



PDFSR

Newsletter



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किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

Agr. search with a human touch

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

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Hearty Welcome to DDG (NRM)

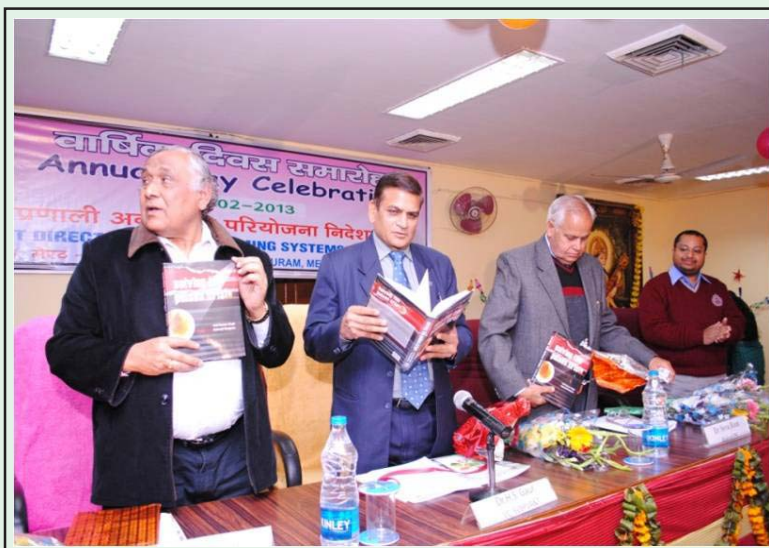


PDFSR family welcomes Dr A.K. Sikka, who took over as Deputy Director General (Natural Resource Management) of ICAR on February 5, 2013. Dr Alok Kumar Sikka is a distinguished scientist in the field of water engineering and management. He served the council in various capacities including the Director, ICAR Research Complex for Eastern Region, Patna (Bihar) before moving to National Rainfed Area Authority as technical expert. He also served in many committees of GOI.

Project Director and staff of PDFSR extend best wishes to him for the new assignment. Under his leadership, natural resource management and farming system research in particular will reach to new heights.

PDFSR Annual Day

The Directorate celebrated its Annual Day on February 23, 2013 in which series of events like Annual Day Lecture, Friendly sports, Quiz competition and tambola were organized to mark the occasion. Dr. H. S. Gaur, Vice-Chancellor, SVBPUAT, Modipuram delivered Annual Day Lecture on "Linking agricultural research and education to small landholders in India". 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, Dr. Gangwar called upon the scientists to take the challenges of identifying various models of farming systems which are suitable for small holders keeping in view the changing agricultural scenario. Friendly sports and quiz competitions

with the staff of Project Directorate on Cattle (PDC), Meerut was organized. In sports, the PDC team won the tug of war while in quiz competition, there were 8 teams out of which 3 teams were given first, second and third prizes.



The main attraction of the programme was Tambola game in which almost all the staff of PDFSR and the participants of PDC played. The retired persons of the Directorate were also felicitated on this occasion by the Project Director.



The programme was concluded with vote of thanks by Dr. Anil Kumar, Principal Scientist (Agricultural Extension) who coordinated all the events.

Agricultural Industry Day

The Agricultural Industry day was celebrated on February 22, 2013 in order to improve the visibility of the

Directorate among all the stakeholders of agriculture. The programme was inaugurated by Dr. Birpal Singh, Director, Central Potato Research Institute, Shimla as a Chief Guest of the programme. Dr Arjuava Sharma, Project Director, Project Directorate on Cattle, Meerut was the guest of honour. On this occasion, Dr. Birpal Singh delivered Industry Day Lecture on the topic "Role of potato in the emerging farming systems in India".



In his address Dr. Birpal Singh suggested the strategies for crop intensification and also to study the entire soil biota for developing appropriate farming system in a given situation. Dr Arjava Sharma pinpointed the role of industry in pursuing the secondary agriculture in various fields. Earlier, Dr. B. Gangwar, Project Director, PDFSR welcomed Dr. Birpal Singh and Dr Arjuava Sharma and explained about the mandate and activities of PDFSR. The inaugural session was followed by technical session in which there was scientist-entrepreneur-farmer interface meeting consisting of thematic areas like conservation agriculture, agro-processing, farm machinery and sustainability of farming system.



In this session, different stakeholders presented their technologies/ products and also highlighted the market demand scenario. There were 2 representatives from fertilizer industries, 2 from food industries, 4 from farm machinery, and 6 from pesticide industries participated in the event. A total of 65 progressive farmers participated in the programme. All the progressive farmers and industrialists were also taken around the farm and explained about the various activities of the directorate. In general, the interaction with industry gave new thrust areas for research in farming system mode.



The programme concluded with vote of thanks by Dr. Anil Kumar, Principal Scientist (Agricultural Extension), who also coordinated the programme.

64th Republic Day

The directorate celebrated 64th Republic Day on 26 January 2013. Dr B. Gangwar, Project Director hosted the national flag and addressed the staff on the occasion. 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.

Agricultural Education

The Agricultural Education Day was celebrated on June 25, 2013 in order to improve the visibility of the Directorate among the students of local schools and colleges, and to sensitize them about the problems and prospects of agricultural education in India. The programme was inaugurated by Dr. Arvind Kumar, DDG (Education), ICAR who was the Chief Guest of this function. In his inaugural address Dr. Arvind Kumar stressed the need to spread the agricultural education among the masses, particularly the youth. He emphasised the importance of agriculture and the scope and opportunities of agricultural education in India.



The inaugural session was attended by other distinguished guests like Dr. Babu Ram, Director (Extension), SVBPUAT, Modipuram, Dr. DV Rai, Registrar, Shobhit University, Modipuram, Dr. Arjava Sharma, Project Director, PDC, Meerut, and Dr. NC Upadhyay, CPRIC, Modipuram. The inaugural session was followed by Debate competition for college/university level students, Quiz competitions for school level students of 9-12 standards and Painting competition for school level students of 6-8 standards.

Prizes were distributed to the winners of different competitions by Dr. B. Gangwar, Project Director in the valedictory function. A total of 18 prizes were given, 3 each in debate and painting competitions and 6 in quiz competition, besides 6 consolation prizes. The programme ended with vote of thanks by Dr. Anil Kumar, Principal Scientist (Agricultural Extension) who coordinated all the events.



Trainings

MTC on GAP

A model training course on “Good Agricultural Practices” sponsored by Directorate of Extension, Ministry of Agriculture, Government of India, New Delhi was organized during March 4-11, 2013. There were 21 participants from state department of agriculture of six states (Andhra Pradesh, Jharkhand, Maharashtra, Odisha, Punjab and Uttar Pradesh).



GAPs in respect of seed and planting materials, tillage practices, crop nutrition, fertilizer and manures, crop protection, irrigation and other crop production techniques, second generation farm machinery for conservation agriculture, concept and approach of integrated farming systems etc were covered.

The trainee participants were taken for field exposure/ study tour to Medicinal Crops Research Farm of Patanjali

Yogpeeth, Haridwar along with adopted villages of KVK, Hastinapur. Participants were also taken to On-Farm Research Programme of PDFSR and labs/ experimental fields of Central Potato Research Institute Campus.



Dr B. Gangwar, Project Director was the Course Director while Dr Kamta Prasad, Programme Facilitator co-ordinated the training.

Krishak Gosthi cum Training

Krishak Gosthi cum training programme was organized on farming system components such as crops, animal husbandry, horticulture, fishery, farm machinery and apiary on 17th February, 2013 at Koteswar and on 16th March 2013 at Kandisud. The farmers reported about positive impact of previous interventions such as introduction of improved variety of wheat (15 to 20 % more yield), improved milk productivity (0.5-1.0 liter) due to mineral mixture supplementation to milking animals, improved health status of milking animals due to deworming and additional farm income through adoption of kitchen gardening. Farmers were given valuable



information in advance on *Zaid* crop cultivation and other farming system components such as animal husbandry and horticulture.

New Initiatives

Regional Training cum Workshop for Eastern Region

As finalized in the 30th biennial workshop held at ICAR Research Complex, Goa during 16-19 November, 2012, the Directorate organized the regional level training cum workshop on “Methodology for OFR experiments with special emphasis for ON-Farm Integrated Farming Systems” for Agronomists, Associated Scientists and Field Assistants of On-Farm Research (OFR) centres from Eastern region comprising of Assam, Bihar, Chattisgarh, Jharkhand, Madhya Pradesh, Odisha and West Bengal during 28-30 January 2013 in collaboration with Indira Gandhi Krishi Vishwa Vidyalaya, Raipur (Chattisgarh). The programme was inaugurated by the chief guest Dr S.K. Patil, Vice Chancellor, IGKV, Raipur. Dr B. Gangwar, Project Director welcomed the gathering and thanked Dr S.K. Patil, vice chancellor for readily accepting the proposal to organise the training cum workshop at Raipur and inaugurating the programme. He informed the vice chancellor about usefulness of the programme in the context of changed mandate from cropping system to farming systems research.

Project Director specified that ECF (OFR) is the only scheme under AICRP which works directly with the farmers to solve their constraints. Dr S.K. Patil, Vice Chancellor, IGKV, Raipur while thanking the Project Director for selecting IGKV, Raipur as venue for the meeting, he felt the need for such a interactions with grass root level workers (Field Assistants) which will improve the data generation in farming systems.



Dr Patil felt that, small and marginal farmers can take benefit only through farming system approach. Integrated farming system is essential for resource recycling thus saving the input costs in the present context of cost escalation. Hands on training, field visits, discussions and review of results were taken during the three day training cum workshop.



The major recommendations are given below.

- The comments and action initiated on the Goa proceedings to be obtained on priority from all the centres.
- Proforma for collecting the bench mark information of new OFR-2 experiment should be sent to centres by 15 March 2013 from PDFSR.
- Proforma for getting the technical programme of OFR-2 should be developed and sent to centres by PDFSR.
- Data collection schedule should be made in pdf and excel format and sent to centres for its use by field assistants.

- The detailed technical programme of new OFR 2 experiment should be submitted by the centres before 15 April 2013 in the prescribed proforma.
- All the centre should conduct formal monthly meetings with field assistant and submit the proceeding along with signature to PDFSR, Also, information on time of input supply to farmers should be communicated.
- Chief Agronomist in consultation with university authorities should take necessary action to delegate financial sanctioning power to OFR Agronomist up to the level of Rs. 20,000/-. This will help in timely procurement of inputs for experiments and ultimately will lead to enhanced quality of data and response from cultivators.
- The vacant position in the scheme needs to be filled on priority. Chief Agronomists are requested to take follow up action.

Regional Training cum Workshop for Western Region

The regional training cum workshop on “Methodology for OFR experiments with special emphasis for ON-Farm Integrated Farming Systems” for Agronomists, Associated Scientists and Field Assistants of On-Farm Research (OFR) centres from Western region comprising of Gujarat, Maharashtra and Rajasthan (only Chittorgarh centre) was organized during 26-28 February 2013 in collaboration with OFR centre, Regional Research Centre of Dr Panjabrao Deshmukh Krishi Vidyapeeth located at Amravati Maharashtra). Dr. Mangala R. Ghanbagdur, Chief Agronomist, AICRP-IFS welcomed the gathering and thanked Project Director , PDFSR for having faith on Dr. PDKV, Akola and Regional Research centre of Amravati for organizing the training cum workshop for field assistants. Dr. J.P. Singh, Programme Facilitator (IFS) said that the farming system research is important in the context of sustaining the small and marginal farm holdings in the country.



Dr. B. Gangwar, Project Director, while highlighting the importance of the training cum workshop said, this is the first time the field assistants of OFR programme in western states are moving outside the state to learn and practice in their domain. He further added that, the training cum workshop is a right platform for clearing the doubts and confusion. In the history of AICRP on IFS, both Chief Agronomist and OFR Agronomist are women and expressed satisfaction with good arrangement made for the programme.



Practical exercise on technical programme preparation and field visit to the OFR experiments were carried out as part of the training cum workshop.



The following recommendations were arrived at the end of training cum workshop.

- The training cum workshop is to be organized every year as considered very much useful by the field assistants.

- Best performing OFR centre and a field assistant can be considered for issuing a merit certificate. It should be based on the critical assessment report by the committee.
- Area under OFR 1 experiment can be extended, if the resources (fund) permit.
- Chief Agronomists should ensure allocation of contingency in 60:40 ratios to on- station and on-farm programme. As soon as Budget Estimate is communicated, the bifurcation should be made and communicated to OFR centre with a copy to PDFSR.
- Training should be organized at PDFSR by Dr Harbir Singh for economists/persons involved in characterisation of farming system to make the uniform collection of data, synthesis and interpretation.
- Proposed new guidelines discussed during the programme would be finalized for characterization and circulated to all by PDFSR within one month. All the 60 experimental households of OFR should be compulsorily included in the survey.
- Proforma of characterization should be revisited and unwanted/ controversial statements be deleted by the characterisation unit of PDFSR.
- The intervention in the technical programme of OFR 2 and 3 should be of low/no cost and the total cost of intervention in all the modules should not exceed Rs 5000/households/year for OFR 2 and Rs 10,000/households/year for OFR 3.
- The centres should select the experimental households across the board, so that the benefits are extended to all sections of the society under marginal and small category.
- The bench mark using the proforma (M0_OFR 2 & M0_OFR 3) be collected and new technical proforma should be finalized for all the OFR experiments by 30th April 2013.
- The centres who have not got the economist post in their on- station or on- farm programme can explore the possibility of involving economist from the university or by filling the approved post of RA/SRF in Agriculture Economics discipline under AICRP-IFS and utilized for characterization work.

Regional Training cum Workshop for Northern Region

Regional level training cum workshop on “Methodology for OFR experiments with special emphasis for On-Farm Integrated Farming Systems” for Agronomists, Associated Scientists and Field Assistants of On-Farm Research



(OFR) centres from Northern region comprising of Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Rajasthan (only Fatehpur centre), Uttar Pradesh and Uttarakhand during 4-6 April 2013 in collaboration with CSK Himachal Pradesh Krishi Vishwa Vidyalaya, Palampur (Himachal Pradesh). Dr. B. Gangwar, Project Director in his address explained to the chief guest that the on- farm research programme is entirely different from normal work. The Project Director also clarified that the on station IFS models are created for education and components optimization point of view. In order to have impact study, GPS based observations are also taken in the on- farm research. Dr. S.P. Sharma, welcomed the participants and complimented the PDFSR for bringing out the success stories in IFS. He highlighted success story of farmers from Kendrapara district of Odisha. Dr. S.K. Sharma, Vice Chancellor in his chief guest address said that only few people think about farmers and real problem faced by farmers. He also emphasized that cost of cultivation should be brought down to greater extent. Dr. Sharma was of the firm opinion that, AICRP-IFS should have more centres than existing one. In the next 10-15 years, there should be a scientifically developed linkage among different components. The training of field staff is appreciable.

The new methodology should be learned and more importantly, they should be practiced. Practical exercise





on characterization of farming systems, technical programme preparation for all the OFR experiments and field visit to the OFR experiments were carried out as part of the training cum workshop.



The following recommendations came at the end of workshop cum training.

- The training cum workshop is to be organized every year as considered very much useful by the field assistants.
- Chief Agronomists should ensure allocation of contingency in 60:40 ratios to on- station and on-farm programme. As soon as Budget Estimate is communicated, the bifurcation should be made and communicated to OFR centre with a copy to PDFSR.
- Training should be organized at PDFSR by Dr Harbir Singh for economists/persons involved in characterization of farming system to make the uniform collection of data, synthesis and interpretation.
- The bench mark using the proforma (M0_OF R 2 & M0_OF R 3) be collected and new technical proforma

should be finalized for all the OFR experiments by 31 May 2013.

- The centres who have not got the economist post in their on- station or on- farm programme can explore the possibility of involving economist from the university or by filling the approved post of RA/SRF in Agriculture Economics discipline under AICRP-IFS and utilized for characterization work.

Meetings

26th IRC Meet

The 26th meeting of the Institute Research Council (IRC) meeting of the Directorate was held on January 08-10, 14 & 19, 2013. The meeting was chaired by Dr B. Gangwar, Project Director. The house congratulated and gave a warm welcome to the new member, Er. Monalisha Pramanik, who joined the Directorate after the last meeting. The Project Director informed the house that the expectations of Director General, ICAR are very high from the Directorate. Therefore, hard work to be put up by all to bring out better research output in farming system mode. He emphasized that the output should be visible in terms of good publications. The meeting proceeded with the presentation of Action Taken Report on the recommendations of IRC held on October 3-4 & 11-12, 2011, presentation of new research project proposals and review of results of on-going research projects. Three new projects were presented and out of which only two were approved after through discussion on the proposals. The results of 37 on-going research projects were also reviewed. The Project Director informed that the progress of many projects was satisfactory, but in some cases, there was scope for further improvement. Dr K.K. Singh, Principal Scientist and I/C PME thanked the Project Director and all the scientists for their cooperation.

Institute Management Committee

Research Advisory Committee

The 3rd meeting of 6th Research Advisory Committee (RAC) of PDFSR was held on 15-16 April 2013 at Modipuram under the chairmanship of Prof. Panjab Singh, former Secretary DARE (GOI) and Director General ICAR. Dr R.P. Singh, Dean, Institute of Agricultural Sciences, BHU, Varanasi. Dr K.K. Vass, Ex-Director, CIFRI, Barrackpore, Dr Shyam Singh, Ex-Director, NRC Citrus, Nagpur, Dr Suresh Pal, Head, Division of Agri. Economics, IARI, New Delhi, Dr A.K. Yadav, Director, National Centre on Organic Farming, Ghaziabad and Dr B. Mohan Kumar, Asst. Director General (Agron. & A.F.), ICAR, New Delhi participated in the meeting as members.



Dr B. Gangwar, Project Director while welcoming the chairman and members, presented the salient achievements of the directorate during the year. He highlighted that national level information on farming systems research is being compiled in the form of book which will serve as status report on farming systems research in India. Further, he mentioned that two success stories from on-farm research have been developed and placed in public domain. In his introductory remarks, Dr Panjab Singh highlighted that farming system has got flagship role in reducing poverty, malnutrition, unemployment etc and the directorate should be upgraded to a full-fledged institute (IIFSR) and responsibility of



developing region and resource specific farming system models should be priority. All the issues of farming needs to be addressed in holistic manner. Enthusiastic inputs of scientist are must but everyone should keep the farmer in mind while developing technologies. Later RAC also visited the field experiments. Dr Kamta Prasad, Principal Scientist and Member secretary proposed the vote of thanks.

Annual Group Meet of NPOF

The Directorate is operating a Network Project on Organic Farming (NPOF) from 2004 with 13 co-operating centres representing 9 agro-climatic regions, 13 NARP zones and 12 states. Annual Group Meeting of Network Project on Organic Farming was organized at ICAR Research Complex, Sikkim Centre, Tadong, Gangtok during 26-27 April 2013.



Dr. H. Kalita, i/c Joint Director of the Centre welcomed the dignitaries and participants and mentioned that the meeting is at right place and on right time looking into the fact of Sikkim state going to be declared as organic state by 2015. Dr. Kamta Prasad, Programme Facilitator, Coordination Unit, PDFSR while delivering his opening remarks highlighted that in order to develop package of practices for organic farming in different cropping systems, NPOF was conceived and implemented at 13 centres. Mr. P T. Bhutia, Additional Director, H&CCDD, Govt. of Sikkim informed that Sikkim state shall become fully organic by the year 2015, which would cover nearly 50,000 hectares. Human resource development in organic farming is vital for the state to progress and achieve the targeted production and he was of the firm opinion that, extension functionaries of the Sikkim state should be trained at PDFSR, Modipuram. Mr. D. K. Pradhan, Additional Director, Fisheries, Govt. of Sikkim told that in Sikkim there are nearly 750 trout fish producing farmers. Thus a substantial quantity of organic feed is also required for trout farming. Dr. P.K. Shrivastava, Dean, CAEPHT, Ranipool, explained that agricultural engineering has a very crucial role in increasing productivity and value

addition including food product processing. Shri B. Swaroop MD, SIMFED and chief guest of the inaugural session told that out of 69000 ha of cultivable area, 18000 ha has been certified as organic, while the remaining areas are under C1, C2 and C3 certification stages.



The demand of organic produces from Sikkim has been increasing day by day worldwide. Organic seed production is an avenue for Sikkim and should be emphasized which is mostly dominated by European countries. Dr. B. Gangwar, Project Director and Chairman of the session informed that in India, Sikkim and Uttarakhand are leading states in organic farming. He felt, it is very important to compile the information on organic farming packages developed through NPOF and elsewhere.



On this special occasion, the publications of the project viz., Annual Report 2011-12 and Consolidated Report (2004-2011) of NPOF brought out by PDFSR was



released by the Chief Guest and Chairman of the Session. All the 13 centres have presented their salient achievements. New technical programme was formulated after through discussions.

Dr J.S. Samra, Chief Executive Officer, National Rainfed Area Authority, New Delhi also attended the group meet for short period and gave valuable ideas about organic farming which also included his experience of recent interaction with the farmers especially women in Sikkim.



Dr Samra pointed out that, priority should be given to high value cash crops like large cardamom, ginger, turmeric and cherry pepper in sikkim. Dr S. Ayyappan, Director General, ICAR upon his visit to ICAR RC Sikkim centre also interacted with participants of annual group meet. Dr N. Ravisankar, National PI, NPOF proposed the vote of thanks.

The recommendations from annual group meet are given below.

Research

- The farming condition (irrigated or rainfed) in which the experiments are conducted should be mentioned clearly in the reports and presentations by all centres.
- Experiment 1 on “Evaluation of organic, inorganic and integrated production systems” and Experiment 2 on “Evaluation of response of different varieties of major crops for organic farming” should be conducted by all the centres. All the critical observations like type and level of insect and disease incidence, weeds etc should be reported from both the experiments.
- Experiment 3 on “Evaluation of bio-intensive complimentary cropping systems under organic production systems” is to be conducted by Dharwad, Pantnagar and Umiam centres while experiment 4 on “Development of Integrated Organic Farming System models” is to be taken up by Calicut, Coimbatore, Dharwad and Umiam centres.

- Experiment 5 on “Evaluation of Farm waste recycling techniques for organic farming” is to be taken up by Dharwad and Modipuram centres.
- Cluster based demonstration of Organic Farming Package under Tribal Sub Plan is to be taken up by Dharwad and Umiam centres.
- All the centres should prepare balance-sheet of nutrients as influenced by organic source of nutrients and cropping systems. The centres should also initiate study on micro-flora of the soil in relation to nutrient availability.
- A common cost effective protocol for vermi wash should be prepared and followed by all the centres. Dr A.B. Singh, PI, NPOF from IISS, Bhopal will prepare the protocol and submit to PDFSR for its circulation to all centres.
- The okra can be taken as effective trap crop for shoot weevil in cotton and the caterpillar trapped in okra may be used as poultry feed under organic farming.
- The cropping systems for the whole year should be specified and in the case of a single crop in a year eg. Turmeric-fallow may be written instead of turmeric only.
- Centres can explore of the possibility of organic honey production wherever mustard is included in the cropping system under organic production system.
- System productivity should always be expressed in kg/ha/unit time.

Administrative

- All the centres should create multi-disciplinary team of scientists for the NPOF. Centres should inform the PDFSR regarding composition of team by 30 June 2013.
- Vacant positions of SRF's in the project should be filled by all the centres at the earliest otherwise financial allotment under contractual services will not be made. Ranchi centre should fill up the post of SRFs immediately as the project activities are suffering and performance of the centre was observed to be not up to the mark.
- All the centres should submit their data sheets and annual report by 30th September of every year.
- All the centres should submit atleast 5 good quality objective oriented photographs from each season for the digital photo library of the project to be created at PDFSR.
- Hard and soft copy of all the publications arising from the project should be forwarded to PDFSR for record.

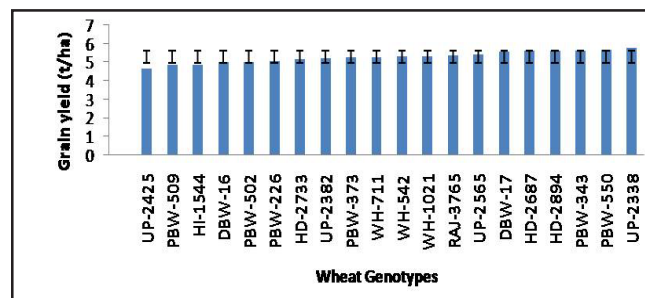
Research Highlights

Performance of timely sown wheat genotypes under irrigated conditions

Mohammad Shamim, B. Gangwar, Devendra Singh, K.K. Singh and Vipin Kumar

Field experiments were conducted during *Rabi* seasons of 2008-10 for morpho-physiological and productivity evaluation of twenty wheat genotypes in relation to prevailing climatic conditions under timely sown irrigated conditions. The genotypes attained flowering and physiological maturity in about 88-105 and 129-137 days after sowing, respectively. Linear increase in leaf area index up to spike emergence was observed in all the genotypes. Rate of photosynthesis (μ mole $\text{CO}_2 \text{ m}^{-2} \text{ s}^{-1}$) was significantly higher (24.17) in UP 2565, while higher rate of transpiration (Tr , $\text{m mole H}_2\text{O m}^{-2} \text{ s}^{-1}$) was observed in UP 2338 (6.17), PBW 226 (6.68) and PBW 509 (6.78). Photosynthetic water use efficiency (PWUE, $\text{m mole CO}_2 \text{ mole}^{-1} \text{ H}_2\text{O}$) and Photosynthetic radiation use efficiency (PRUE, $\text{m mole CO}_2 \text{ mole}^{-1} \text{ photon}$) declined with temperature. A positive association between total biomass and PRUE ($r = 0.50^*$) and seasonal RUE ($r = 0.84^{**}$) was observed. Yield performance was significantly higher (5.5-5.7 t ha^{-1}) in DBW 17, HD 2687, HD 2894, PBW 343, PBW 550 and UP 2338, while it was lower (4.6-4.9 t ha^{-1}) in UP 2425, PBW 509, HI 1544 and DBW 16 (Fig. 1). Grain yield was positively correlated with stomatal conductance and also the number of grains per spike ($r = 0.85^{**}$), biomass productivity ($r = 0.80^{**}$), harvest index ($r = 0.66^*$), spikelets/ spike ($r = 0.69^{**}$). The stepwise regression analysis revealed a number of yield attributing characters biological yield, HI, Spikelets pike^{-1} , shoot length) and HUE were significantly correlated to grain yield. ($R=0.998$). The strong relation of grain yield (t ha^{-1}) of wheat crop with yield attributes is explained with the following linear model.

$$Y (\text{t ha}^{-1}) = -5.354 + (0.425 \times \text{Biological yield, t ha}^{-1}) + (0.131 \times \text{HI, \%}) + (0.004 \times \text{Spikelets pike}^{-1}) + (-0.001 \times \text{shoot length, cm}) + (-0.068 \times \text{Heat use efficiency, kg ha}^{-1} \text{ } ^\circ\text{d}^{-1}).$$



The wheat genotypes in this study exhibited a highly variable response due to biological yield, HI, Spiklets pike⁻¹, shoot length and HUE. The findings of this study provide a practical significance for growers to select wheat varieties based on weather susceptibility. This can help mitigate the risk of poor performance when growers select new varieties of wheat crops. The study also indicated that physiological parameters such as stomatal conductance, Radiation Use Efficiency (RUE) and the environmental parameter i.e. even the moderately higher temperatures can become a constraint to the wheat productivity even under timely sown irrigated conditions in the main wheat producing belt (north western plain zone) of India.

Conservation practices and soil respiration under various rice-wheat system

S.S. Pal, P.K. Rai, P.Kumar and Kuldeep Singh

In situ soil respiration measurements were made under various resource conservation technique (RCT) in rice-wheat cropping system. The RCT included System Rice Intensification (SRI), Direct Seeded Rice (DSR) and Transplanted rice (TPR). For wheat cultivation four subplot treatments like Zero Tillage (ZT), Happy Seeder (HS), Furrow Irrigated raised bed (FIRB) & Conventional wheat sowing (CWS) were superimposed on main plot treatments. Total CO₂ evolution was measured periodically at regular interval of seven days during the entire cropping sequence for two consecutive cropping system from 2010-2012. Total CO₂ evolution from soil, root and rhizosphere was highest under SRI, 115.38 mg CO₂ m² day⁻¹ out of which, soil, root and rhizosphere contributed to 10.48, 15.96 and 73.56% respectively during kharif 2010. On the other hand during kharif 2011, out of total CO₂ evolution from these above components, 164.89 mg CO₂ m² day⁻¹, relative combination from soil, root and rhizosphere were 10.67, 16.77 and 72.56% respectively. Total CO₂ evolution from these three components under HS were highest during rabi seasons 2010-2011 and 2011-12, 147.25 and 160.68 mg CO₂ m² day⁻¹ respectively and the relative contribution from soil, root, rhizosphere was 10.43, 15.02 and 74.54% during rabi 2010-2011 and 10.68, 15.60 and 73.73% during rabi 2011-2012 respectively. From the studies it is evident that the contribution of the rhizosphere is highest releasing higher quantum of CO₂ to the atmosphere than other components viz. soil and the root system only. The crop growing season and the environment also affect the total soil respiration from the cropping system. The resource conservation techniques may play a great role in reducing the CO₂ load in the atmosphere and happy seeder enhances more soil respiration compare to other conservation method during *rabi* season whereas during *kharif* season SRI adds to higher quantum of atmosphere carbon pool.

Simulating the effects of different irrigation regimes on rice-wheat cropping system

N. Subash, V.K. Singh, Mohd. Shamim and B. Gangwar

Scarcity of irrigation water under climate change scenarios is a great concern for rice-wheat production systems, which cover 13.5 million ha in the Indo-Gangetic Plains (IGP) and that are vital for food security. Under this circumstance, demonstration of the impact of different irrigation regimes on rice, wheat and system yields are essential to adopt suitable water saving technologies to minimize productivity risk. This study tested the ability of the Agricultural Production Systems sIMulator (APSIM) model to simulate the effects of different irrigation regimes on yield, irrigation water requirement and irrigation water productivity (WP_i) of selected rice, wheat and rice-wheat system in Upper-Gangetic plains of India. The efficiency of APSIM for simulating grain yield using yield data for 17 years of long-term nutrient experiment was also tested. Based on observed local climate, soils and crop phenological data, the model was parameterized and calibrated. The parameterized model performed well for simulating the grain yield of the rice - wheat system using the weather data of 17 years as indicated by the statistical test. The long term simulated rice yield shows a steadily declining trend at an average rate of 120 kg ha⁻¹yr⁻¹ (R²=0.94, p<0.05) while long term simulated wheat yields show lower declining trend at an average rate of 48 kg ha⁻¹yr⁻¹ (R²=0.48, p<0.05). At 60 % cumulative probability level, rice yield reduced by more than 50 % in 8 alternate wetting and drying (AWD) treatments compared to continuous flooding. Highest WP_i of 8.31 kg ha⁻¹mm⁻¹ was observed under rice-wheat system with the rice irrigation (IR) regime

Treatments	RW system yield (kg ha ⁻¹)	Total irrigation water requirement (mm)	System irrigation water productivity (kg ha ⁻¹ mm ⁻¹)	System water deviation compared to CF+5IF irrigation regime (%)
CF+2IR	9678	1828	5.29	-20.0
CF+3IR	10991	1878	5.85	-9.2
CF+5IR	12102	1978	6.12	0.0
2AWD+2IR	8316	1608	5.17	-31.3
2AWD+3IR	9629	1658	5.81	-20.4
2AWD+5IR	10740	1758	6.11	-11.3
5AWD+2IR	7243	1222	5.93	-40.2
5AWD+3IR	8556	1272	6.73	-29.3
5AWD+5IR	9667	1372	7.05	-20.1
8AWD+2IR	6592	935	7.05	-45.5
8AWD+3IR	7905	985	8.03	-34.7
8AWD+5IR	9016	1085	8.31	-25.5

of 8 days AWD and 5 irrigations for wheat with a yield penalty of 25.5 %. The next highest WP_i was observed in the treatment with a 5 day AWD regime in rice and 5 irrigations for wheat, with a yield penalty of 20.1 %. Thus, we suggest a 5 AWD irrigation regime for rice combined with 5 irrigations during wheat may be the best option under water limiting situations.

Rice-wheat system yield, total irrigation water requirement, system irrigation water productivity and system yield deviation compared to conventional flooding (CF) and 5 irrigation for wheat (+5 IR) treatment. The 2 AWD + 5IR treatment represents the current farmer practice in the Upper-Gangetic plains.

Sucess Stories

Farming System doubles the income of marginal household through low cost interventions

AICRP-IFS, OFR centre, Kendrapara (Odisha)

Shri Keshab Jena having the family of 6 members (3 adults and 3 childrens) was deriving livelihood from the 0.70 ha area (Latitude 20°32'090' N, Longitude 86°17'586' E) located in village Darabal, block Derabis (85 km from Bhubaneswar) in Kendrapara district of Odisha. The annual rainfall of the region is 1500 mm with maximum area under rice-fallow. However, Shri Keshab Jena tried to grow greengram, blackgram, jute and some vegetables like brinjal, bittergourd and tomato after the rice in order to get sufficient income to run his family. Besides these, he was also having a mango plant, one desi cow, two bullocks and four goats. The milk yield of cow was only <2 litres/day. One small pond of 320 m² was present in his farm from which he was harvesting only 10 kg of local species of fish. In general, the productivity of all crops, animals and fish was very low compared to standards. The net income obtained from marketable surplus of all



the components was only Rs 17600/year from which his family were thriving.

On-Farm Research (OFR) unit of Kendrapara district under AICRP on Integrated Farming Systems operating in Orissa University of Agriculture and Technology, Bhubaneswar selected Shri Keshab Jena during 2011 for conducting the research of “On-farm evaluation of farming system modules for improving profitability and livelihood of small and marginal farmers”. The farmer participatory research was conducted in the system perspective by identifying the module wise constraints and addressing of the same with low / no cost interventions in four modules namely crop, livestock, on-farm processing & value addition and optional.

In crop module, the constraints of low yield crop cultivars, imbalanced fertilizer application, high incidence of pest and higher incidence of weeds in jute was addressed through low cost interventions such as replacing the local variety of paddy with high yielding JKRH-401 and Hanseswari, bitter gourd with sathi and tomato with deepti, balanced fertilizer application to rice, application of rhizobium and paper mill sludge to pulses, IPM practices with low cost yellow trap and ash treatment to pulses & vegetables and quizalfop-ethyl weedicide application to jute. Similarly, in livestock module, constraints of low productive desi breed, inadequate & imbalanced feeding and no vaccination was addressed through promotion of Artificial Insemination (AI), integration of azolla for feed, use of albendazole for deworming and vaccination as per schedule. AI led to conception of cow and delivery of calf. In fisheries, the constraint was identified as seasonal derelict pond with short culture period which was addressed by stocking of quick growing species of paccu and silver carps. Apart from these, backyard poultry with improved breed of vanaraja, duckery and paddy straw oyster mushroom was integrated under optional module. In the on-farm processing and value addition module, the house women was trained for making quality pickle from mango and ghee from the excess milk



for which low cost inputs like hand blender/milk frother were given. The total cost of interventions in all the modules was only Rs 8700/year which contributed for additional income of Rs 25000/year. Within one year, the net return per rupee invested on interventions stands at 1.87. The household earns net income of Rs 33900/year which is 92 % higher than benchmark. Besides the higher income, the family meets the nutritional requirement by in house production of quality products such as pulses, milk, egg, mushroom and fish. Nearby farmers are also evincing interest in adopting all the modules as these are of low cost in nature. The family gets additional employment of 43 man days due to the interventions made in farming systems perspective. The success story is also available in <http://www.icar.org.in/en/node/5783>

Human Resource Development

International Training/Workshop

- Dr. N. Subash, Senior Scientist and Dr. Mohd. Shamim, Scientist attended the third training workshop and final review meeting of SAARC-Australia Project on “Developing capacity in cropping systems modelling to promote food security and the sustainable use of water resources in South Asia” during 10-14 March, 2013 at SAARC Agriculture Centre (SAC), Dhaka, Bangladesh organized by SAARC, CSIRO- Australia, IRRI-Philippines, Australian Centre for International Agricultural Research-Australian Government.



- Dr. N. Subash, Senior Scientist attended the AgMIP multiple crop modeling training workshop during 18-22, March, 2013 at Kathmandu, Nepal organized by AgMIP, ICRISAT and CIMMYT-Nepal
- Dr Harbir Singh participated in the AgMIP-sponsored workshop on regional economic modeling and climate change impact assessment using the TOA-MD model held in Dubai during 29 April – 3 May 2013.



Recognition

Dr N. Subash, Senior Scientist was selected as “Principal Trainer” by AgMIP for APSIM for two multiple crop modeling training programs held at Kathmandu, Nepal (18-22nd March, 2013) and ICRISAT, Hyderabad (25-29th March, 2013).

National Training

New Joining

Probation Clearance

Promotion

Transfer

Visitors

- Dr Panjab Singh, Ex Director General, ICAR and Secretary, DARE visited on 15-16 April 2013
- Dr A.K. Sikka, DDG (NRM) Visited on 12 May 2013

WAY FORWARD



As per the latest agriculture census, the total number of operational holdings in the country has increased by 6.6 % (138 million in 2010-11). In the coming years, one of the biggest challenges for Indian agriculture would be retaining its youth in agriculture as more than 40 % of the farmers are willing to quit agriculture if better livelihood options through off-farm employment are provided. Over 60 per cent of the world's rural population is made of youth, but due to their limited access to assets (in particular land), markets, finance, education and skills training, rural youth are often unemployed or work informally. With India's population forecast

to grow at 1 per cent per year, significantly faster than that of China at 0.4 per cent per year, India will become the most populated country in the world by 2030. India's population is likely to rise from 1.21 billion in 2010 to 1.48 billion by 2030, and further to 1.6 billion by 2050. More significantly, India will have the largest number of people in the working age group of 15-59 years. According to Census of India's population projections, Uttar Pradesh, Bihar, Madhya Pradesh and Rajasthan will account for more than 50 per cent of the increase in India's working age population and these states account for large number of operational holdings with almost equal share of operated area. Empowering today's youth is our generation's greatest responsibility. A 10-15 year old today will be the farmer and agricultural leader who will feed the world in 2050-2075. These youth are the innovators and change agents who can solve the world's food crisis. Size and resource neutral farming system models are proved to be highly profitable besides generating round the year income and employment. Rural youth can be utilized for developing secondary agriculture and input-output supply chains in farming systems perspective. Educating the youth starting from schools especially on farming systems will make them better understand the concepts and new technologies. Making of professional and business oriented models in farming systems perspective for youth will be important to meet the challenge of retaining youth in agriculture.

B. Gangwar

Important Publications

1. Annual Report 2011-12 of NPOF
2. Annual Report 2011-12 of AICRP-IFS
3. QRT report 2007-12 of PDFSR
4. Impact of resource conservation technologies in India
5. Sanrakshan krishi apnayan kethi ka vyasha bhanaiyun
6. Krishi Alok pranali (Hindi patrika)

Upcoming events

July :
Aug. :
Sept. :
Oct. :
Nov. :
Dec. :

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