



ICAR-IIFSR Newsletter



ICAR-Indian Institute of Farming Systems Research
(ISO 9001:2015 Certified Institute)

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From the Director's Desk



Dear Readers,

I am delighted to present you this issue of ICAR-IIFSR Newsletter covering many important events, activities and accomplishments that happened during January-June 2023. Our commitment to research and extension is evident in the tangible outcomes we have achieved. In the past six months, we have witnessed breakthroughs that promise to shape the future of our field, and our commitment to excellence remains unwavering. Our collaborative efforts have not only strengthened our internal capabilities but have also established meaningful partnerships that amplify our impact. As we continue on this journey of exploration and dissemination, I encourage each member to remain inspired and engaged, for the collective dedication that truly makes a difference.

I extend my gratitude to each member of the institute for their hard work and collaborative spirit. Let's carry this momentum forward, building on our successes and embracing new challenges with enthusiasm. I am sure that you would find this issue informative and interesting.

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About the Institute

The ICAR-Indian Institute of Farming Systems Research, with a 70-year legacy, has been instrumental in advancing agronomic management methods and promoting alternative cropping systems. Initially focused on fertilizer trials, it launched the "Simple Fertilizer Trials on Cultivators' Fields" in 1953, evolving into the 'All India Coordinated Agronomic Experiments Scheme (AICAES)' in 1956. This initiative broadened to encompass agronomic research, including cultural practices, irrigation, nutrition, and multi-cropping. Recognizing the need for a holistic approach, it transformed into the 'Project Directorate for Cropping Systems Research (PDCSR)' during the 7th five-year plan in 1989. Subsequently, during the 11th five-year plan, it became the 'Project Directorate for Farming Systems Research (PDFSR).' In 2014, under the 12th five-year plan, PDFSR was elevated to a full-fledged institute, named the "ICAR-Indian Institute of Farming Systems Research." With 74 centers under the AICRP on IFS and 20 cooperating centers under NPOF, it spans 26 States/UTs, organized into three research divisions and one project coordinating unit, along with a section for Technology Transfer and Assessment, to effectively fulfill its mandate.

Research Highlights

Sustainable resource management for climate smart IFS under AICRP on integrated farming systems, Modipuram centre

(N Ravisankar, PC Ghasal, D Dutta, S Malik, Amit Nath, AK Prusty, Poonam Kashyap and M Shamim)

Total cost of cultivation of 0.70 ha IFS model was recorded to be Rs. 2,15,025 with a gross return of Rs. 4,52,324 and net return of Rs. 2,37,299. A total of 396 mandays were generated in IFS model. If the cost of family labour is excluded then total net return increased to Rs. 3,56,099 with B:C ratio of 4.70 of the IFS model. Among different modules, highest net return per unit area was recorded from agri-horti module followed by cropping system and multi-layer farming module.

AICRP on integrated farming systems (AICRP IFS) (On-Station National)

(AK Prusty, M Shamim, D Dutta and Raghuvveer Singh)

REY(t/ha) varied between 10.24 (LGP) to 41.00 in Trans Gangetic Plains (TGP). Animal feed cost as percentage of market input cost varied from 5.7% in Lower Gangetic Plains (LGP) to 78.8 % in Islands. Net returns per rupee invested varied from 0.2 (West coast plains and hills) to 1.29 in Eastern Himalayan region (EHR). Water productivity (Rs/m³) was highest being in West Coast Plains and Hills (254.8). Improvement in soil OC was observed over initial status in the range of 2.4 % (Eastern Plateau and Hills) to 69.7 % (Island)

AICRP on integrated farming systems- On-Farm research (National)

(Raghuvveer Singh, MA Ansari, Raghavendra KJ and Sunil Kumar)

It was recorded that application of NPK gave 1359, 2086 and 1415 kg/ha higher yield over the farmers' practice, which can be further increased up to 1866, 2633 and 1804 kg/ha in rice-wheat, maize-wheat, and rice-chickpea systems, respectively, with the addition of soil test-based micronutrients. Agronomic Efficiency of N can be enhanced to 34, 20, 19 and 47 kg (grain yield/kg of N) from 7, 9, 8, 18 (grain yield /kg of N) in rice-rice, rice-wheat, maize-wheat and rice-chickpea systems, respectively, by application of recommended dose of N with P and K instead of N alone.

All India Network Programme on Organic Farming (AI-NPOF) (National)

(N Ravisankar, M Shamim, Raghuvveer Singh, MA Ansari and Raghavendra KJ)

Economic analysis of integrated organic farming system (IOFS) models developed in different states indicates that under organic farming system, a net income of 2.29 lakhs per acre can be obtained from the spices based organic farming systems. Results of evaluation of IOFS (1 acre) for Western Plain Zone of Uttar Pradesh revealed that basmati rice-mustard-moong bean system recorded net return of Rs 1,67,995/ha. Yield level of fodder was found to be 44, 34.5, 46.5 and 48.5 t/ha for berseem, oat, maize + cowpea and sorghum + cowpea, respectively which can meet the requirement of 2 dairy animals.

Updating of cropping system atlas of India and preparation of futuristic crop plan for 2030, 2040 and 2050

(Raghuveer Singh, N Subash, V Ramamurthy, CA Ramarao, BMK Raju and M Shamim)

The rice, wheat and sugarcane replacing other crops in North and Central India and mono-cropping pattern emerged in last two decades is replacing minor crops. The number of cropping systems have also reduced from 250 to 225. In case of rice-wheat, around 5 mha area increased in last two decades.

Scaling and impact assessment of integrated farming system for livelihood of farmers.

(Raghavendra KJ, AK Prusty, MA Ansari, Nirmal, P Punia, T Rajendran, Jacob John and Alibaba)

The IFS beneficiaries have more diversified farming systems than non-participants with horticulture and animal component generating higher net income. The matching results show that there is positive and significant impact on the gross and net income through adoption of IFS. The improvement in the dietary diversity is also testimony for farming system approach of programme implementation.

Development of sustainable IFS model for Western Plain Zone of Uttar Pradesh

(LR Meena, S Malik, Amit Nath, D Kumar, C Bhanu, P Punia and AL Meena)

A comprehensive IFS model has been developed, encompassing crop cultivation (1.04 ha), horticulture (0.22 ha), dairy+family unit (0.1ha), fish pond (0.1 ha), vermicompost unit, mushroom production unit, kitchen garden, boundary plantation and secondary agricultural activities. In the crop components, the sugarcane-ratoon-wheat system yielded the highest SEY of 31.0 tons per year, followed by the pearl millet-chickpea-okra system (24.4 tons per year), and the sorghum-mustard-moong bean system (21.0 tons per year). In terms of energy output and input, the sugarcane-ratoon-wheat cropping system in a 3,500 square meter area generated the maximum energy output of 11.2×10^4 MJ (mega-joule) calories, while it also required an input of 3.4×10^4 MJ calories. The model yielded an overall gross return of Rs. 7,60,000 and a net return of Rs. 5,14,000. The model generated a per day income of Rs. 1450. The model also generated a total of 862 mandays. The model emitted 6033 kg CO₂ equivalent GHGs whereas the carbon sequestration was in the tune of 44028 kg. So overall it was a carbon negative model in

terms of GHGs emission.

Development of fruit based integrated farming systems for Western Plain Zones of U.P.

(PP Singh, P Punia, S Malik, Amit Nath, AL Meena, Nirmal and Raghavendra KJ)

A field experiment encompassing three Guava varieties (*Psidium guajava*) - Allahabad Safeda, Sardar Guava (L-49), and Sweta and three Pomegranate varieties (*Punica granatum*) - Bhagwa, Arakta, and G-137 was conducted. These were intercropped with Sweet orange/Mosambi (*Citrus sinensis*), Nagpur mandarin (*Citrus reticulata*), and Kinnow (Mandarin X Orange). The vegetable-based intercropping module yielded the highest rice equivalent yield (REY) across all crops and their respective cultivars, ranging from 178.3 to 186.2 q/ha. In contrast, the fodder-based cropping module produced REY ranges 126.4 to 135.6 q/ha, while the cereal-based module achieved yields ranging from 90.3 to 98.8 q/ha reflecting the superior profitability of vegetable-based intercropping in orchard farming.

Status of organic agriculture in Western Himalayan region

(Sunil Kumar, AL Meena, LR Meena and Nirmal)

The result of the baseline survey showed that out of 120 sample farmers; of cultivated lands are landless (0.02 hectares), marginal (0.021-1 hectares) of cultivated lands are small, (1-2 hectares) of cultivated lands are medium and (4-10 hectares) of cultivated lands are large farmer (Above 10 hectares). The sample farmers numbers were 14, 19, 46, 13 and 08, respectively. Among cropping systems, the highest net returns was obtained in the order of rice-maize-vegetable cultivation (Rs.120344/ha) followed by rice-pulses-wheat (Rs. 98000/ha), rice-wheat (Rs.88950/ha), maize-potato-wheat (Rs.103380/ha) and pulse-mustard-wheat (Rs.101100/ha). The most preferred farming system based on adoption by more number of households are Crop+Livestock+Poultry (13%), Crop+ Livestock+ P o u l t r y + A g r o f o r e s t r y (6 7 %) , Crop+Livestock+homestead (16%), Crop +Vegetables (9%), Crops + Horticulture (8%) and Vegetable+ Vegetable+ Vegetable (7%). The food insecurity gap/surplus index shows that the food secure households exceeded the food poverty line by 7, 6 and 9 percent while food insecure 4 households fell short of required calorie intake by 0.09, 0.10 and 0.08 percent, respectively.



Plate 1. Interaction with farmers during the survey for Districts Udhampur & Reasi during 21st August 2022 to 30th August 2022

Development of mustard strains for organic production system

(D Kumar, LR Meena, KH Singh and Raghavendra KJ)

In this programme, nine homozygous and high-yielding mustard strains were successfully produced for organic farming. Notably, MM16A241 and MM16A082 were found with seed yields of 29.84 q/ha and 29.07 q/ha, surpassing the standard RH-749 (26.38 q/ha). These strains also demonstrated an average 11.64% higher yield and an impressive 46% oil content.

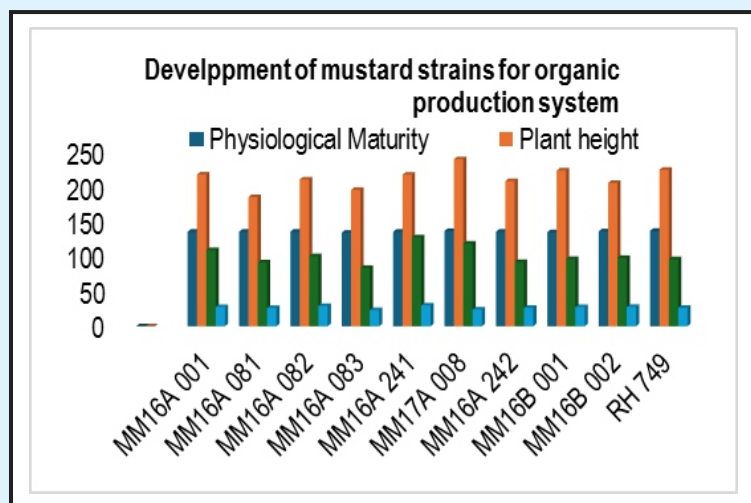


Plate 2. Monitoring of mustard fields grown under organic management systems by Scientists

Nutrient management in different cropping systems under organic production systems

(PC Ghasal, C Bhanu, D Dutta, Lalit Kumar, AL Meena and Jairam Choudhary)

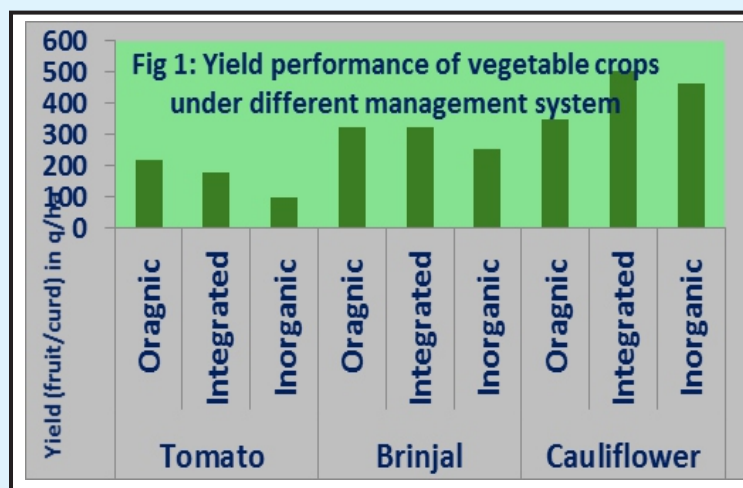
Mustard oilcake application, particularly at 5.0 t/ha, significantly improved the growth and yield parameters of both basmati rice and mustard. This translated into a substantial 44-115% increase in basmati rice yield and a noteworthy 45.1-100.1% enhancement in mustard productivity compared to FYM and vermicompost application. The highest yields were observed with the application of 5.0 t/ha mustard cake, resulting in a basmati rice yield of 4565 kg/ha, mustard yield of 2647 kg/ha, and a system productivity of 10.42 t/ha REY. System profitability was also maximized with the application of 2.5 t/ha in both kharif and rabi seasons.



Plate 3. Mustard and basmati rice crops under organic nutrient management

Pest and disease management module of vegetables developed for organic production systems

(C Bhanu, AL Meena and Jairam Choudhary)



Developed an organic pest and disease management approach for tomato, brinjal, and cauliflower, focusing on holistic methods. Three years of data (2019-22) has shown significant improvement in scientific nutrient and pest management, yielding impressive results: tomato - 220q/ha (B:C ratio 4.04), brinjal - 322q/ha (B:C ratio 5.07)

cauliflower - 347q/ha (B:C ratio 4.6), outperforming integrated systems. Tomato suffered losses, with the highest damage (23.4%) from fruit rot in inorganic management, compared to lower impact (16.7%) in integrated management. Brinjal faced a 26.9% average fruit yield loss, with the highest infestation (37%) under organic, followed by integrated (26%) and inorganic (23.5%) systems. Cauliflower demonstrated resilience, to downy mildew which was observed late. Highest water productivity (0.174 kg/L) was under organic management, highlighting its efficiency over other practices.

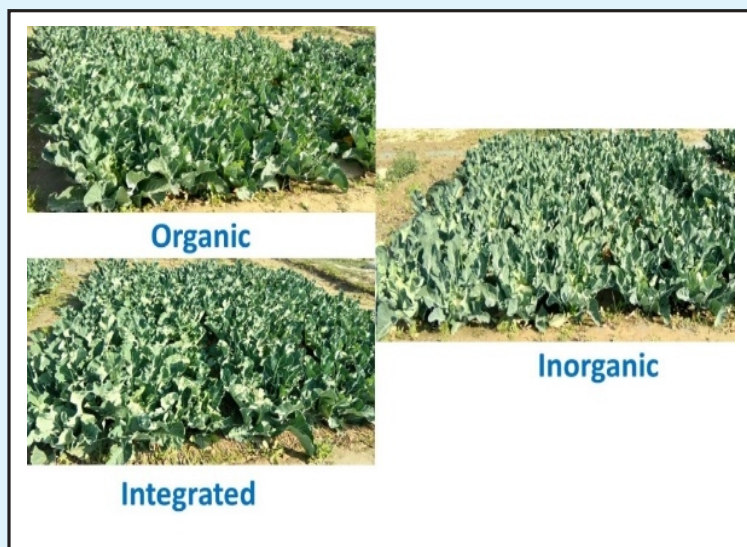


Plate 4. Field view of cauliflower under different management system

Characterization of existing farming systems in Uttarakhand.

(Nisha Verma, VP Choudhuary, Amit Nath and Vipin Kumar Choudhary)

A Survey conducted for 30 households of Chakarpur (Bhoodpuri), Khambari (Mashra), Pahadpur (Nagadpuri) villages of Bazpur block and Uddham Singh Nagar District showed that Non-mechanized (manual/traditional tools) operations are mainly done by women farmers in terms of manual dibbling (93.3%), paddy transplanting manually (100%), weeding using hand hoe (88%), harvesting of field crops using sickles (80.6%), harvesting of horticultural crops manually (78%), threshing manually (53.3%), carrying of fodder as head load (93.3%). Time involvement in farming system activities for male was 750 hrs per annum whereas 1052 hrs per annum for female. On average women in the prevailing farming systems of Bazpur block, Uddham Singh Nagar district were found disempowered in the five domains of agriculture (5DE score < 0.80).

Evaluation and identification of farm implements under different farming systems

(VP Choudhuary, Nisha Verma and LR Meena)

Ergonomically designed multipurpose horticultural crops harvesting tool developed by ICAR-IIFSR was evaluated amongst users in selected horticultural crops to assess its ergonomic comfort (grip fatigue, strain index) and work output (kg/hr). The tool was found very effective in terms of improved work output by ~9.0, 10 and 11 % in case of harvesting of bitter gourd, sponge gourd and bottle gourd respectively. A significant reduction ($p < 0.01$) was observed in grip fatigue by ~49, 39 and 58 % in okra, bottle gourd and sponge gourd harvesting respectively. Significant reduction ($p < 0.01$) in Strain Index was observed by ~ 44.37, 56, 55, 47, 69 % in okra, bottle gourd, sponge gourd, bitter gourd and brinjal harvesting respectively.



Plate 5. Harvesting of sponge guard with improved tool

Cluster based on-farm participatory research in farming systems under tribal sub plan

(Nisha Verma, VP Choudhary, S Malik, Amit Kumar, C Bhanu, Amit Nath, Alka Verma and Dinesh Kumar)

Impact of farming system interventions towards adoption and net benefit realized by the farmers was assessed (without input support). Non-significant reduction in total income was observed in all the four farm types without input support. Dietary gap as compared to recommended dietary allowances (RDA) in terms of vegetables, fruits, milk and animal food consumption has reduced significantly after farming systems interventions in all the four farm types. Partial adoption of improved practices in different crops (72-90%) was observed due to non-

availability of inputs (IPM) at local level. Non availability of poultry chicks of improved breeds, higher requirement of labour and non-availability input (spawn) for mushroom were the major constraints in adoption of IFS technologies. Improved tools and implements are being used by 100 % members of custom hiring centres.

New Appointments/ Superannuation



Dr Sunil Kumar joined as Director, ICAR-IIFSR, Modipuram w.e.f. 01-02-2023



Dr N. Ravisankar joined as Project Coordinator, AICRP on IFS at ICAR-IIFSR, Modipuram w.e.f. 15-06-20



Dr R. P. Mishra joined as Head, Integrated Farming Systems (IFS) Division at ICAR-IIFSR, Modipuram w.e.f. 16-06-2023



Dr A.S. Panwar superannuated from ICAR-IIFSR, Modipuram as Director on 31-01-2023

Seminar/Symposia/Workshop Organized



The VII (XXXV) Biennial workshop of AICRP on Integrated Farming Systems held during 18-21 January, 2023 at MPKV, Rahuri.



National Symposium on Agroecology based Agri-food Transformation Systems organized at ICAR-IIFSR by Farming Systems Research and Development Association (FSRDA) in collaboration with CIMMYT and ICRISAT during 27-28 January, 2023. Dr Rajendra Agrawal, Hon'ble Member of Parliament graced the occasion as Chief Guest along with Padamshri Dr Arvind Kumar, as Guest of Honour with gracious presence of Dr AK Singh, EX VC, BAU Sabour, Dr M S Chouhan, VC, GBPUAT, Dr Rajbir Singh ADG (AAFCC), Dr V K Singh, Director, ICAR-CRIDA, and Mr Naresh Sirohi.

HRD and Capacity Building Activities



A fifteen days Hands on Training Course on "Certified Farm Advisors on Organic Farming (Module II)" in collaboration with National Institute of Agricultural Extension Management (MANAGE), Hyderabad was organized from 07-21 February, 2023. Twenty-eight participants from five different states namely Tamil Nadu, Andhra Pradesh, Madhya Pradesh, Uttar Pradesh and Manipur participated in the training.



ICAR-IIFSR organized training programme on Agro-Ecology and Sustainable Food Systems during 10-12 April, 2023 for NABARD officials sponsored by NBSC, Lucknow.



A capacity building and skill upgradation on Farm Management 22-28 February, 2023 was organized for Technical Officers of ICAR and completion certificate awarded to trainees.

Exhibition of IIFSR Technologies



Display of Integrated Farming System, Organic Farming, Natural Farming and Drudgery reduction technologies to

Hon'ble Governor Smt Anandi Ben Patel and State Agri. Minister Sh Surya Pratap Shahi on 19 March, 2023 during Krishi mela.



Display of Integrated Farming System, Organic Farming, Natural Farming technologies at exhibition on the occasion of World Environment Day on 05 June, 2023 at NAS complex, New Delhi visited by Hon'ble Minister of State GoI, Sh. Kaliash Choudhary.



Hon'ble Secretary, DARE and DG, ICAR visited ICAR IIFSR stall at G20 MACP meet at Varanasi during 17-19 April, 2023.



Display of IFS technologies in Pashu Mahotsav and Pradarshini evam Prashikshan, from 06-07 April Muzaffarnagar.

Celebration of Events



34th Foundation Day of ICAR-IIFSR organized on 1st April, 2023 with great fervour



Cultural evening on the eve of 34th Foundation day celebration of ICAR-IIFSR on 1st April, 2023.



Empowering Women: International Women's Day (March 08, 2023) in Iklauta Village, Meerut.

Other Events



One day Farmers Meeting and Frontline Demonstration on Oil Seeds and Agri-drone Demonstration organized at Village Atali, Muzaffarnagar on 27 March, 2023.



Team of IIFSR scientists' participation in Inception Meeting of CIMMYT project on 'Additive intercropping in Wide-Row Crops' at Lataguri, WB during 24-27 May, 2023.



प्लास्टिक प्रदूषण को हराना विषय पर दिनांक 05 जून 2023 को विश्व पर्यावरण दिवस आयोजन। निदेशक डॉ सुनील कुमार ने सभी से सिंगल यूज प्लास्टिक का उपयोग कम करने, बारंबार प्रयोग होने वाली प्लास्टिक का उपयोग करने और प्लास्टिक के अधिकतम पुनर्चक्रण करने का सुझाव दिया।



Biennial workshop of AICRP on IFS was organized at MPKV, Rahuri during 18-21 January 2023.



Field visit and discussion with scientists on experimental activities by PMEC team at ICAR-IIFSR on 01 March, 2023.



Demonstration of Agricultural Spray drone to participants of CFA trainees on 10th February, 2023 at ICAR-IIFSR.



Newly elected members of Staff Welfare and Recreation committee on 10th May, 2023.



PMEC team led by Dr Sunil Kumar, Director, ICAR-IIFSR visiting experimental farms on 01 March, 2023.



35th Institute Research Council meeting held during 19-24 June, 2023



ICAR-IIFSR scientists Dr N Ravisankar and Dr A K Prusty as resource personnel for International training organized by CIMMYT and IWMI, Nepal during 14-17 February, 2023 at Kathmandu, Nepal.

Technology Commercialization and Agri - Business Incubation

एग्री बिजनेस इनक्यूबेशन के अंतर्गत क्षेत्र में कृषि व्यावसायीकरण द्वारा स्वरोजगार को बढ़ावा देने के उद्देश्यों से कृषि प्रणाली संस्थान और कृषि व्यवसायों (एग्री-फार्म बड़ी प्रोड्यूसर कंपनी लिमिटेड, मुजफ्फरनगर; अनंत गोल्ड सिरका, मुजफ्फरनगर; देशी मशरूम एग्रो प्राइवेट लिमिटेड, मेरठ और ओर्गी फ्रू, मेरठ) के मध्य समझौता ज्ञापन पर हस्ताक्षर (3 मई 2023)



Awards and Honors

1. Best Research Division Award was awarded to Project Coordination Unit of ICAR-IIFSR on Foundation Day (1 April, 2023).
2. Best Research Paper Award was awarded to Dr. N. Ravisankar et al published in Land Degradation and Development on Foundation Day (1 April, 2023).
3. Best Technical Officer Award was conferred to Dr Vipin Kumar, CTO, of PC Unit on Foundation Day (1 April, 2023).
4. Dr. M.A.Ansari, received the IAHF- Young Scientist Award- 2020 by The Indian Association of Hill Farming, Umiam, Meghalaya during National Conference on "Rebooting the Hill Farming for Future Sustainability and Livelihood" on 8- 9 June, 2023 at ICAR RC for NEH Region, Umiam.
5. Dr. M.A.Ansari, received the Young Scientist Award in the area of Plant Nutrition -2022 by Mosaic India Pvt. Ltd., Gurgaon, India during Mosaic Foundation Award Ceremony on 10 April, 2023.



6. Best Outreach/Extension activities award was awarded to Team Farmer First Project.
7. Best paper award conferred for the article entitled Jaivik fasal utpaadan : Gunvatta drishtikon evam mahatta Authored by Nisha Verma, Peyush Punia, Lalit Kumar, Kushagra Joshi, evam Azad Siungh Panwar published in Gehun Evam Jaun Swarnima 2021, Vol 13, ICAR-IIWBR Karnal on 9th February, 2023 by ICAR-IIWBR

Training Attended by Scientists

Sl. No.	Details of training attended by Scientists
1.	Multivariate Data Analysis (online) training organized by ICAR -NAARM, Hyderabad during-2027 March, 2023 was attended by Dr P C Ghasal
2.	Training Programme on "Data Visualization using R (Online)" organized by ICARNAARM, Hyderabad during 01-08 March, 2023 was attended by Dr P C Ghasal

Snapshots from ICAR-IIFSR participation under aegis of Natural Resources Management Division of ICAR at exhibition held on the sidelines of G20 Meeting of Agricultural Chief Scientists (MACS) organized at Varanasi during 17-19th April 2023





Published by
Dr. Sunil Kumar
Director
ICAR-Indian Institute of Farming Systems Research
Modipuram, Meerut 250 110 (UP)

Telephone: 0121-29733430
E-mail: director.iifsr@icar.gov.in



Compiled and Edited by
Dr. Poonam Kashyap
Dr. A.L. Meena
Dr. P.C. Ghasal
Dr. Kamlesh Kumar



एक कदम स्वच्छता की ओर



भाकृअनुप - भारतीय कृषि प्रणाली अनुसंधान संस्थान
मोदीपुरम, मेरठ -250 110, उत्तर प्रदेश, भारत

