production in Sh George Veeran's farm. Efficient recycling of farm wastes within the farm had improved soil health and soil productivity. Interventions made in existing farming system had enabled the farmer to increase his net returns to the tune of 54 percent. This had enhanced his purchasing capacity, standard of living, social upliftment, nutritional and food security.

## Human Resource Development

### International Training/ Workshop

- Dr M. Shamim, Scientist attend “International conference on Emerging Food Safety Risks: Challenge for Developing Countries” during 9-11 January, 2014 at NIFTEM campus, Kundli at Sonapat (Haryana).
- Dr Harbir Singh, Pr. Scientist and Dr N. Subash, Sr. Scientist attended AgMIP Regional Research Team Finish Line Workshop in Arusha, Tanzania during 30 January - 4 February 2014 at Arusha, Tanzania.
- Dr B. Gangwar, Project Director and Dr Poonam Kashyap, Scientist attended 'Word Congress on Agroforestry' (WCA-2014) during 10-14 February, 2014 at New Delhi.
- Dr V. K. Singh, National Fellow, Dr M. P. Singh, Pr. Scientist and Dr R. P. Mishra, Sr. Scientist attended International Symposium on “Potassium nutrition and crop quality” organized by IPI-BAU during 4-5 March, 2014 at Ranchi (Jharkhand).

### National Training / Workshop

- Dr V. K. Singh attended “20<sup>th</sup> World Congress on Soil Science” during 8-13 June, 2014 at Jeju, South Korea.
- Dr B. Gangwar, Project Director and Dr R.S. Yadav, Pr. Scientist participated in the Brain Storming Session on 'Carbon Economy in Indian Agriculture' at NASC complex, New Delhi on 1 February, 2014 organized by NAAS, New Delhi and convened by IISS, Bhopal.
- Sh P.P. Mishra, ACTO attend a training programme on “Application of Data Mining Techniques in Agriculture (MDP) during 17-22 February, 2014 at NAARM, Hyderabad.

- Dr R. S. Yadav, Pr. Scientist participated in the National Level Consultation Meet on 'Soil Health Assessment' at IISS, Bhopal on 26 February, 2014 organized by IISS, Bhopal.
- Sh R. B. Tewari, STO attended “10<sup>th</sup> Advanced Level training in soil Testing, Plant Analysis and Water Quality Assessment” during 11 February to 03 March, 2014 at IARI, New Delhi.
- Dr Nisha Verma attended National workshop on “Managing Agricultural Knowledge Resources through Koha” sponsored under NAIP eGranth Project during 28-29 March, 2014 at SVPUA&T, Meerut.
- Dr B. Gangwar, Project Director, Dr Kamta Prasad, Dr N. Ravisankar Dr. R.S. Yadav, and Dr N. K. Jat, Scientist participated in the 9<sup>th</sup> Annual Group Meeting of Network Project on Organic Farming (NPOF) during May 19-20, 2014 at CSKHPKV HAREC, Bajaura, (H.P.).
- Dr Nisha Verma, Scientist, Dr Debashis Dutta, Sr. Scientist, Dr Amith Nath, Pr. Scientist and Dr Poonam Kashyap, Scientist attended International Conference on “Horticulture for Nutritional Livelihood and Environmental Security in Hills: Opportunity and challenges in India” during 21-24 May, 2014 at Kalimpong Darjeeling.
- Dr Suresh Malik, Pr. Scientist attended training on “Forecast Modelling Analytics in Crops” during 30 May to 19 June, 2014 at New Delhi.
- Sh S. K. Gupta, Assistant attended a special training programmed during 9-20 June 2014 at ISTM, New Delhi.
- Dr Chandra Bhanu, Scientist attend 2<sup>nd</sup> UP Agricultural Science congress 2014 during 14-16 June, 2014 at IISR, Lucknow.

### New Entrants

- Dr L.R. Meena joined as Principal Scientist (Agronomy) on selection on 01-02-2014 from CSWRI, Avikanagar.

### Promotion

- Dr V.P. Chaudhary Sr. Scientist was promoted to Grade pay Rs. 9000 w.e.f. 16 August, 2013.
- Sh S.K. Gupta, Assistant, Smt Alka Jain, Assistant, Sh Brijbeer Singh, Jr. Stenographer, Sh Rajesh Kumar, Jr. Stenographer were given the financial upgradation in Grade pay from Rs. 4200 to 4600.
- Sh Rajender Kumar, Jr. Clerk, Sh Parmanand, Jr. Clerk, Sh D.C. Mishra, Jr. Clerk, Sh. Rajendra Singh, SSS, Sh Prem Kumar, SSS, Sh Anand Singh, SSS, Sh Rakesh Kumar, SSS were given the financial upgradation in Grade pay from Rs. 1900 to 2000.

### Awards

- Dr B. Gangwar, Project Director was bestowed with Fellow of NAAS w.e.f. January 1, 2014 in Annual General Body meeting of NAAS held at Delhi on June 6, 2014.



- Dr Poonam Kashyap, Scientist received 'Best Oral Research Paper Presentation Award' in "International Horticultural Congress" held at Kalimpong, Darjeeling during May 22-24, 2014.

### Visitors

- A group of 38 students of MIET, Meerut visited the Directorate on February 12, 2014.
- Dr Pankaj Kumar, Associate Professor (Biotechnology) of SVPUAT, Meerut visited the Directorate on February 18, 2014.
- Dr N.S. Rana, Professor (Agronomy), of SVPUAT, Meerut with 25 UG students visited the Directorate on April 4, 2014.
- Dr Ummed Singh, Senior Scientist (Agronomy), IIPR, Kanpur visited the Directorate on March 26, 2014.
- A group of 25 Girl Students of Aaryans' School, Meerut visited the Directorate on May 2, 2014.
- Dr P. Sukumari, Chief Agronomist, AICRP-IFS, Karanama, Trivendram, Kerala visited the Directorate on 16-17 June, 2014.



- Dr A. K. Sikka, DDG NRM, ICAR, Dr M.L. Jat, Senior Scientist, CIMMYT and Dr Santiago Lopez-Ridaura visited the Directorate on 3<sup>rd</sup> June, 2014.



## WAY FORWARD



Although, several types of farming systems exist in India, crop + dairy is the most predominant system in the country as being practiced by 86% farm households. The benchmark data collected from OFR mandated districts reveals that existence of 11 types of farming systems with number of components as high as 5 [eg. crop + dairy + goat + sheep + poultry (2.7%) in Warangal district of Andhra Pradesh & Crop + horticulture + dairy + fish + poultry in Angul district of Odisha (11.1%)]. Even though, the number of households having the farming systems with more components are less, their presence in the farmers field indicates that such systems are possible and will hold key in realizing the target monthly net income of Rs. 25000 ha<sup>-1</sup> in irrigated and Rs. 10,000 ha<sup>-1</sup> in rainfed systems. The Prime Minister of India, Sh Narendra Modi ji in his speech on ICAR foundation day held on 29<sup>th</sup> July 2014 gave the mantra of *Kam Jameen, Kam Sameye aur Adhik Utpadan* for agricultural research. The farming system approach of research exactly aims for producing more from less resource and targets marginal and small holders. Interventions made in farming systems perspective using holistic approach in selected households of on-farm research resulted in 4.2 times increase in net returns within a year. Further, on-station IFS models results indicates that out of 31 models, 11 models could result in net income of more than Rs. 2 lakhs ha<sup>-1</sup> year<sup>-1</sup>. Organic farming is gaining momentum due to the increasing awareness and policy support from the government. Organic farming to be successful also requires farming systems approach. Simulation techniques need to be applied in future to develop models based the best available technologies from different components and fit them in a system friendly way. Further decision support system to suggest IFS models based on requirement of client and his/her resources is also in need. Capacity building in farming systems research and strengthening the partnership with sister Institutions is the key for further advancements. Therefore, the Directorate has focussed its attention for further strengthening through workshops and special training to stakeholders.

(B. Gangwar)

### Important Publications

1. Annual Report 2012-13 of NPOF
2. Annual Report 2012-13 of AICRP-IFS
3. Annual Report 2013-14 of PDFSR
4. Krishi Pranali Alok (Hindi patrika)

### Upcoming events

- July : Regional workshop of AICRP on IFS at Hyderabad
- Aug. : Regional workshop of AICRP on IFS at Hisar & S.K. Nagar  
Agricultural Education Day
- Sept. : Hindi fortnight
- Oct. : Agri Innovators Day
- Nov. : OFR Agronomist Meet: Farmers Perception on Climate Change and Farming System Success Stories
- Dec. : 31 Biennial workshop of AICRP on IFS

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