



ICAR-DWR

SIGNIFICANT ACHIEVEMENTS

2024-25



ICAR - DIRECTORATE OF WEED RESEARCH

Jabalpur- 482004 (M.P.)

<https://dwr.icar.gov.in>



April 2025

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Preface

Weeds are the most important biological constraint in sustainable crop production. They directly impact resource utilization and crop productivity, human, animal and environmental health, and ultimately the food security and farmer's income. The ICAR-Directorate of Weed Research, Jabalpur with its AICRP-WM centers located in different agro-ecological regions of the country, is continuously developing and disseminating the viable weed management technologies for the benefit of the farming community and other stakeholders. The major achievements of ICAR-DWR during 2024-25 are presented in this document.

The achievements are grouped into themes. Development of integrated weed management technologies for different crops (rice, maize, finger millet, cluster bean, soybean, etc.) and cropping systems, weed management in natural farming, and battery-operated hand-held weeders were the major achievements under **Sustainable weed management programme**. Under the theme **Management and utilization of invasive alien weeds**, the major achievements were importation of new insect-bioagent for management of Parthenium, large-scale demonstration and popularization of biological control of water fern (*Salvinia molesta*) using insect bioagent *Cyrtobagous salviniae*, and development of weed maps and state weed atlas. With regard to **Crop-weed interference under changing climate and herbicide resistance**, emphasis was given to understand the physiological, biochemical and molecular mechanisms of crop-weed interaction and herbicide efficacy under changing climate scenario, chemical mutagenesis for generation of herbicide tolerant crops, and development of weed seed genebank. Leaching, persistence and degradation of different herbicides in soil and their residues in soil, food-grain and stover were focused under the theme **Environmental impacts of herbicides and mitigation measures**.

The major accomplishments of outreach activities have been covered under **Dissemination and socio-economic impact of weed management technologies**. MoUs with different organizations were also signed to widen the scope of weed research and to produce quality crop seeds. Six technologies of the Directorate have been certified by the ICAR. In addition, 05 copyrights and 01 patent were also received. Conferences, meetings, training programmes, publications, rajbhasha activities, recognitions, seed production, new facilities, revenue generation, health camp, etc. summarizes the overall achievements of the Directorate in these areas. The present document provides a glimpse of Directorate's achievements during year 2024-25. The inputs from all the scientists of DWR and AICRP-WM centres are duly acknowledged. The support of Mr Daud Raza, Young Professional of ARIS Cell is highly appreciated. We hope that this document will be useful to the researchers, students, farmers and other stakeholders. The suggestions for further improvement are welcome.

Editors

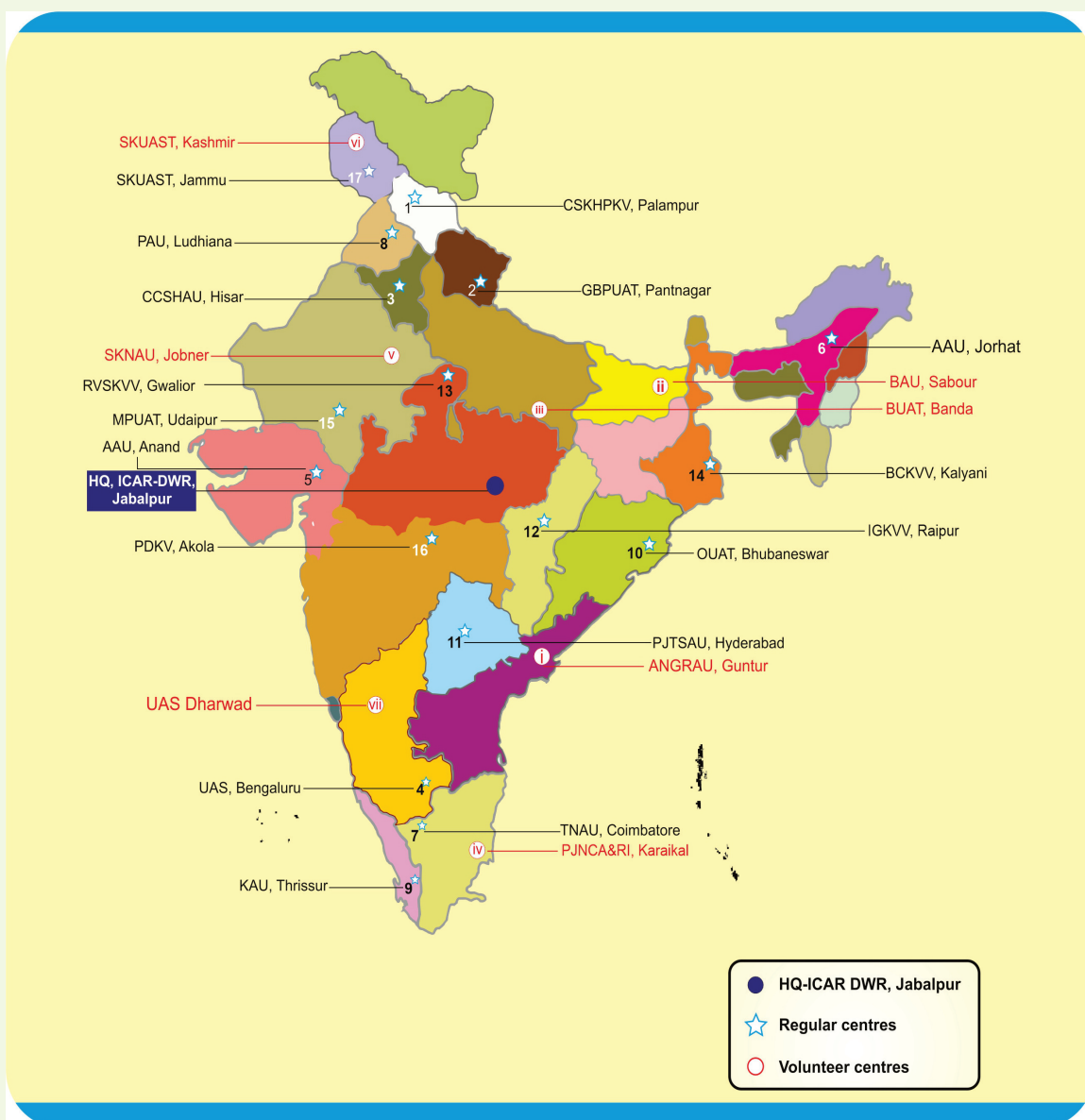
Date: 15 April, 2025

Place: Jabalpur



ICAR-Directorate of Weed Research

All India Coordinated Research Project on Weed Management





ICAR-Directorate of Weed Research

Significant Achievements 2024-25

A. Sustainable Weed Management Strategies in Diversified Cropping Systems

Rice

Drone-based application of herbicides in transplanted rice

- Drones are increasingly used globally for herbicide application, offering precision spraying and efficiency, uniform coverage, reduced herbicide usage, and labour savings compared to traditional methods. In India, use of drones for herbicide spraying is still under experimentation, and SOPs are being developed. In transplanted rice, post-emergence application of triafamone + ethoxysulfuron (66.5 g/ha), florpypyrauxifen-benzyl + cyhalofop-butyl (150 g/ha) and bispyribac sodium (25 g/ha) using drone provided effective weed control and higher grain yield. The bio-efficacy of all the herbicides using drone was similar to that of knapsack spraying (AICRP-WM, PJ TSAU, Hyderabad).



Management of Najas and Utricularia in rice field using quick lime (Calcium oxide)

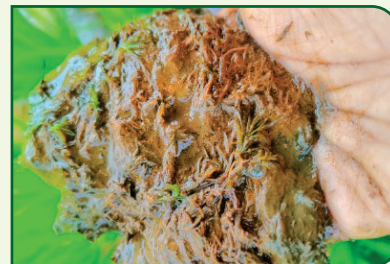
- Aquatic weeds such as Najas (southern naiad or bushy pondweed) and Utricularia (bladderworts) are becoming a serious menace in rice under low-land ecologies of Kerala. To manage the infestation of these submerged aquatic weeds in transplanted rice, localized application of quick lime 240-300 g/m² has been found quite effective (AICRP-WM, KAU, Thrissur).



Severity of infestation



Mixing of lime with water in rice field



Decomposition of weed 10 days after liming

Sustainable weed management in direct-seeded rice (DSR)

- In **dry DSR**, rice varieties *viz.*, Purna, Swarna Shreya, DRR47 and Swarna Samriddhi were found promising for weed suppression (49.1-67.3%) with 4.39-4.76 t/ha grain yield. Application of florpyrauxifen-benzyl 2.13% w/w + cyhalofop-butyl 10.64% w/w EC 150 g/ha as PoE effectively controlled diverse weed flora and recorded higher rice grain yield. Pendimethalin 38.4% + pyrazosulfuron ethyl 0.85% ZC (Ready mix/RM) 920 g/ha as PE *fb* florpyrauxifen-benzyl 2.13% w/w + cyhalofop-butyl 10.64% w/w EC 150 g/ha as PoE, pretilachor + pyrazosulfuron 615 g/ha (PE) *fb* cyhalofop + penoxsulam 135 g/ha (PoE) *fb* HW at 45 DAS were equally effective for broad-spectrum weed control (ICAR-DWR).



- At Hisar, penoxsulam + pendimethalin (RM) 625 g/ha as pre-emergence (PE) *fb* fenoxaprop-ethyl + ethoxysulfuron (67 + 18 g/ha, tank-mix) as post-emergence (PoE) resulted in significantly lower density of *Leptochloa chinensis* and *Dactyloctenium aegyptium* and recorded significantly higher grain yield (5.14 t/ha), which was at par with pendimethalin 38.4% + pyrazosulfuron ethyl 0.85% ZC 785 g/ha as PE *fb* florpyrauxifen-benzyl 2.13% w/w + cyhalofop-butyl 10.64% w/w EC (150 g/ha) as PoE (AICRP-WM, CCSHAU, Hisar).



Weedy check



Penoxsulam + pendimethalin (RM) 625 g/ha as PE *fb* fenoxaprop-ethyl 67g/ha + ethoxysulfuron 18 g/ha (tank-mix) as PoE (25 DAS)



- In **wet DSR**, weeds caused 59% yield loss. Application of florpyrauxifen-benzyl 2.13% w/w + cyhalofop-butyl 10.64% w/w EC 150 g/ha at 25 DAS recorded the lowest density and dry weight of weeds and higher rice grain yield (3.97 t/ha) (AICRP-WM, AAU, Jorhat).



- For management of **weedy rice** in DSR, soil solarization during April to June was most effective and significantly reduced the weedy rice emergence. Use of imazethapyr-tolerant rice completely controlled the weedy rice in field, while stale seedbed and Sesbania green manuring provided moderate control. Sixty-three weedy rice biotypes from 13 districts of Madhya Pradesh, Maharashtra and Chhattisgarh were collected and characterized, and 27 unique germplasms were sent to ICAR-NBPGR for registration (ICAR-DWR).



- In **finger millet**, stale seedbed technique using flame-weeder recorded lesser weed dry weight and provided higher grain yield (2.11 t/ha) almost similar to two-hand weeding (20 & 40 DAS) (2.34 t/ha). After one crop cycle the weed seed bank of *Dinebra retroflexa*, *Physalis minima*, *Echinochloa colona* and *Cyperus rotundus* was significantly reduced due to flame weeding. However, the seed bank of *Medicago denticulata* was not affected by any of the treatments (ICAR-DWR).



- In **clusterbean**, pre-emergence application of pyroxasulfone 85% WG at 127 g/ha or post-emergence (at 2-3 leaf stage of weed) application of propaquizafop 2.5% + imazethapyr 3.75% w/w (RM) at 125 g/ha recorded the highest weed control efficiency at 60 DAS, and the highest seed and haulm yield (2083 kg/ha, 1874 kg/ha) (AICRP-WM, MPUAT, Udaipur).



Pyroxasulfone 85% WG 127g/ha as PE

Imazethapyr + propaquizafop (RM) 125 g/ha as PoE

Weedy check

- In **soybean**, the pre-emergence application of diclosulam 84 WDG @ 22 g a.i /ha and post emergent application of flauzifop -p- butyl 11.1% + fomesafen 11.1% SL @ 150 g a.i /ha were found more effective to control complex weed flora (AICRP-WM, UAS, Bengaluru).



Diclosulam 84 % WDG @ 22 g/ha (PE)



Flauzifop-p-butyl 11.1% + Fomesafen 11.1% SL @ 150 g/ha (PoE)

Crop diversification for effective weed management in conservation agriculture

- In CA-based **rice-wheat-greengram** system, diversification of rice with maize significantly reduced the weed prevalence and thereby enhanced the system productivity in terms of rice equivalent yield (18.16 t/ha), net returns (Rs 3.87 x 10⁵/ha), system B: C (5.31), and total water productivity (8.9 kg/ha/mm) (ICAR-DWR).



- In CA-based **maize-mustard** cropping system, zero tillage and residue management (ZT +R) recorded the lowest density of *Phalaris minor*, *Avena ludoviciana*, *Medicago denticulata*, *Rumex dentatus*, *Coronopus didymus* and *Cyperus rotundus* in mustard. Pre-emergence application of pendimethalin @ 339 g/ha (2 DAS) fb hand weeding (30 DAS) fb weed seed harvest recorded the lowest density and biomass of all weeds, and the highest seed yield of mustard. The residues of pendimethalin and fenoxaprop-propargyl in soil (<0.01 µg/g) and mustard (<0.05 µg/g) at harvest were below detectable limit (AICRP-WM, PAU, Ludhiana).



Weedy check



IWM

- In **organically grown basmati rice-vegetable pea-sweet corn** cropping system, Sesbania green manuring before rice transplanting *fb* 1 hand weeding at 30 DAT in rice, two hand weedings at 20 and 40 DAS in vegetable pea and intercropping with Sesbania and its mulching at 40 DAS recorded the lowest total weed density and weed biomass and the highest rice equivalent yield (AICRP-WM, SKUAST, Jammu).
- In **rice - blackgram** cropping system, application of bensulfuron-methyl 0.6% + pretilachlor 6% GR 660 g/ha as PE *fb* bispyribac sodium 10 SC 25 g/ha as PoE for rice and clodinafop-propargyl 8% + acifluorfen sodium 16.5% EC 185 g/ha as EPoE for blackgram was found to be effective in controlling weeds with higher yield, net returns and BC ratio (AICRP-WM, TNAU, Coimbatore).

Weed management in natural farming

- In **direct-seeded rice-chickpea-greengram** cropping system, narrow row spacing (15 cm in rice and 22.5 cm in chickpea and greengram) and stale seedbed provided effective weed control. The yield of DSR under natural farming was significantly low, but chickpea and greengram yields were almost the same when compared with conventional system (ICAR-DWR).



Compatibility of herbicides with nano fertilizers

- Majority of herbicides used in rice, wheat and greengram were compatible with nano urea and it enhanced WCE (88.3-99.2%), higher yields and was more profitable. Cyhalofop+ penoxsulam 135 g ai/ha in rice, clodinafop+metsulfuron 60 + 4 g ai/ha in wheat and propaquizafop+imazethapyr 125 g ai/ha in greengram were compatible with nano urea. Among the nano fertilizers, the efficacy was: nano-urea> nano urea+nano DAP> nano DAP (ICAR-DWR).



Management of itchgrass in maize

Itchgrass (*Rottboellia cochinchinensis*) is becoming an increasingly serious problem in maize cultivation due to its aggressiveness, invasive nature and ability to cause significant crop losses. Commonly used herbicides in maize are not effective to control this weed. Recent study revealed that isoxaflutole 225 g/L SC + thienencarbazone-methyl 90 g/L SC @ 90+36 g a.i./ha at 12 DAS in maize provided excellent broad-spectrum weed control including itchgrass (ICAR-DWR).

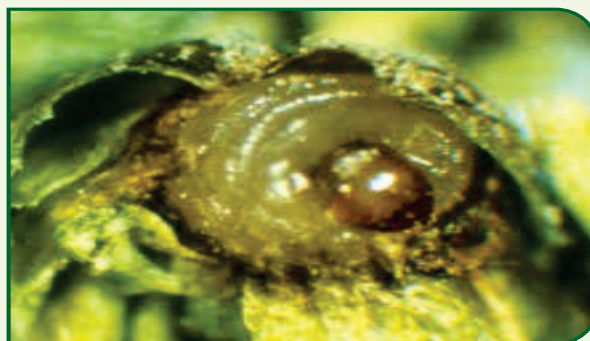


Development of battery-operated hand-held weeder

- A battery-operated hand-held weeder has been developed to ease the manual weeding operations which is tedious and mostly done by female labours. The developed weeder can be easily operated to perform the weeding operation. The weeder is best suited for intra-row weeding and kitchen garden weeding, and costs around Rs. 3000/- per unit (ICAR-DWR).

B. Management and Utilization of Invasive Weeds

- **Importation of new insect bioagents:** The Directorate in collaboration with ICAR - National Bureau of Agricultural Insect Resources (NBAIR), Bengaluru has imported an insect bioagent *Smicronyx lutulentus* from Australia for effective management of *Parthenium hysterophorus*. The insect has been kept under quarantine at the NBAIR and studies on its survival and feeding behavior are in progress. This insect is a seed-feeding weevil that damages the flower buds and reduces the seed production of *Parthenium*. Supplementation of *S. lutulentus* with the already introduced stem- and leaf-damaging biological control agent (*Zygogramma bicolorata*) is expected to give better control of the weed. The Directorate has also initiated the process to import other bioagent *Megamelus scutellaris* from South Africa for management of water hyacinth.



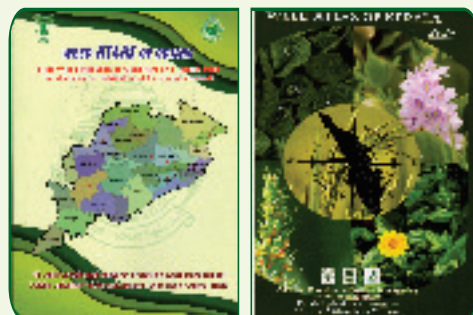
Source: <https://www.daf.qld.gov.au>

- Biological control of water fern (*Salvinia molesta*) using insect bioagent *Cyrtobagous salviniae* has been successfully demonstrated at Chandrapur (3 ponds- 510 acre) and Gadchiroli (2 ponds- 190 acre) districts in Maharashtra; Durg district (80 acre) in Chhattisgarh and Katni (5 acre) and STPS, Sarni, Betul (2900 acre) districts in Madhya Pradesh. The success story was widely covered by media including Down to Earth magazine (www.hindi.downtoearth.org.in).



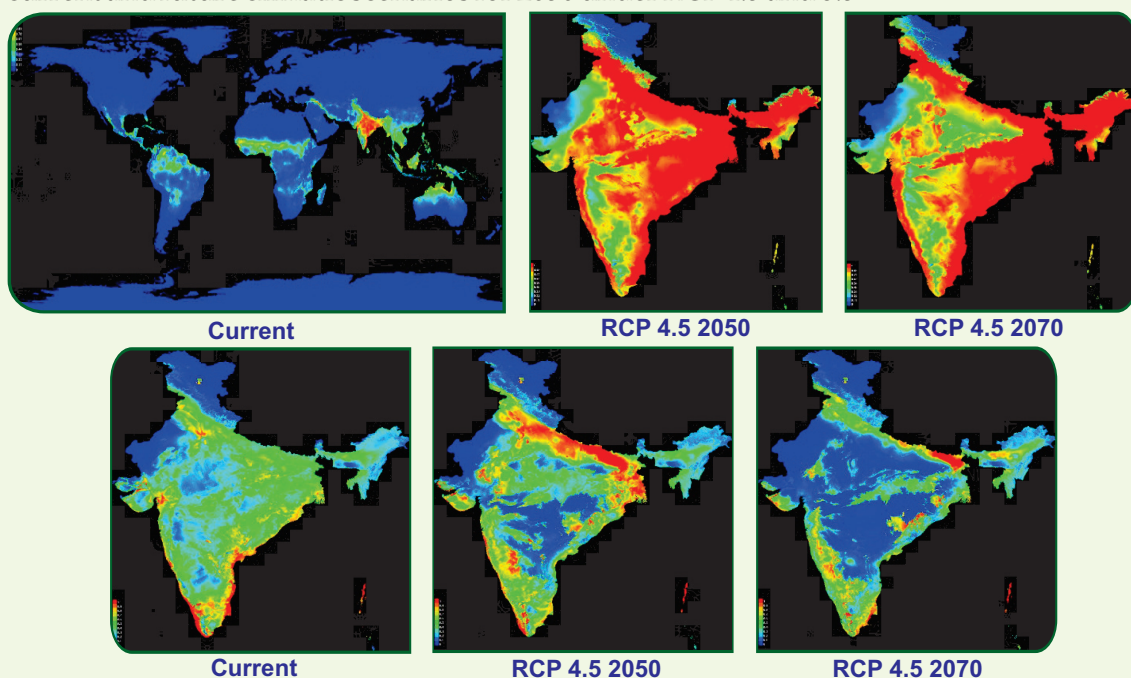
Development of weed atlas

- The information on weeds and their spatial distribution in different agro-ecosystems is of paramount importance for developing sustainable weed management strategies. During 2024-25, AICRP-WM, OUAT Bhubaneswar, KAU Thrissur and GBPUAT Pantnagar have developed Weed Atlas of their respective states. These atlases provide district-wise and block-wise comprehensive information on the most prominent weeds associated with major field crops of the states.

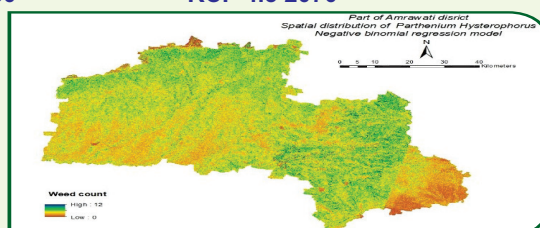


Future projections of weed severity

- Distributional patterns of *Echinochloa colona* and *Cyperus rotundus* were obtained under current and future climatic scenarios for 2050 under RCP 4.5 and 8.5



- Developed weed map on soil resources of Amravati district of Maharashtra using geo-spatial techniques.



C. Crop-weed Interaction under Changing Climate and Herbicide Resistance

Physiological, biochemical and molecular assessment of crop-weed interaction and herbicide efficacy under changing climate scenario

- Efficacy of cyhalofop-butyl and ethoxysulfuron against *Cyperus rotundus* and *Leptochloa chinensis* in rice, and clodinafop+ metsulfuron against *Medicago denticulata* and *Phalaris minor* in wheat was significantly reduced and delayed (3-4 days) due to drought stress in comparison to control. Reduced herbicide efficacy caused enhancement in oxidative stress in rice and wheat, ultimately reducing the rice and wheat productivity.



Chemical mutagenesis for generation of herbicide tolerant crops

- Evaluated the mutagenic efficiency and effectiveness by assessing germination rate, seedling vigor, and survival percentage after EMS treatment in soybean, maize, and greengram. Standardized treatment duration and conditions to ensure uniform mutagenesis while minimizing adverse effects on seed viability, with the objective of introducing the desirable trait of herbicide resistance in these crops. 60 mM (18 hrs) resulted in about 50% survival rate and is optimum concentration for our bulk EMS mutagenesis of soybean.



- Initiated work on development of glufosinate-tolerant rice variety '*Kranti*' by genome editing. Primers have been synthesized for amplification of glutamine synthetase for amplifying the coding regions of OsGS1 (Os02g0735200).

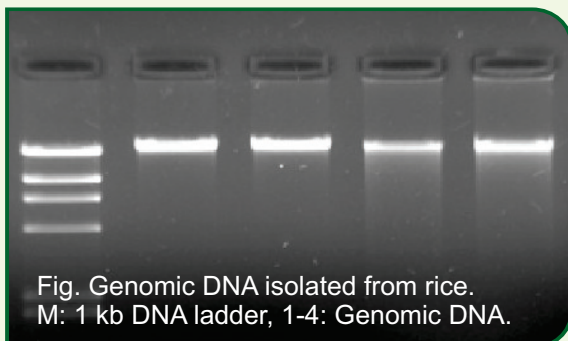


Fig. Genomic DNA isolated from rice.
M: 1 kb DNA ladder, 1-4: Genomic DNA.

Development of weed seed genebank

Initiated working on development of National weed seed genebank at the Directorate. Till date, 221 weed germplasm samples, including 36 weedy rice genotypes, have been collected and catalogued from 11 AICRP-WM centers. In addition, a weed cafeteria is also being maintained for live demonstration of different weeds.



D. Environmental Impacts of Herbicides and Mitigation Measures

- Clodinafop, metribuzin, carfentrazone and pyroxasulfone were dissipated with the passage of time in the soil and wheat plants and residues were found below detection limits at harvest.
- Half-life of clodinafop, metribuzin, carfentrazone and pyroxasulfone were found to be 11.71, 10.8, 16.7 and 9.36 days, respectively in the soil of wheat field in 2023-24.
- Leaching potential of topramezone was evaluated in five different soils. Leaching was found high in sandy clay soil than in sandy loam soil under approximately 427 mm simulated rain. Topramezone was found in the leachates also. Pseudo second order rate kinetics for topramezone in five different soils showed inclination towards chemisorption.

E. Dissemination and Socio-economic Impact of Weed Management Technologies

Capacity Development and Farmers Outreach Activities

- During the year 2024-25, a total of 66 field demonstrations in rice, maize, wheat, chickpea and greengram were conducted at 10 villages of Panagar and Sihora locality in Jabalpur district. A total of 18 training programmes were organized for the farmers, input dealers, State Government officials and other stakeholders. In addition, facilitated visit of 715 farmers and agricultural officers of State Department of Agriculture from various states of the country. Demonstrated the herbicide (bispiribac sodium) application in rice through drone to the farmers under different programmes such as Farmers FIRST, Mera Gaon Mera Gaurav and SCSP. Insect bio-agent (*Zygogramma bicolorata*) for control of Parthenium was distributed to the farmers and other stakeholders. More than 1500 farmers, students and other stakeholders benefitted with new knowledge and technologies during the Kisan Mela organized at the Directorate on 18th February, 2025.



ICAR-DWR SIGNIFICANT ACHIEVEMENTS 2024-2025

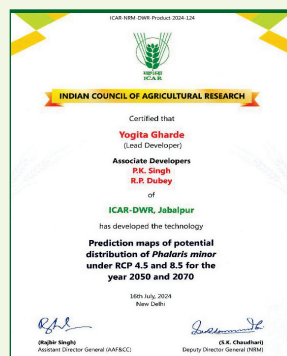
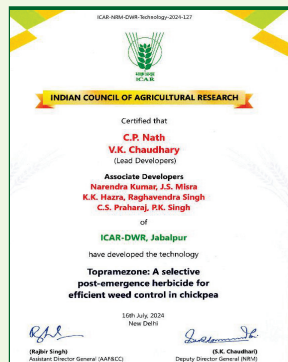
To make the public aware of the ill effects of Parthenium, the '19th Parthenium Awareness Week', was organized during 16-22 August, 2024 under the auspices of the Directorate involving SAUs, ICAR institutions, KVKs, municipal corporations, schools and colleges, NGOs and others. Press Conference, Webinars, Live programmes and Training programmes were also organized during the week.



Technologies Certified by the ICAR

During July 2024, following 06 technologies of the Directorate were certified by the ICAR.

- Biological control of *Salvinia molesta* using insect bioagent *Cyrtobagous salviniae*.
- Establishment of herbicide (Bispyribac-sodium) resistance in *Cyperus difformis* and its management strategies.
- Prediction maps of potential distribution of *Phalaris minor* under RCP 4.5 and 8.5 for the year 2050 and 2070.
- Management of waste water through aquatic weed-based phytoremediation system.
- Topramezone: A selective post-emergence herbicide for efficient weed control in chickpea.
- DWR WeedSeed GURU Android application.



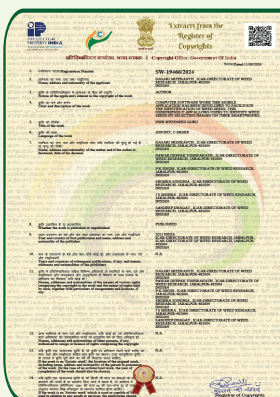
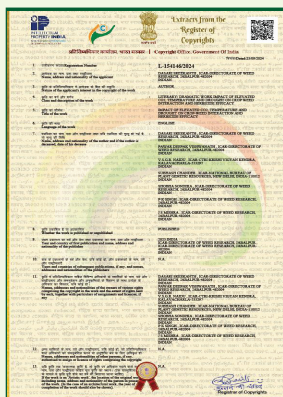
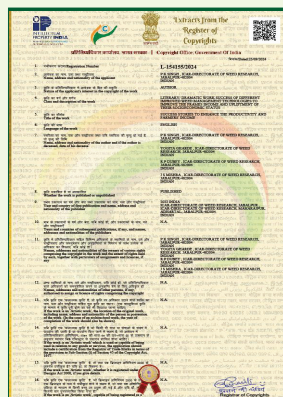
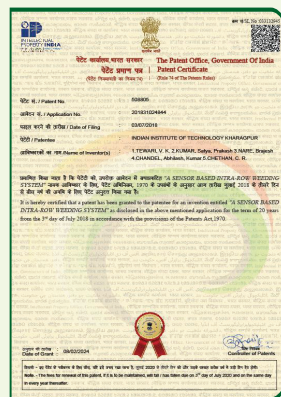
Patents and Copyrights

Patents

Innovators/Authors	Application/Registration No.	Name of Innovation/Technology/ Product/ Variety	Date of Filing/Registration	Application Granted/Registered**
Tewari V.K., Kumar S.P., Nare B., Chandel A.K. and Chethan C.R.	201831024844	Sensor-based intra-row weeding system	03/07/2018	Patent No. 508805, (February 8, 2024)
Chethan C.R., Dubey R.P. and Singh P.K.	202321050032	Multi-nozzle spray boom holding tool for tractor operated stationary mount boom sprayer.	25/07/2023	-
Chethan C.R., Dubey R.P. and Singh P.K.	202421000165	An adjustable spray boom-holding assembly for hand-free knapsack sprayer	02/01/2024	-

Copyrights

Name of Innovation/Technology/ Product	Authors	Date of Filing/Registration	Application/Registration No.	Application Granted/Registered**
DWR Weedseed GURU	Dasari Sreekanth, Deepak Pawar, P.K. Singh, Shobha Sondhia, J.S. Mishra and Sandeep Dhagat.	01/08/2024	24194/2024-CO/SW	11/09/2024 (SW-19466/2024)
Success stories to enhance the productivity and farmers income	P.K. Singh, Yogita Gharde, R.P. Dubey and J.S. Mishra.	01/08/2024	24193/2024-CO/L	23/09/2024 (L-154155/2024)
Impact of elevated CO ₂ , temperature and drought on crop - weed interaction and herbicide efficacy	Dasari Sreekanth, Deepak Pawar, V.S.G.R. Naidu, Subhash Chander, Shobha Sondhia, P.K. Singh and J.S. Mishra.	01/08/2024	24236/2024-CO/L	23/09/2024 (L-154146/2024)
DWR-HerbCal Mobile App for herbicide calculation	P.K.Singh, V.K. Choudhary, R.P. Dubey, J.S. Mishra and Sandeep Dhagat	01/08/2024	24192/2024-CO/SW	27/12/2024 (SW-19898/2024)
Yield and economic losses due to weeds in India	Yogita Gharde and P.K. Singh	21/11/2024	36522/2024-CO/L	06/01/2025 (L159428/2025)





Linkages and Collaborations

- To widen the scope of weed research, and to increase the revenue of the institute, the ICAR-DWR signed MoU with ICAR-Indian Institute of Pulses Research, Kanpur for quality seed production of different pulses.



In addition, 03 new contract research projects funded by various herbicides industries and other organization were undertaken by the Directorate during 2024-25.

S. No.	Project title	Duration	Budget (in lakh)	Funding agency
1	Efficacy evaluation of isoxaflutole 225g/L+ thien carbazole-methyl 90 g/l SC (Adengo) on maize	July 2024-June 25	7.56	Bayer Crop Science limited, Thane Mumbai
2	Bio-efficacy evaluation of UPL SAS range of products on DSR Paddy	2024	5.72	UPL Pvt. Ltd. Mumbai
3	Efficacy evaluation of diflufenican 125g/l + pyrasulfotole 250g/l SC in wheat crop and its effect on succeeding greengram	2024-26	11.89	Bayer Crop Science Ltd., Thane, Mumbai

G. राजभाषा कार्यान्वयन

- खरपतवार अनुसंधान निदेशालय, जबलपुर में दिनांक 13-27 सितंबर, 2024 तक हिन्दी पखवाड़ा आयोजित किया गया। इस समारोह का उद्घाटन डॉ. सुनील कुमार, निदेशक भारतीय कृषि प्रणाली अनुसंधान संस्थान, मेरठ के मुख्य अतिथि में आयोजित किया गया। हिन्दी पखवाड़े के दौरान निदेशालय में हिन्दी कार्यशाला का भी आयोजन किया गया जिसमें मुख्य वक्ता डॉ. पंकज कुमार, ए.जी.एम., बी.आर.बी.आर.ए.आई.टी.टी., जबलपुर ने "भावनात्मक बुद्धिमत्ता सफल जीवन की शैली" विषय पर व्याख्यान दिया। हिन्दी पखवाड़े के दौरान निदेशालय में विभिन्न प्रतियोगिताओं का आयोजन किया गया जिनमें आलेखन एवं टिप्पण, तात्कालिक निबंध लेखन, हिन्दी शुद्धलेखन, कम्प्यूटर में यूनिकोड पर टाइपिंग, अन्ताक्षरी, क्विज कांटेस्ट एवं वाद-विवाद प्रतियोगिताएं थी। निदेशालय द्वारा प्रकाशित 'तृण संदेश' पत्रिका का विमोचन भी किया गया। नगर राजभाषा कार्यान्वयन समिति, कार्यालय क्रमांक-2 द्वारा वर्ष 2023-24 के दौरान राजभाषा हिन्दी के प्रयोग-प्रसार के क्षेत्र में सर्वाधिक एवं सराहनीय कार्यों के लिए खरपतवार अनुसंधान निदेशालय को राजभाषा ट्रॉफी से सम्मानित किया गया।





Publications

During the year 2024-25, the Directorate has published a total number of 54 research papers, 01 book, 14 book chapters, 01 information bulletin, 04 technical bulletins, 04 extension folders, 22 popular/technical articles, 02 Annual Reports, 04 Newsletters, 01 Hindi magazine and 03 other publications



Research papers with >6.0 NAAS rating

1. Deeksha, M.G., Nebapure, S. M., Dahuja, A., Sagar, D., Bhattacharya, R., & Subramanian, S. 2024. Metabolic Adaptations in Phosphine Resistant *Tribolium castaneum* Driven by Mitochondrial Enzyme Variability and Gene Expression. *Archives of Insect Biochemistry and Physiology*, **117**(2), e70002. (NAAS 8.20)
2. Deeksha, M.G., Nebapure, S. M., Sagar, D., Bhattacharya, R., Dahuja, A., & Subramanian, S. 2024. Revealing the role of CYP346 family genes on phosphine resistance in Indian populations of *Tribolium castaneum*. *Frontiers in Bioscience-Landmark*, **29**(6), 203. (NAAS 9.10)
3. Dinesh, G. K., Sharma, D. K., Jat, S. L., Venkatramanan, V., Boomiraj, K., Kadam, P., Prasad, S., Anokhe, A., Selvakumar, S., Rathika, S., Ramesh, T., Bandyopadhyay, K., Jayaraman, S., Ramesh, K. R., Sinduja, M., Sathya, V., Rao, C. S., Dubey, R., Manu, S. M., Mahala, D. M. 2024. Residue retention and precision nitrogen management effects on soil physicochemical properties and productivity of maize-wheat-mungbean system in Indo-Gangetic Plains. *Frontiers in Sustainable Food Systems*, **8**, 1259607. <https://doi.org/10.3389/fsufs.2024.1259607> (NAAS 10.70)
4. Dubey Rachana, Mishra JS, Das Anup, Dinesh GK, Jain N, Bhatt BP, Poonia SP, Ajay A, Mondal S, Kumar S, Choudhary AK, Kumar rakesh, Upadhyaya A and McDonald AJ. 2024. Enhancing ecosystem services through direct-seeded rice in middle Indo-Gangetic Plains: a comparative study of different rice establishment practices. *Agronomy for Sustainable Development*. DOI:10.1007/s13593-024-00992-2. (NAAS 13.30)
5. Kumar Rakesh, Choudhary, JS, Nail SK, Mishra JS, Banra S, Poonia SP, Mondal S, Das Anup, Rao KK, Kumar Virender, Bhatt BP, Chaudhari SK, Malik RK and McDonald Andrew. 2024. Effect of conservation agriculture on soil fungal diversity in rice-wheat-green gram cropping system in eastern Indo-Gangetic plains of South Asia. *Frontiers in Microbiology*, DOI: 10.3389/fmicb.2024.1441837. (NAAS 11.20)

6. Kumar S.P., Tewari V.K., Chandel, A.K., Mehta C.R., Nare B., Chethan C.R., Pareek C., and Mundhada, K. 2024. Automated prototype intra-row weeding system. *Journal of Scientific and Industrial Research*, **83**; 1-13. 10.56042/jsir.v83i4.5427. (NAAS 6.60)
7. Kumar Santosh, Basu Sahana, Choudhary A.K., Shashi Shekhar, Mishra J.S., Kumar Sanjeev, Shubha Kumari, Dubey Rachana, Mondal Surajit, Dwivedi S.K., Bhakta N, Kumar Rakesh, Sarkar Sujoy, Dhamudia Srustidhar, Kumari Sunny, Das Anup, Kumar Arvind and Kumar Gautam. 2024. Sequential submergence and drought induce yield loss in rice by affecting redox homeostasis and source-to-sink sugar transport, *Field Crops Research*, **310**; 109362, <https://doi.org/10.1016/j.fcr.2024.109362>. (NAAS 11.80)
8. Kumar, Rakesh, Rao KK, Mondal S., Choudhary JS, Kumar Saurabh, Jat SL, Mishra JS, Singh AK, Upadhyay PK, Das A, Singh VK, Kumar Sanjeev, Jadhav SK, Sharma SK, Bhatt BP, Raksht S, Chaudhari SK. 2024. A comprehensive analysis of resource conservation strategies: Impacts on productivity, energetics and environmental footprints in rice-based systems of the Eastern Indo-Gangetic Plains. *Current Research in Environmental Sustainability* **8**; 100271. <https://doi.org/10.1016/j.crsust.2024.100271> (IF 3.70).
9. Manjunatha, K. Savadi S., Adiga J.D., Balasubramanian, D., Naik, R., Muralidhara, B.M., Chethan, C.R. 2024. Evaluation of fruit detachment forces and related characteristics reveals differential fruit detachments at developmental stages and cultivar differences in cashew. *Scientia Horticulturae*, **331**; 113128. <https://doi.org/10.1016/j.scienta.2024.113128>. (NAAS 10.30)
10. Manjunatha, K., Savadi, S., Naik, R., Balasubramanian, D., Adiga, J.D., Muralidhara, B.M., Chethan, C.R. and Anilkumar, C. 2024. Investigation on torsional forces and angles at the nut and pedicel junction (NPJ) revealed varying cashew apple (hypocarp) and nut separation efficiency at different developmental stages in cashew. *Industrial Crops & Products*, **222**; 119951. <https://doi.org/10.1016/j.indcrop.2024.119951> (NAAS 11.50)
11. Moulick D., Ghosh D., Gharde Y., Majumdar A., Upadhyay M.K., Chakraborty D., Mahanta S., Das A., Choudhury S., Brestic M., Alahmadi T.A., Ansari M.J., Santra S.C. and Hossain A. 2024. An assessment of the impact of traditional rice cooking practice and eating habits on arsenic and iron transfer into the food chain of smallholders of Indo-Gangetic Plain of South-Asia: Using AMMI and Monte-Carlo simulation model. *Heliyon* **10**; e28296. <https://doi.org/10.1016/j.heliyon.2024.e28296> (NAAS 10.0)
12. Nath, C.P. Narendra Kumar, K.K. Hazra, Asik Dutta, C.S. Praharaj, Raghavendra Singh, S.S. Singh, R.P. Dubey, Suman Sen, G.P. Dixit and Deepak Kumar. 2024. Five years of conservation tillage and weed management in a rice-chickpea rotation of northern Gangetic Plains of India: Weed growth, yield benefits and economic profitability. *Soil & Tillage Research* **244**; <https://doi.org/10.1016/j.still.2024.106226>. (NAAS 12.50)
13. Rao KK., Dwivedi SK, Kumar S., Samal SK, Singh NR, Mishra JS, Ved Prakash, Choubey AK, Kumar Manoj and Bhatt BP. 2024. Impact of simultaneous increase in CO₂ and temperature on soil aggregates, associated organic carbon, and nutritional quality of rice-wheat grains. *Journal of Plant Nutrition and Soil Science*, Doi:10.1002/jpln.202200261. (NAAS 8.50)
14. Rao KK., Samal SK, Kumar S., Singh NR, Kumar R, Mondal S, Kumar S, Mishra JS, Bhatt BP, Ravishankar N, Kumar Sunil, Upadhyay PK, Jadhav SK and Choubey AK. 2024. Decade-long effects of integrated farming systems on soil aggregation and carbon dynamics in sub-tropical Eastern-Indo-Gangetic plains. *Frontiers in Sustainable Food Systems*, DOI:10.3389/fsufs. 2024. 1384082. (NAAS 10.70)

15. Saurabh Kirti, Kumar Santosh, Kumar Rakesh, Mishra J.S., Das Anup, Srivastava A.K., Naik S.K., Shinde Reshma, Raman R.K., Roy H.S., Kumari Arti, Kumari Sunny, Kumar Atish, Upadhyaya Ashutosh, Singh Sudhanshu, Choudhary A.K., Kumar Sanjeev & Singh A.K. 2024. Biofortifying drought-tolerant rice: enhancing growth and nutritional quality with foliar iron and zinc applications in Eastern India. *Journal of Plant Nutrition*, DOI: 10.1080/01904167.2024.2378925. (NAAS 8.10)
16. Soni, J.K., Lalramhlmi, B., Sailo, L., Sunani, S.K., Lungmuana, L., Shakuntala, I., & Doley, S. 2024. Diversity of wild mushrooms and ethnomycological studies in Mizoram. *Indian Journal of Traditional Knowledge*, **23**(9): 831-842. DOI: 10.56042/ijtk.v23i9.4959. (NAAS 6.80)
17. Sreekanth, D., Pawar, D.V., Kumar, R., Ratnakumar, P., Sondhia, S., Singh, P.K., Mishra, J.S., Chander, S., Mukkamula, N. and Kiran Kumar, B. 2024. Biochemical and physiological responses of rice as influenced by *Alternanthera paronychioides* and *Echinochloa colona* under drought stress. *Plant Growth Regulation*, **103**(1), pp.119-137. (NAAS 10.20).
18. Sreekanth, D., Pawar, D.V., Mahesh, S., Chethan, C.R., Sondhia, S., Singh, P.K., Mishra, J.S., Mukkamula, N., Kumar, B.K. and Basavaraj, P.S. 2024. Elucidating the interactive effects of drought, weeds, and herbicides on the physiological, biochemical, and yield characteristics of rice. *Plant and Soil*, pp.1-25. <https://doi.org/10.1007/s11104-024-06979-y> (NAAS 10.90).

Awards and Recognitions

Several awards and recognitions have been bagged by the scientists and other staff during 2024-25.

1. Dr. Yogita Gharde received Best Oral Presentation Award during 74th Annual Conference of Indian Society of Agricultural Statistics on “Harnessing Statistics and Artificial intelligence for Sustainable and Smart Agriculture” Organized by NAU, Navsari, Gujarat during 02-04 February, 2024.
2. Dr. Deepak V. Pawar, Scientist, Smt. Iti Rathi, Technical Assistant, Sh. Francis Xavier, Assistant (Administration); and Sh. Nemi Chand, Supporting Skilled Staff received the Best Worker Award by the ICAR-DWR on the occasion of its 36th Foundation Day on 22nd April, 2024.



3. Dr. Chethan C.R. received “Best Research Paper Award” published in *Scientia Horticulturae*, 331, 113128. from ICAR-Directorate of Cashew Research, Puttur on the occasion of ICAR-Directorate of Cashew Research, Puttur Foundation Day on 18 June, 2024

4. The Satpura Thermal Power Station (STPS), Sarni, honoured the ICAR-Directorate of Weed Research, Jabalpur for their commendable work on the complete biocontrol of the aquatic weed *Salvinia molesta* in the Satpura water reservoir of STPS, Sarni on 3 July 2024.
5. Dr. V.K. Choudhary received ISWS Fellow Award 2022 for contribution in weed science during ISWS biennial conference from 28-30 November 2024 at BHU, Varanasi.
6. Dr. Shobha Sondhia received ISWS Gold Medal for contribution in weed science during ISWS biennial conference from 28-30 November 2024 at BHU, Varanasi.
7. Dr. Jeetendra Kumar Soni received ISWS Prof V.S. Rama Das Young Weed Scientist Award (2022-23) on 28 November, 2024 in ISWS Biennial Conference 2024 on "Climate-smart Weed Management for Global Food Security" during 28-30 November, 2024 at Banaras Hindu University, Varanasi, India
8. Dr. Deepak Pawar received 'Best Oral Presentation Award' in ISWS Biennial Conference 2024 on "Climate-smart Weed Management for Global Food Security" during 28-30 November, 2024 at Banaras Hindu University, Varanasi, India
9. Dr Surabhi Hota received 1st prize in women carrom, Dr. Archana Anokhe got 3rd prize in women discuss throw, Mr. S.K. Bose won 1st prize in chess, Mr. Veer Singh got 1st prize in men carrom and Mr. Bhagunte Prasad won 2nd prize in 5000 m cycling during the ICAR Zonal sports (2024) meet hosted by the ICAR-Indian Institute of Soil Science, Bhopal from 4-7 March, 2025.





Seed Production

In order to increase the Institute's revenue, the Directorate has started quality seed production programme with the ICAR-Indian Institute of Pulses Research, Kanpur and Madhya Pradesh State Seed and Farm Development Corporation (MPSS & FDC). A total of 125.26 tonnes of certified seed comprising rice 'JR 206' (45.6 t), pigeonpea 'Pusa 16' (60 kg), wheat 'GW 322' (59.6 t), mustard 'Giriraj' (5.9 t), chickpea 'RVG 204' (7.5 t) and greengram 'Virat' (5.6 t), blackgram 'OP 410-26' (1.0 t), was produced and sold to the MPSS & FDC.



New Facilities

During 2024-25, new facilities/equipment/vehicle/farm implements, such as insect-quarantine lab, tractor (42.9 HP), drone, power tiller, solar street light, weeders, IR-spectroscopy, PCR system, computers, air conditioners, farm shed, etc. were created/procured.



Tractor (42.9 HP)



Drone



RT-PCR system



-80°C Deep freezer



-40°C Deep freezer



Quarantine lab



IR-spectroscopy

Health Camp Organized

A free medical checkup camp was organized on 26.09.2024 for all staff and casual workers of the Directorate and their family members at the guest house of the Directorate by the courtesy of Baderia Metroprime Multispeciality Hospital, Jabalpur.



New Colleagues Joined

During 2024-25, Mr. Amit Kumar Sachan, Assistant, Mr. Rahul Patel, Assistant and Mr. Manish Kumar, Technican (T-1) joined the Directorate.

Revenue Generation

During 2024-25, the Directorate generated total revenue of Rs. 59.0 lakhs from various sources such as sale of seed & farm produce, guest house, herbicide testing, etc.

Budget Utilization

The Directorate utilized 100% of its budget* as per RE of 2024-25.

Head of expenditure	Budget received (RE) (Rs. in Lakhs)	% of expenditure
ICAR-DWR+SCSP		
Grant-in-Aid Capital	175.56	100
Grant-in Aid General	424.11	100
AICRP-WM+SCSP		
Grant-in-Aid Capital	0.10	100
Grant-in Aid General	124.85	100
Grand Total	724.62	100

*Excluding salary

Important Meetings/Conferences Organized

Name of activity	Date and venue
XXXI Annual Review Meeting of AICRP-Weed Management	19-21 June, 2024; OUAT, Bhubaneswar.
National Training Programme on Weed Management	On-line, 28 August-6 September, 2024.
Brainstorming on Weed Management in India: Emerging Challenges and Management Strategies	4 October, 2024; NASC, New Delhi
ISWS Biennial Conference	28-30 November; BHU, Varanasi
Workshop on HT rice to develop Stewardship guidelines	1 st December, 2024; ISARC, Varanasi
IMC meeting	23 December, 2024; ICAR-DWR, Jabalpur
Winter school on Integrated Weed Management	7-27 January, 2025; ICAR-DWR, Jabalpur
Training programme on Weed Management	19-21 February, 2025; Online in collaboration with NIPHM, Hyderabad
Consultative Workshop on Weed Management in Agroforestry Systems	27 Feb, 2025; ICAR-CAFRI, Jhansi
RAC meeting	3-4 March, 2025; ICAR DWR, Jabalpur

ICAR-DWR SIGNIFICANT ACHIEVEMENTS 2024-2025



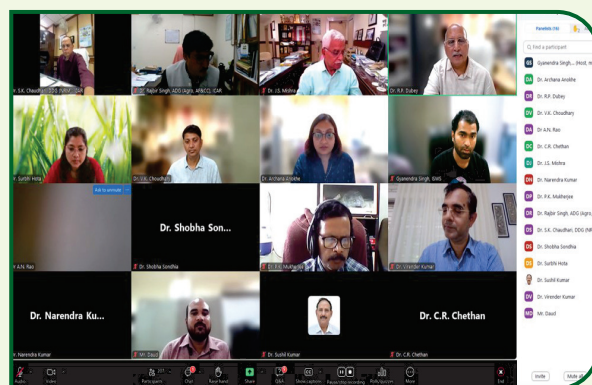
XXXI Annual Review Meeting of AICRP-WM



Brainstorming Meeting on Weed Management



ISWS Biennial Conference



National Training Programme on Weed Management



Quinquennial Review Team Meeting



XXXII Institute Management Committee Meeting



हर कदम, हर हज़ार
किसानों का ह्वासाफर
आरतीय कृषि अनुसंधान परिषद

Agriculture with a human touch

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