

11th BRAIN STORMING SESSION

VICE CHANCELLORS OF AGRICULTURAL UNIVERSITIES



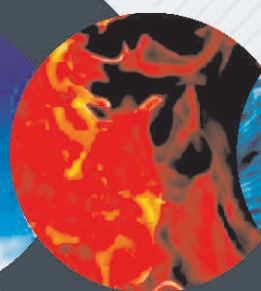
Innovations in Sustainable Natural Resource Management



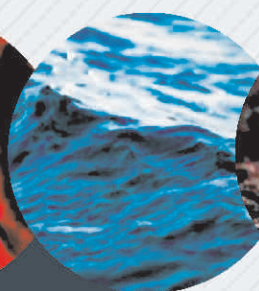
Ether



Air



Fire



Water



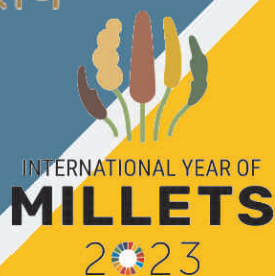
Earth

PROCEEDINGS & REPORT

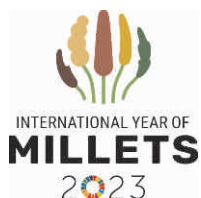
April 7-8, 2023



भारत 2023 INDIA



RANI LAKSHMI BAI CENTRAL AGRICULTURAL UNIVERSITY, JHANSI



11th BRAIN STORMING SESSION

VICE CHANCELLORS OF AGRICULTURAL UNIVERSITIES

Innovations in Sustainable Natural Resource Management

PROCEEDINGS & REPORT
April 7-8, 2023

RANI LAKSHMI BAI CENTRAL AGRICULTURAL UNIVERSITY
JHANSI

**11th BRAIN STORMING SESSION &
VICE CHANCELLORS CONFERENCE OF AGRICULTURAL UNIVERSITIES**
Innovations in Sustainable Natural Resource Management

Patron & Guidance

Prof. Ashok Kumar Singh
Vice Chancellor

Chairman

Prof. A.R. Sharma
Director Research, RLBCAU, Jhansi

Editorial Team

Chairman

Prof. Anil Kumar
Director Education, RLBCAU, Jhansi

Convener(s) of Sessions

Dr. A.R. Sharma
Dr. Yogeshwar Singh
Dr. R. P. Yadav
Dr. P.P. Jambhulkar
Dr. Manmohan Dobriyal
Dr. Mukesh Srivastava
Dr. S.S. Kushwah

Publisher

Vice Chancellor

Rani Lakshmi Bai Central Agricultural University
Jhansi (U.P)
Telephone: 0510-2730777
E-mail: vcrlbcu@gmail.com
Website: www.rlbcu.ac.in

Printed Year



April, 2023

Publisher and the editorial team are not responsible for views expressed in the proceedings and report of 11th Brain Storming Session and Vice Chancellors Conference.

Printed at

Classic Enterprises, Jhansi. 7007122381

PROGRAM SCHEDULE

11 th Brain Storming Session of the Vice Chancellors of Agricultural Universities		
7-8 April 2023		
	Rani Lakshmi Bai Central Agricultural University, Jhansi- 284003	
	Indian Agricultural Universities Association	
Theme:	Innovations in Sustainable Natural Resource Management	
Venue:	Board Room, Administrative Block, RLBCAU, Jhansi	
Program		
7 April 2023, Friday		
09.15 Hrs	Arrival of the Dignitaries and Guests at the University	
09.30-11.00 Hrs	Inaugural Session	
	Co-Chair	Dr. Panjab Singh, Former Secretary (DARE) & DG (ICAR)
	Co-Chair	Dr. Rameshwar Singh, President, IAUA
	Chief Guest	Padma Bhushan Dr. R.S. Paroda, Chairman, TAAS, Former Secretary, DARE & DG, ICAR
09.30-09.37 Hrs	Lighting of the lamp & Presentation of Bouquet	
09.37-09.45 Hrs	Welcome Address	Dr. A.K. Singh, VC, RLBCAU, Jhansi
Online Mode	Remarks	Dr. R.C. Agarwal, DDG (Edu.)
09.45-09.53 Hrs	Remarks	Dr. S.K. Chaudhary, DDG (NRM), ICAR
09.53-10.01 Hrs	Remarks	Dr. J.K. Jena, DDG (Fisheries), ICAR
10.01-10.11 Hrs	Remarks	Dr. P.L. Gautam, Former Chairman, PPVFRA & BDA
10.11-10.21 Hrs	Co-Chair' Remarks	Dr. Rameshwar Singh, President, IAUA
10.21-10.35 Hrs	Co-Chair' Remarks	Dr. Panjab Singh, Former Secretary (DARE) & DG (ICAR)
10.35-10.55 Hrs	Chief Guest' Address	Padma Bhushan Dr. R.S. Paroda
10.55-11.00 Hrs	Vote of Thanks	Dr. N.P. Dakshinkar, Secretary General, IAUA
	Convener	Dr. A.R. Sharma, Director Research, RLBCAU
11.00-11.30 Hrs	Tea Break	
11.30-13.00 Hrs	Technical Session –I: Sustainable Management of Soil and Water resources	
	Co-Chair	Dr. A.K. Singh, Vice President, NAAS
	Co-Chair	Dr. S.K. Chaudhary, DDG (NRM), ICAR
11.30-11.45 Hrs	Keynote Speaker	Dr. S.K. Chaudhary, DDG (NRM), ICAR
11.45-12.25 Hrs	Panelists	Dr. Arun Kumar, VC, SKRAU, Bikaner
		Dr. B.R. Kamboj, VC, CCSHAU, Hisar
		Dr. Anupama Singh, Joint Director (Education.), IARI, New Delhi
		Dr. S.S. Singh, Director Extension Education
12.25-12.55 Hrs	Discussion and Chair/Co-Chairs' Remarks	
12.55-13.00 Hrs	Convener	Dr. Yogeshwar Singh, Head (Agronomy), RLBCAU
13.00-14.00 Hrs	Lunch Break	

14.00-15.30 Hrs	Technical Session –II: Sustainable Management of Animal and Fish Resources	
	Chair	Dr. Rameshwar Singh, President, IAUA
	Co-Chair	Dr. J.K. Jena, DDG (Fisheries), ICAR
	Co-Chair	Dr. A.K. Srivastava, VC, DUVASU, Mathura
14.00-14.20 Hrs	Keynote Speakers	Dr. J.K. Jena, DDG (Fisheries), ICAR
		Dr. A.K. Srivastava, VC, DUVASU, Mathura
14.20-15.10 Hrs	Panelists	Dr. N.H. Kelawala, VC, Kamadhenu Univ., Gandhinagar
		Dr. V. Reddy, VC, SVVU, Tirupati
		Dr. N.P. Dakshinkar, Secretary General, IAUA
		Dr. Ravi Shankar, Director, ICAR-CIFE, Mumbai
		Dr. N.I. Singh, Dean, CFT, CAU, Imphal
		Dr. V.P. Singh, Dean, CoV & AS, RLBCAU
		Dr. B.K. Behera, Dean, CoF, RLBCAU
15.10-15.25 Hrs	Discussion and Chair/Co-Chairs' Remarks	
15-25-15.30 Hrs	Convener	Dr. R.P. Yadav, Associate Prof. (Forestry), RLBCAU
15.30-16.00 Hrs	Tea Break	
16.00-17.30 Hrs	Technical Session –III: Sustainable Management of Plant Resources (including biodiversity)	
	Chair	Dr. P.L. Gautam, Former Chairman, PPV&FRA & BDA
	Co-Chair	Dr. Parvinder Kaushal, UH, Bharsaar
16.00-16.15 Hrs	Keynote Speaker	Dr. P.L. Gautam, Former Chairman, PPV&FRA & BDA
16.15-17.05 Hrs	Panelists	Dr. T. Janakiram, VC, Dr. YSRHU, Venkataramannagudem
		Dr. S.K. Chakrabarti, VC, UBKV, Pundibari
		Dr. Amaresh Chandra, Director, ICAR-IGFRI
		Dr. S.K. Chaturvedi, Dean Agriculture, RLBCAU
17.25-17.35 Hrs	Discussion and Chair/Co-Chairs' Remarks	
17.35-17.40 Hrs	Convener	Dr. P.P. Jambhulkar, Head (Plant Pathology), RLBCAU
17.40-18.00 Hrs	Tea Break	
18.00-21.00 Hrs	Visit to Jhansi Fort for Light & Sound Show & Dinner	
8 April 2023, Saturday		
8.00-09.15 Hrs	Visit to Orchha	
09.45 Hrs	Arrival at University Campus & Tea	
10.00-11.30 Hrs	Technical Session –IV: Sustainable Climate Resilient Practices	
	Chair	Dr. B.S. Dwivedi, Member, ASRB
	Co-Chair	Dr. B.C. Deka, VC, AAU, Jorhat
10.00-10.15 Hrs	Keynote Speaker	Dr. V.K. Singh, Director, CRIDA, Hyderabad
10.15-10.55 Hrs	Panelists	Dr. P.L. Patil, VC, UAS, Dharwad
		Dr. (Ms.) Indira Sarangthem, Dean Agriculture, CAU, Imphal
		Dr. A.R. Sharma, Director Research, RLBCAU
		Dr. M.J. Dobriyal, Dean, COHF
10.55-11.25 Hrs	Discussion and Chair/Co-Chairs' Remarks	
11.25-11.30 Hrs	Convener	Dr. M.M. Dobriyal, Dean CoH&F, RLBCAU
11.30-11.45 Hrs	Tea Break	

11.45-13.15 Hrs	Technical Session –V: Introducing Innovations (including AI, IoTs, Block chain, Agri-Drone, Blended learning etc.)	
	Chair	Dr. P. Das, Ex-DDG (AE), ICAR
	Co-Chair	Dr. Anupam Mishra, VC, CAU, Imphal
	Co-Chair	Dr. P.M. Pandey, Director, BIET, Jhansi
11.45-12.00 Hrs	Keynote Speaker	Dr. P.S. Pandey, VC, RPCAU, Pusa
12.00-12.30 Hrs	Panelists	Dr. Indra Mani Mishra, VC, MKV, Parbhani
		Dr. K.K. Singh, VC, SVBPUA&T, Meerut
		Dr. P.M. Chauhan, Registrar, JAU, Junagarh
		Dr. I.N. Singh, Dean (CoFT), CAU, Imphal
		Dr. Anil Kumar, Director Education, RLBCAU
12.30-13.10 Hrs	Discussion and Chair/Co-Chairs' Remarks	
13.10-13.15 Hrs	Convener	Dr. Mukesh Srivastava, Registrar, RLBCAU
13.15-14.30 Hrs	Lunch Break	
14.30-15.30 Hrs	Plenary Session	Chairman: Dr. Panjab Singh, Former Secretary (DARE) & DG (ICAR)
		Dr. A.K. Singh, VC, RLBCAU, Jhansi
		Dr. Rameshwar Singh, President, IAUA
14.30-14.40 Hrs	Recommendations and Remarks	Dr. Rameshwar Singh, President, IAUA
14.40-14.55 Hrs	Remarks	Dr. A.K. Singh, VC, RLBCAU
14.55-15.10 Hrs	Remarks	Dr. Panjab Singh, Former Secretary (DARE) & DG (ICAR)
15.10-15.20 Hrs	Convener	Dr. S.S. Kushwaha, University Librarian, RLBCAU
15.20-15.30 Hrs	Vote of Thanks	Dr. A.R. Sharma, Director Research, RLBCAU & Dr. Dinesh Kumar, Secretary, IAUA
15.30 Hrs	Tea Break and Departure of the Guests	
16.00-18.30 Hrs	Visit	
Conduct of the Inaugural and Plenary Sessions: Dr. Artika Singh, Scientist (Agronomy), RLBCAU		

11th BRAIN STORMING SESSION
VICE CHANCELLORS OF AGRICULTURAL UNIVERSITIES
April 7-8, 2023

Innovations in Sustainable Natural Resource Management

In view of the natural resource degradation issues and further emerging challenges as well as the opportunities, the 11th Brain Storming Session on “Innovation in Sustainable National Resource Management” was held at the Rani Lakshmi Bai Central Agricultural University, Jhansi during April 7-8, 2023. The program was organized under the aegis of Indian Association of Agricultural Universities, New Delhi, and attended by the Vice Chancellors of Agricultural Universities, Deputy Director Generals of the ICAR, Deans and Directors of research and academic institutions.

The following technical sessions were held:

1. Sustainable management of soil and water resources.
2. Sustainable management of animal and fish resources.
3. Sustainable management of plant resources including biodiversity.
4. Sustainable climate resilient practices.
5. Introducing innovations including AI, IoTs, block chain, Agri-drone, blended learning etc.

The proceedings of different sessions are summarized below, followed in the end by recommendations of the Brainstorming Session:

INAUGURAL SESSION

The inaugural session was graced by the presence of Chief Guest, Dr. R.S. Paroda; special guests, Dr. Panjab Singh, Dr. P.L. Gautam, Dr. Rameshwar Singh; Guest of Honors, Dr. A.K. Singh, Dr. P. Das, Dr. J.K. Jena, Dr. S.K. Chaudhari; along with Dr. N.P. Dakshinkar, Secretary General, IAUA and Dr. A.K. Singh, Vice Chancellor, RLBCAU on the dais. Dr. A. R. Sharma was Convener of the Inaugural session.

After the lighting of the lamp by the dignitaries, a floral welcome was given by Dr. A.K. Singh, Vice Chancellor to all dignitaries on the dais.

Dr. A.K. Singh, Vice Chancellor, RLBCAU made the following remarks in his welcome address:

A galaxy of stalwarts in the field of agricultural sciences from all over the country has assembled which is a matter of pride for all of us.



Coming to a place like Jhansi requires double commitment because of its location and not having air connectivity. It is a historical place associated with the first war of independence, led by the legendary queen of Jhansi, Rani Lakshmi Bai. She ruled this region at a very young age despite the *purdah* system being in vogue at that time. This land is also known for the 'Bundelas' who were warriors, and also for two famous religious places nearby – the Ram Raja temple at Orchha and Maa Pitambra Peeth at Datia.

This is a unique academic meeting at our campus with the presence of great achievers who have made an impact in agriculture development at the national and international level. The topic for the 11th Brain Storming Session “Innovations in Sustainable Natural Resource Management”, will focus on the *Panchmahabootas*, to be covered under the 5 sub-themes. 'One-health' concept encompassing soil, water, air, human and animals should be the

focus of this Brainstorming Session. Some people believe that current system of chemical-based agriculture is leading to availability of poor-quality food and environment, which is hazardous to our health. A common man wants chemical-free food. Agricultural universities are following a number of practices at different levels and various models of NRM have been developed. Ecosystem-based agriculture is the need of the hour.

RLBCAU has been established as an Institution of National Importance, under the same act as the IITs and IIMs. We are a small university at present, the buildings were inaugurated in 2020, and there is a long way to go. IGRI and CAFRI helped in the emergence of this University in the early years of establishment.

It is hoped that discussions during this meeting will lead to recommendations for better management of natural resources and make India a net zero C emission country as per the vision of Hon'ble Prime Minister of India in the years to come.

Dr. S.K. Chaudhari, DDG (NRM), ICAR, New Delhi

The topic of the 11th BSS is very important in the present times. Scalable and business innovative models in NRM are needed for maintaining sustainable agricultural production. This is the best platform where the very senior colleagues from the SAUs and CAUs are participating to discuss better solutions to the many problems of present-day agriculture.



Agricultural research and education require a different kind of thinking. Young people are joining agriculture, and there is a need of opportunities for entrepreneurship. Time is changing very fast with new innovations in Artificial Intelligence (AI), IoT, and we need to provide better solutions to the young colleagues and entrepreneurs.

Indian agriculture is robust enough as it was seen during the *COVID-19* pandemic era. There is strength in the NARES, and we need to sit together, and storm our brains so as to provide better avenues for the coming generations.

Dr. J.K. Jena, DDG (Fisheries), ICAR, New Delhi

It is a rare opportunity to have such a galaxy of participants in this Brainstorming Session. Fisheries sector has seen a much higher growth than any other sector in the recent times. At the time of our independence, the fish production was less than 1 million tons, and there has been a 21-fold increase since then. We have done much better than most other countries globally. We are one of the front runners in this sunrise sector not only in terms of production and productivity, but also in technology generation and innovation. We have not only been able to meet our domestic requirements but have also done well in terms of exports also, which is about Rs. 57,000 crores at present.



One-third of our fish production comes from hunting and gathering. Challenges in fish sector are many as we have to increase the production from 16 million tons at present to 35 million tons by 2050, and we do not know whether by that time, required water resources will be available.

We need to increase productivity and water-use efficiency. The focus should be on good husbandry practices, super-intensive farming, genetic enhancement, etc. Achieving a fish productivity of 100 t/ha is possible with the available technologies, but for producing this, a lot of resources will be needed and sediment will be produced. Pollution in terms of micro-plastic and climate change is a big threat to biodiversity and fish production.

Dr. R.C. Agrawal, DDG (Agril. Education), ICAR, New Delhi (online)

The number of applications for UG degree programmes in agriculture were 84,000 for the 2500 seats last year, but this year the number is 5, 37,000, i.e., a ratio of 1: 170. There is a great inclination for admission in agricultural sciences. Twenty more universities have joined to utilize the ICAR score for admissions.

Resource generation model should be discussed and final comments are sought from the Vice Chancellors. Training of the Nodal Officers will be conducted at the NAARM, Hyderabad. Guidelines for polytechnic education (after class 10) have been finalized. It is required to discuss whether the IAUA should start giving membership to private universities so as to make the IAUA more vibrant.



It is hoped that good recommendations for research and education will come out from this Conference.

Dr. P.L. Gautam, Former DDG (Crop Sciences), ICAR; Chairman, PPVFRA and NBA, and Vice Chancellor, GBPUAT, Pantnagar

It is a very good initiative to have this meeting at this University. We all extend our congratulations to Dr. Arvind Kumar for getting the Padma Shri Award.



IAUA is a dynamic and neutral platform, and all Vice Chancellors are members. The Vice Chancellors can raise those issues at this platform which otherwise they cannot do at their university.

The land grant system which we have followed in the 1960s, i.e., by integrating teaching, research and extension – it is not that research is the job of the ICAR institutes, education by the AUs, and extension by the state government department – this sort of thinking has to be resisted. Land grant model was mono-campus and multi-faculty, and this need to be decided whether we want land grant system or not, and also whether we want to make AUs also a general universities. Most universities do not have staff, which is an issue of serious concern. We should be fearless and take a stand on all these issues.

While working out the resource generation data, we should also mention the expenditure involved, because the resource generation amount gets deducted from the budget allocation. We have to be rational while working out these figures.

Sustainability of natural resources is important and a “Jhansi declaration” should be brought out based on the outcome of this Brainstorming Session. Sustainability of Indian NARES is equally important. The health of NARES is to be maintained and it has to be reborn. It is required to conduct BSS on how the NARES, especially the Universities, have to be made more self-sustainable and supportive. A revolution is needed in the NARES, and a beginning should be made from this IAUA Conference.

Dr. Rameshwar Singh, President, IAUA and Vice Chancellor, BASU, Patna

Indian agriculture has come up from a state of food deficit to food surplus. We have now a very robust system of SAUs and ICAR institutes, called NARES. During the period of *COVID* crisis and Ukraine-Russia war, most countries are facing the food shortages, while our situation is quite comfortable. We are having enough buffer stock, enough production, and we are in a much better situation than many of the similarly situated countries. This situation has happened due to our strides in research, teaching and extension in agricultural sciences by the NARES.



AUs have contributed a lot towards Green Revolution. Sometimes, we see the criticism of Green Revolution – this effort of undoing what has been achieved does not auger well in the system. Many new alternative systems are being suggested and also being imposed, but we have to be rational and take decisions based on scientific data. There is a narrative that even urea is poisonous. Without fertilizers, are we in situation to sustain our production with cow dung and other sources?

We need to conserve the soil, water and other natural resources, which are shrinking, while the population is increasing. Quality food and nutrition are becoming more and more relevant, and now we have to develop a food system where we can address food production, food security, health security and environmental security.

This platform can be very effective and many recommendations can be highlighted from this platform. The points which are of common interest should also be taken up for discussion at this meeting, apart from the chosen theme of the BSS.

Dr. Panjab Singh, Chancellor, RLBCAU, Jhansi

A very important topic has been chosen for this conference. We need to see the cost of production versus sustainable production – both the natural resources and sustainable production have to grow simultaneously.



Challenges now are more than in the past as we have to feed 130 crores of people in the country, and at the same time, save or balance the natural resources. It is not only the question of meeting the requirements of 7 billion human population of the world but also the 700 million livestock population. Technology has to be strong for environmental security.

The 11% of our land has no limits of production as they are good, but the rest 89% of the land has several kinds of

problems – shallow depth, salinity and others. 52% of the land is cultivable. Unfortunately, we are not able to make use of the rainwater, and most of it is getting wasted. About 50% of the land is rainfed; we need to see the use of available water for better use efficiency.

Millets have almost disappeared from most of the areas. We have to sustain the resource-use efficiency. Previously, our soil was deficient only in N; now there are 12-13 nutrients which are deficient in soil. We are passing through a very severe deficiency of plant nutrients. Our soils are becoming deficient by 10 million tons of nutrients every year as we add less and take out more from the soil. Nitrogen use efficiency is only 30-35%, P 15-20%, K 70-80%, micronutrients <5% - all this calls for focusing more on improving the Nitrogen Use efficiency (NUE). Water-use efficiency (WUE) is only 35% as conveyance losses are 65-70%. In view of all these facts, Eco-services became important for safe environment and sustainable natural resources.

Dr. R.S. Paroda, Former DG, ICAR and Secretary, DARE, GOI, New Delhi

It is a matter of greater privilege for me on two counts – first to visit this beautiful campus, for which, I congratulate Dr. Arvind Kumar and Dr. Panjab Singh, and the second, this being first event of IAUA in which I am participating. I compliment Dr. A.K. Singh for selecting this topic, which is very relevant in the present context.



We have come a long way, but we now need a paradigm shift for integrated natural resource management. On the demography front, we have the challenges – already we have become the most populous country in the world – overtaken China, and our demand for food will be 50% more by 2050.

We have not only to take care of production, but also post-production handling of produce. We have to now talk in terms of farming systems approach, rather than commodity approach that we have been following. Diversification of agriculture is most important for sustainability. More funding and resources are needed, without which sustainable resource management and Conservation Agriculture (CA) for sustainable intensification will not be possible.

For Conservation Agriculture, the machinery cannot be owned by the farmer himself. For this, FPOs, NGOs, private sector organizations, cooperatives and others should come forward to provide custom hiring services. We must think of innovations in CA, and of regenerative agriculture, which includes all other forms of climate-resilient practices. We cannot make all agriculture as organic farming, because of the non-availability of organic manures.

COVID-19 has taught us a lesson. Now, natural resource management has come upfront and everybody is talking of conserving natural resources. Economic Survey of India for the last 5 years has been expressing that Green Revolution has though succeeded in the past, but it possibly was an exploitative technology in terms of natural resources – our soil, water and environment – all have been deteriorating to a great extent.

We have to think of one-health – it requires inter-institutional and inter-disciplinary approach. It requires us to work together, and not within our own umbrella. In this context, the role of IAUA is very important when we have to think of challenges at the global level.

Climate change is a reality, and we have to develop technologies which are climate smart. A commitment has been made by our Hon'ble Prime Minister at the Paris agreement – in *COP-26*, and we need to focus on clean energy, bio-energy and C-sequestration, but we are lagging behind.

Our National Forest Policy wants us to have 31-33% of forest cover, but at present, it is only 25%, Agroforestry policy has indicated a possibility to increase the tree cover. Agroforestry (which also includes fruit trees) and Conservation Agriculture are the two important areas which can help us in meeting the targets of C-sequestration and C-trading for the small holder farmers, which require innovative approaches. All this is required to be done in a big way in aggressive manner.

Conservation Agriculture has been adopted globally on 200 million hectares, but Indian does not have even 5 million hectare, which we started about 25 years back. Globally, CA is adopted in rainfed areas. Our rainfed area is more than 50%, which is a grey area, which we have to make green now. Conservation Agriculture has been adopted on a large scale in USA, Canada, Argentina, Brazil, and even in Turkey, and it is all in dryland areas. We need to think why should we cultivate the land after wheat or rice? We have to convince the farmers to adopt it, and that should be our major focus. For increasing water-use efficiency, we have to go in for micro-irrigation.

At the end, Dr. N.P. Dakshinkar, Secretary General, IAUA and Vice Chancellor proposed formal vote of thanks.

TECHNICAL SESSION-I: SUSTAINABLE MANAGEMENT OF SOIL AND WATER RESOURCES

Optimal functioning of soil is crucial to the long-term production and sustainability of agriculture on a national and global scale, with well managed soils providing ecosystem services addressing societal grand challenges. Conventional agriculture and future environmental change impose pressures on soil functions and quality. Soil degradation, in a range of forms, is a major threat to crop productivity and yield stability, profitability and sustainability. Consequently, soil and water resources need to be managed to be increasingly sustainable and productive, while also improving soil function and quality. This deliberations in this session focuses on the application of existing and novel models, soil management interventions, plant genotypes and soil quality indicators to enhance sustainable use and management of soils and water in agricultural systems whilst reducing environmental impact. Further, there is also need of discussion on how to achieve the goal of use of less water, mainly because of pressures from growing urbanization, industrialization and climate change and increase water use efficiency in agriculture which is the major user of water, accounting for about 70% of the world's freshwater withdrawals. There is urgent need of developing and demonstrating self-sustained to sustainable agriculture production through the integration of modern tools. These tools are like Artificial Intelligence, Drones with location-specific technologies like integrated farming system model, conservation agriculture, techniques for rain water harvesting, solar-based micro-irrigation system, crop diversification through climate resilient drought and heat tolerant fruit crops, and promotion of local goat and cow breeds to improve soil health, water productivity and environmental quality. Agriculture promotion needs to be done through technology promoting agencies, farmer-owned agencies, farmer-industry linked production and promotional tie-ups to meet the new emerging demands.

Dr. A.K. Singh, Vice President, NAAS and Dr. S.K. Choudhari, DDG (NRM), ICAR Co-Chaired the Session, and panelists were: Dr. Arun Kumar; Dr. B.R. Kamboj, Dr. Anupama Singh, and Dr. S.S. Singh, Dr. Yogeshwar Singh was the Convener of the session.



Dr. S.K. Choudhari, DDG (NRM), ICAR delivered the keynote address and made the following points:

- Soil Health program should be planned and executed in timeline manner for improving soil health and productivity to increase fertilizer use efficiency.



- There is need of strengthening research for development of nano-formulation based agrochemicals for increasing the efficiency of the products along with its standard operational procedures.
- Innovations and success stories should be included in course curriculum for better understanding and thought-provoking ideas generation.
- Upscaling of reclamation of degraded/problematic lands should be carried out in mission mode to bring additional area under sustainable cultivation.
- Niche areas for various production technologies like conservation agriculture (CA), organic farming, natural farming, IFS etc. should be well identified, mapped and upscaled in mission mode to harness its potential in sustainable manner.
- Awareness programs should be organized in mass manner to create belongingness and responsibilities of every citizen of India for judicious use of natural resources.
- Policy papers for its practical feasibility need to be developed.

Dr. A.K. Singh, Vice President, NAAS, New Delhi highlighted the following points:

- Carbon sequestration and zero-carbon emissions-based technologies should be developed and up-scaled for sustainable agriculture.



- Direct seeding/aerobic rice production should be encouraged and rice cultivation through puddling should be discouraged.
- Pest management should be addressed on priority basis for promotion of organic and natural farming.
- Automation technologies should be made more practical and economically feasible, and upscaled to increase the input-use efficiency.
- AI and drones should be used more extensively for minimizing input requirements and upscaled for increasing input use efficiency, crop productivity, and farmers' income in eco-friendly manner.
- The incentives should be given for practicing sustainable organic/natural farming models rather than subsidy for agri-inputs.

Panelists' Remarks

Dr Arun Kumar, VC, SKRAU, Bikaner

- Human health should be given priority by judicious and minimal use of agro-chemicals.
- More attention should be given for addressing the multi-nutrient deficiencies, especially S, Zn and B.



- Awareness programmes should be strengthened to make people responsible towards the conservation and judicious use of agrochemicals, land and water by adoption of suitable models and technologies.
- Policies should be made for reducing the exploitation of ground water with possibilities of water taxes.

Dr. B.R. Kamboj, VC, CCSHAU, Hisar

- Residue management should be given due attention through the upscaling of Conservation Agriculture in cluster mode. At least 20 per cent crop residue should be recycled / retained at field level.
- Cultivation of cover crops should be planned for sustaining soil health.
- Weed management through crop residue retention should be promoted to minimize the use of herbicides.
- Direct-seeded rice should be made compulsory, with ban/restriction on puddling for ensuring proper ground water recharge.

Dr. Anupama Singh, Joint Director (Education), ICAR-IARI, New Delhi

- There is a need of strengthening research for development of nano-formulation based agrochemicals for increasing the efficiency of the products.
- Safety measures and guidelines should be developed and strictly adopted for the development and use of nano-agrochemicals products.

Dr. S.S. Singh, Director Extension Education, RLBCAU, Jhansi

- Phosphorus solubility should be increased in red/laterite soils for increasing the PUE (Phosphorus Use Efficiency).
- Focus should be given for reclamation of acid soils with proper government support in mission mode.
- Water storage of canal command areas should be increased through upscaling of de-siltation and its regular maintenance for improving canal efficiencies.



RECOMMENDATIONS OF TECHNICAL SESSION-I

1. Mega Soil Health program should be planned and executed in timeline manner for improving soil health and productivity.
2. Provision of incentives as reward for farmers adopting sustainable and renewable technologies like CA, Organic/Natural farming, water harvesting, micro-irrigation, etc.
3. Up-scaling of reclamation of degraded/problematic lands should be carried out in mission mode to bring additional area under sustainable cultivation.
4. Niche areas for various production technologies like CA, organic farming, natural farming, IFS, etc. should be well identified, mapped and up-scaled in mission mode to harness its potential in sustainable manner.

5. Awareness programs should be carried out in mass manner to create belongingness and responsibilities of every citizen of India for judicious use of natural resources.
6. Need of developing policies for use of ground and surface water including of incentives of water harvesting.
7. Carbon sequestration and zero-carbon emissions-based technologies should be developed and up-scaled for sustainable Agriculture.
8. Pest management should be addressed on priority basis for promotion of organic/natural farming.
9. Water storage of canal command areas should be increased through up-scaling of de-siltation and its regular maintenance for improving canal efficiencies.
10. Automation technologies using AI, Drones and others should be made more practical and economically feasible and up-scaled to increase the input use efficiency.
11. Strengthening research for development of nano-formulation based agrochemicals for increasing the efficiency of the products.

TECHNICAL SESSION-II: SUSTAINABLE MANAGEMENT OF ANIMAL AND FISH RESOURCES

Animal production contributes about 40% of the total value to agriculture globally. Two billion people depend, at least in part, directly upon livestock for their livelihood. India has large livestock population and provides livelihood to ~60% population of rural areas and also paramount for nutritional security. However, there are many challenges like disease outbreak, shortage of feed and fodder, poor extension of livestock and markets for livestock products.



With appropriate management, livestock enable sustainable use of marginal lands for food production, transforming otherwise unusable fibrous material into high quality protein. Continued human population pressure, economic advancement leading to growing demands for foods of animal origin, and environmental factors affecting land will require sustainable intensification of livestock production to meet increasing human demand. Fishery is a key sector in India that provides nutritional security and livelihoods to millions of fishers, many of whom are small scale and low income. Keeping in view the bio-security and environmental concerns, blue revolution can really help to achieve economic prosperity of the country, fishers and fish farmers also contribute towards food and nutritional security by full potential utilization of water resources for fisheries development in a sustainable manner.

Dr. Rameshwar Singh, President, IAUA chaired the session, while Dr. J. K. Jena, DDG (Fisheries), ICAR and Dr. A.K. Srivastava, VC, DUVASU, Mathura the co-chairs as well as keynote speakers of this session. The panelists were: Dr. N.H. Kelawala; Dr V. Reddy; Dr. N.P. Dakshinkar; Dr Ravi Shankar; Dr N.I. Singh; Dr. V.P. Singh; and Dr. B. K. Behera. Dr. Ram Prakash Yadav was the convener of the session.

Dr. A.K. Srivastava, VC, DUVASU, Mathura made a keynote lecture on “Sustainable Management of Animal Resources” and highlighted the following points:

- India has large number of genetic resources and we need to strengthen carrying capacity of livestock. Genomic selection in breeding programme should be based on input-use efficiency in relation to milk production, productivity and nutritional security.
- Technology needs to be developed and addressed related to semen transfer. Need to strengthen tools and protocols for enhancing production and reproduction in small ruminants. Gene banking to manage genetic diversity is required to be addressed both in short-term and long-term.

- Technology for automatic monitoring platforms should be developed to manage livestock farms, and need to be adopted and transferred to stakeholders.
- The gap between demand and availability of vaccine should be reduced, and vaccine technology has to be improved for immunization of livestock.
- The gap between demand and availability of male germplasm is required to be bridged. Need to prepare a road map for enhancing productivity through breed improvement and address the shortage of feed and fodder.



- We need to see animal resources as essential component for sustainable future of India. Biosafety of farms for surveillance monitoring entry of infectious disease should be addressed.

Dr. J.K. Jena, DDG (Fisheries), ICAR delivered a keynote lecture on “Sustainable Management of Fisheries Resources in India” and made the following points:

- Deep sea fisheries (200-2000 m depth), wetland and reserve stocking are important for conservation of fish resources.



- Sustainable and certified capture of fish is the need of the hour. Certification of seed resources is needed to be addressed.
- Fish farming should be promoted adopting ecosystem approach. Fisheries sector can help in meeting Sustainable Developmental Goals (SDG) through fish resources management that can promote blue economy.
- Green fishing systems need to be adopted. Inland and marine fisheries need to be strengthened for production and conservation.
- More research is required on mesh size for fish catching to avoid loss of catching small size fish. Harvest technologies should be improved and regulatory and management measures for it should be in place.
- Partnership should be promoted among different stakeholders for fish resource management.

Dr V. Reddy, VC, SVVU, Tirupati

- Crop residues management and their utilization is the need of the hour. We need to create awareness and educate the farmers regarding benefit of the crop residue management. In breeding programme, opinion of livestock keepers must be taken.



Dr Ravishankar C. N., Director, ICAR-CIFE, Mumbai

- Fisheries sector has a big role to play in nutritional security of the nation. Need to make fishing remunerative through technology development. In fish sector, 15% loss can be reduced through post-harvest technology and 55% waste of fish resources can be diverted to pharma and other sectors.

Dr. V.P. Singh Dean, CoVAS, RLBCAU, Jhansi

- Need to see health system as one and challenges are required to be addressed. Biosafety surveillance and stable vaccine are required to be strengthened. Antimicrobial resistance and breeding of disease resistant animals are needed to be addressed.

Dr. B.K. Behera, Dean, CoF, RLBCAU, Jhansi

- The level of pollution in the water bodies is required to be tackled for sustainable fish resources managements.
- Aquaculture and fish farming are required to be promoted on a large-scale involving farmer for sustainable management of fish resources.

RECOMMENDATIONS OF TECHNICAL SESSION-II

1. Considering the importance and potential of deep-sea fisheries (200-2000m depth), wetland and reservoir stocking are required to be explored and promoted for conservation of fish resources.
2. Certification of fish seed resources is needed to be addressed for sustainable and certified capture of fish.
3. Fish farming should be promoted adopting ecosystem approach as fisheries sector can help in meeting Sustainable Developmental goals (SDG) through fish resources management promoting blue economy.
4. Inland and marine fisheries need to be strengthened for production and conservation. More research is required on mesh size for fish catching to avoid loss of catching small size fish.
5. Harvest technologies should be improved, regulatory and management measures for it should be in place.
6. Partnership should be promoted among different stakeholders for fish resource management.
7. Need to strengthen tools and protocols for enhancing production and reproduction in livestock sector as animal resources are essential component for sustainable future of India.
8. Genomic selection in breeding programme and gene banking to manage genetic diversity should be strengthened. The gap between demand and availability of male germplasm is required to be bridged.
9. Technology for Automatic Monitoring system to manage livestock farms need to be developed and transferred to stakeholders.
10. Need to address the shortage of feed and fodder.
11. Need to prepare a road map for enhancing productivity through breed improvement. Vaccine technology needs to be improved for immunization of livestock.



TECHNICAL SESSION-III: SUSTAINABLE MANAGEMENT OF PLANT RESOURCES (INCLUDING BIODIVERSITY)

Plant Genetic Resources (PGR) is basic for crop improvement – traditional or molecular plant breeding or genome editing. The extent of utilization of PGR has not been uniform across different countries. The developed countries are stock piling the rare wild species available anywhere. The novel PGRs offer scope for discovering new genes. Conservation of the unique plant diversity and microbial biodiversity of ecosystems needs trans-disciplinary approaches. Comprehensive integrated program is needed for conservation of plant genetic resources. The experts and conservation agencies in several countries are proposing indicators to encourage and improve management of plant genetic resources in nature



Dr. P.L. Gautam, Former Chairperson, PPVFRA & BDA and Dr. Parvinder Kaushal, UUHF, Bharsaar Co-Chaired the session, and the panelists were Dr. T. Janakiram; Dr. S.K. Chakrabarti; Dr. Amaresh Chandra; and Dr. S.K. Chaturvedi. Dr. P.P. Jambhulkar was the Convener of the session.

Dr. P.L. Gautam, Former Chairman, PPVFRA & NBA was the keynote speaker, and made the following points in his address:

- Globally about 42000 endangered species are in threatened list. In India 1355 species are in threatened list.
- Prior to the implementation of Convention on Biological Diversity 1992 (CBD-1992), the biodiversity was considered as common heritage of mankind, and the exchange of PGR was unrestricted and facilitated. After its implementation it became sovereign domain. Post-CBD era has witnessed fast and intense technological developments in plant biology and agricultural research led by genomics.
- Biodiversity hotspots are facing threats of habitat fragmentation, over-exploitation, climate change, shrinking resources, forest fires, Invasive alien species and needs due attention for its conservation.
- Each species needs to be conserved in-situ (in forest, farm) and ex-situ (in Gene bank, Cry bank)
- The conservation work in India is being done by 6 Bureaus.
- Earth Summit 1992 has categorically mentioned that responsibility of conservation lies on developed countries and these should support developing countries by sharing sustainable models and remedies for conservation of genetic resources.
- Traditional knowledge also needs to be conserved.
- There is a need to strengthen policy and legal framework, implementation of seed act, encourage public-private partnership, strengthening infrastructure, and promote ex-situ and in-situ conservation, and capacity building of stake holders.

Panelists' Remarks

Dr. Amaresh Chandra, Director, ICAR-IGFRI, Jhansi

- Preservation and conservation of grasslands is contributing to conserving bioresources.
- There is a need to protect biodiversity of these grasslands. Among newer technologies, drone technology can be utilized and exploited to know how and what type of grassland covered in non-accessible region.
- Monoculture in the grassland is disastrous as it proliferates disease and insect-pests.
- There is need to preserve genetic resources by better preserving techniques.



Dr. S. K. Chakrabarti, VC, UBKV, West Bengal

- Regenerative agriculture and biointensive agriculture will help in nutrient mobilization by proliferation of microbes.
- Microbial diversity in forest system revealed by metagenomics suggests that there is a treasure of data on microbes which can be exploited for natural and organic farming.
- Monoculture should be discouraged and it needs to be encouraged for crop rotation.
- Wild relatives of microbes should be collected and preserved.



Dr. S.K. Chaturvedi, Dean Agriculture, RLBCAU, Jhansi

- Crop nutritional acquisition efficiency is an essential consideration for environment-friendly and sustainable agriculture.
- There is a need of search and preserve future crops by reemphasizing on seed bill and certification system.
- There is a need to intensive cropping system with at least two crops in a season.



Dr. Parvinder Kaushal, VC, UUHF, Bharsar

- Sustainable plant genetic resources are fundamental for a progressive realization of the right to food.
- There is a need to conserve all genetic resources in habitat where they were originated.



RECOMMENDATIONS OF TECHNICAL SESSION III

1. Intellectual Property rights and traditional knowledge of germplasm needs to be secured.
2. There is need of strengthening policy and legal framework, implementation of seed act.
3. Encourage public-private-partner-ship, strengthening infrastructure, promote *ex-situ* and *in-situ* conservation and capacity building of stake holders.
4. Monoculture in grasslands should be discouraged.
5. Drone technology to be utilized to assess the type of grassland spread in Bundelkhand region.
6. Benefits of microbial diversity for natural and organic farming need to be utilized through regenerative agriculture, bio-intensive agriculture.
7. Wild relatives of microbes should be collected and preserved.
8. Reforms in policies are needed to conserve available genetic resources.
9. Heritage Gardens (orchards) in the country must be identified and protected.
10. The indigenous vegetables should be promoted which will benefit local farmers.

TECHNICAL SESSION-IV: SUSTAINABLE CLIMATE RESILIENT PRACTICES

Climate change is a major threat in recent times and various non-agricultural and agricultural factors are responsible for this problem. Agriculture and development practices are estimated to contribute almost 30% of greenhouse emissions, primarily due to the use of chemical fertilizers, pesticides, and animal wastes. Climate-resilient agricultural practices look at adaptive agricultural methods that can withstand the shocks of climate change and weather extremes. These practices must be flexible enough to prepare and tackle long-term climate change as well as short-term weather shocks such as storms, hail, droughts, etc. The danger of climate change in agriculture sector looms on crop production and management of farm resources. The natural resources use on sustainable basis is derailed due anthropogenic pressure which is accelerating the climate change phenomenon. The realignment of common practices at farm level livestock management, farm machinery uses and agro-forestry is essential for promotion of climate resilient agriculture Vis a Vis regenerative agriculture. Further to ensure alignment of environmental policies and investments across global, regional, national and sub-national levels, strengthening of vertical and horizontal coordination mechanisms between sectors and stakeholders across different levels are required to ensure streamlining of climate resilient practices. We need steady budget for execution of climate adaptation and mitigation from public and private sectors. There is an also need to promote certification procedures viz., sustainable and ecological labels, certifications, and standards. The monitoring of environmental, social, sanitary, and economic sustainability of the research and development projects along with their relative positive and negative impacts is equally important. The future climate risk is a key element required to be addressed for sustainable and transformational development in agriculture. Reorientation and redesigning of agricultural practices in line with SDGs and local socioeconomic needs with site specific interventions is the need of time e.g., organic farming, conservation agriculture, ecological farming, Agri-waste management, etc., These all activities will develop a sustainable agro-ecosystem for resilient agriculture and production to consumption linkages.



Dr. B.S. Dwivedi, Member ASRB, New Delhi and Dr. B.C. Deka, VC, AAU, Jorhat Co-Chaired the session. Dr. V.K. Singh, Director, CRIDA was the keynote speaker, and the panelists were: Dr. P.L. Patil; Dr. Indira Sarangthem; Dr. A. R. Sharma and Dr. Manmohan Dobriyal. Dr. Manmohan Dobriyal was also the convener of this session.

Dr. V.K. Singh, Director, CRIDA, Hyderabad made the following points in his keynote address:



- In different Representative Concentration Pathway (RCP) models, soil temperature and coastal water temperature is equally important to monitor for biodiversity of land and water resources threat and management. Rainfall pattern and precipitation will be affected due to increase in temperature. The growing season will be shortened more in Rabi than Kharif season.

- Green House Gas (GHG) emission from livestock is 54%. Fifty per cent of countries are most affected due to GHG emission due the cultivation of rice and wheat which are in declining trends.
- The National Mission for Sustainable Agriculture (NMSA) need to be strengthened and the farming system, landscape based and watershed-based approach should be adopted for better resilience of agro-ecosystem.
- Climate resilient agriculture with smart agricultural practices for specific ecoregion, the land utilization, land capability classification or land use scheme to be adopted in true sense.
- NICRA like project is creating data sets even at village level and is supported by local youths in adaptive practices including custom hiring centers, agro-met advisory, etc. Dr Singh also highlighted the success stories of NICRA project of ICAR.
- The village climate resilient management committees have to play significant role for preparedness of draught threat.
- To combat climate change, there is a need to integrate agroforestry; conservation agriculture, etc. and planning should be done accordingly. Heat waves have impact on production and accordingly crop rotation and other technological interventions have been adopted. Due to all these measures, CRIDA developed models for 97 % resilience.
- Megdoot App is helping the farmers and NICRA supporting state wise schemes for climate resilient agriculture.

Panelists' remarks

Dr. P.L. Patil, VC, UAS, Dharwad

- Resilience of soil ecosystem focusing on the rhizosphere and building soil as well as water conservation system is advocated. Land resource information is needed at large scale level. In Karnataka, soil and water conservation plans have been adopted, which helped to regenerate agriculture landscape.
- Selection of crops as per market, advocacy and government intervention for MSP well in time is essential.
- Rain water harvesting, capacity building, zero tillage, wind break and agroforestry are essential component for climate resilience.
- To reduce soil erosion, shelter belt / windbreak is more helpful in coastal areas.



Dr. Indira Sarangthem, Dean Agriculture, CAU, Imphal

- Jhum farming in some areas of north-east is a threat to natural resources.
- Organic production practices are by de-fault, edible plants in fruit basket, Apatani system, IFS linking with poultry, livestock, fisheries are being followed in North-East region.
- The biodiversity and novel drugs, innovative land development, various produces for the North East region need to be promoted.



Dr. A.R. Sharma, Director Research, RLBCAU, Jhansi made a presentation on “Conservation agriculture for climate resilience and soil resource management”, and emphasized the following points:

- Conventional agriculture systems are characterized by intensive tillage, clean cultivation, fixed cropping systems, greater dependence on chemical fertilizers and other pesticides, flood irrigation and other faulty practices, which are not sustainable in the long-run.
- Conservation Agriculture (CA) based on the principles of minimum soil disturbance, soil mulch cover and

diversification of species is the answer to combat climate change and arrest soil resource degradation.

- CA is presently followed on >200 M ha (15% of the cropped area) and is the fastest adopted technology globally.
- Based on the experimental findings of the past 3-4 decades, it has been conclusively proved that CA brings about resource saving, soil health improvement, environmental benefits, and ensures higher productivity and profitability.
- In India, CA is adopted on a limited area in some locations of north-west India, central, south, west and north-eastern region on about 4-5 M ha.
- CA roadmap for India has been prepared, enlisting 10 points, which must be followed in letter and spirit.
- World Congress on Conservation Agriculture (WCCA) has given a call to cover 50% cropped area globally under CA by 2050, and in India we should cover 20 M ha by 2030.
- It was advocated to become practitioners and not only preachers of CA to combat climate change and ensure sustainable natural resource management.



Dr. Manmohan J. Dobriyal

- Climate-resilient agriculture is a synchronized approach to manage the components of agriculture and food security affected by climate change. The World Bank promotes climate-resilient agriculture focusing on improving productivity, quality and quantity, leading to improved nutrition and farmer income.
- Resilience generally reduces the susceptibility to water scarcity, pests, and other climate-related adverse events, and improve the capacity to adapt and grow in the face of longer-term stresses like shortened seasons and erratic weather patterns.
- Carbon sequestration is to reduce emissions in the process of food production, avoid deforestation, and promote methods to capture and remove carbon dioxide from the atmosphere.
- In current era of climate change, the perennial / tree-based farming is imperative to reduce the risk and diversify the agricultural production system through agroforestry. The agroforestry may have been adopted in any fashion of composition, structural, spatial or temporal manner as per ecologies and multipurpose trees be promoted for livelihood security.
- Underutilized crops, trees or medicinal plants are required to be introduced in agricultural landscape as well as wasteland or problematic soils for better land resource utilization. These practices lead to increased resilience and consistency in yield despite varying climatic conditions. The best part is that they may require minimum intervention as they are already part of many cultures and systems.
- National Agroforestry Policy 2014 adoption is essential for increasing tree cover on farm for micro to macro level climate amelioration with long-term sustained intervention for promotion of climate resilient-cum-climate smart agriculture.



RECOMMENDATIONS OF TECHNICAL SESSION-IV:

1. Climate resilient agriculture with eco region specific smart agricultural practices for the land utilization land capability classification or land use scheme to be adopted in letter and spirit. Soil and land use policy should be brought out highlighting the carrying capacity of land / water resources.
2. Climate resilience is fundamental concept of climate risk management and in agricultural sector we need to

have adaptation strategy more than mitigation measures. Nature - friendly technologies with consideration of below ground biological processes should be worked out and promoted for resource management. NICRA like project to create data sets even village level and supported by local youths in adaptive practices including conservation agriculture, custom hiring centers, Agromet advisory, etc. need to be promoted.

3. Regenerative agriculture involving conservation agriculture along with good agronomic practices is needed for efficient resource management.
4. There is a need to work out the coefficient used in modeling for estimating, anticipated losses due to climate change as the figures reported in 6th IPCC report appears to be bit exaggerated. NMSA need to be strengthened and farming system / landscape-based watershed-based approach to be adopted for better resilience of agro ecosystem.
5. An environment of innovations needs to be created in the agricultural universities and the “failures” if any, while pursuing novel ideas also need to be recognized in order to motivate the youngsters for innovations in their respective fields of specialization without a fear of possible failures.
6. Eco region-based planning an adaptive mechanism from crop selection to other agronomic/ silvicultural practices need to be defined for precise micro functionality. In north East areas, hill, desert and other ecologically fragile areas default organic farming or natural farming need to promote.
7. Agroforestry or tree/ perennial based farming/ fruits orchards is important to meet the national mission of sustainable agriculture being its part. IFS models a need to be developed and promoted on farms and also integrated with different agencies dealing with climate change.
8. Underutilized crops including medicinal and aromatic plants are better suited for wastelands or uncultivated lands need to be promoted for resilience of agro ecosystem and expansion of the areas.

TECHNICAL SESSION-V: INTRODUCING INNOVATIONS (INCLUDING AI, IOTS, BLOCK CHAIN, AGRI-DRONE, BLENDED LEARNING ETC.)

Growing global food demands place major strains on water and other natural resources, including quality impairments and increased scarcity. Technological innovation is the need of hour to explore the long-term impacts of alternative policy approaches to the agricultural impacts on natural resources. The agricultural research is expanding beyond the development of annual crop technologies for individual farms to the development of longer-term natural resource management techniques for entire landscapes. But technologies or practices with a long lag time between investment and returns are unlikely to be adopted by farmers unless they have secure rights to the underlying resources (property rights). Similarly, technologies that span multiple farms are unlikely to be adopted unless neighbors and groups work together (collective action). But little is known about the way property rights and collective action in developing countries mediates the adoption of technologies by farmers and groups. This session discussed the importance of innovations for promoting sustainable natural resource management. Agriculture 4.0 represents the fourth agriculture revolution that uses nano-bio-information technologies and moves toward a smarter, more efficient, environmentally responsible agriculture sector. Agricultural technologies have emerged to enhance sustainability and discover more effective farm methods. This encompasses all digitalization and automation processes in business and our daily lives, including Big Data, Artificial Intelligence (AI), robots, the Internet of Things (IoT), and virtual and augmented reality as well as frontier technologies including nano-biotechnology.





The session was chaired by Dr. P. Das, Ex-DDG (Agricultural Extension), ICAR, and co-chaired by Dr. Anupam Mishra, VC, CAU, Imphal and Dr. P. M. Pandey, Director, BIET, Jhansi. The keynote speaker was Dr. P. S. Pandey, VC, RPCAU, Pusa. The panelists were: Dr. Indra Mani Mishra, Dr. K.K. Singh, Dr. P.M. Chauhan, Dr. I.N. Singh and Dr. Anil Kumar. The Conveners of the session were Dr. Mukesh Srivastava and Dr. Tanuj Mishra.

Dr. P.S Pandey, VC, RPCAU, Pusa made a keynote presentation on the topic “Innovations in Agriculture” and emphasized the following points:

- Innovation has increased in India especially during the last decade, which has changed the image of the country. The innovation must be novel. Many factors are responsible for creating innovation.



- Innovation in agriculture in the area of Decision Support system, traceability in seed and Agri-products, sensor-based technology, remote sensing and GIS, precision agriculture and drone technology was highlighted.
- Huge potential exists for use of AI and Machine Learning in Agricultural Research and Education.
- Application of technology is another important area which should be used judiciously. The introduction and adoption of new technology in agricultural education was deliberated.

Panelists' Remarks

Dr. Indra Mani Mishra, VC, MKV, Parbhani

- The role of Kisan drone: a revolutionary technology for agriculture and natural resource management was highlighted.
- The next agricultural revolution will be driven by data, which will help to increase agriculture productivity with minimum damage to the environment and increased livelihoods for community involved in agriculture.
- With the availability of sensor, drones can detect the things which are beyond the visible range of human site.



- The role of drone's technology in soil and field analysis, planting crops and trees, crop spraying, irrigation scheduling, crop monitoring, weed identification, crop health assessment, crop Insurance, geo-fencing livestock management was mentioned.
- Financial support available for Agri-drone in India will drive the application of this technology.

Dr. K.K. Singh, VC, SVPUAT, Meerut

- Sustainable agriculture, natural resource management, precision farming needed high-end technologies like artificial intelligence, machine learning, deep learning, internet of things, drone technology, etc. for augmented production and productivity.
- NAIP, DST, DBT funded projects are there in collaboration with IITs and Agricultural Universities/Research Institutes for plant disease identification, crop health monitoring, irrigation automation, development of Agri-bot, yield monitoring, smart grain storage, etc.
- Some initiatives in the field of AI and IoT are like CIAE, Bhopal develop fruits and vegetables grading system, low-cost SPAD meter, and uniform sprayer. IIT, Kharagpur had developed image-based herbicides applicator, etc.
- Success stories like Microsoft in collaboration with ICRISAT developed AI based crop sowing app for sending crop sowing advisory for the optimal sowing date and farmers increased the production by 30% by using this application.



Dr. P.M. Chauhan, Registrar, JAU, Junagarh

- India faces the challenge of a comprehensive ecological transition of economy and lifestyles.
- New concepts and approaches are required to rethink and redo the way to manage the renewable and non-renewable resources.
- Highlighted Agri-voltaic model has been developed by Junagadh Agricultural University.



Dr. I.N. Singh, Dean, CoFT, CAU, Imphal

- The facilities developed at CAU, Imphal like, auto-harvester, Makhana harvester, eco-tourism, etc. were highlighted.
- Importance of food and seed traceability is now needed of time to monitor good agricultural and good manufacturing practices.



Dr. Anil Kumar, Director Education, RLBCAU

- Highlighted the shift in paradigm from deterioration to sustainable production system. The precise mapping of the land, soil fertility (micro and macro nutrients), water body, bio-diversity, cropping pattern, air quality monitoring is required to monitor the real-time status and protective measures to save and manage the natural resources. Thus, science and technology led innovations and interventions are needed to address the pressing concerns of Indian Agriculture.



- Monitoring of soil health having direct impact on plant and animal nutrition, deterioration of natural resources has impacted badly on quality of life and thus nutrient cycling being a key factor in deciding the maintenance of human health.
- There is also urgent need to extensively work on regenerative agriculture, frontier sciences and technology at the farm level, etc.
- In 21st century, Nano-technology, Bio-technology and Information technology can play a pivotal role in soil improvement, crop production, precision farming, and crop improvement through innovation in research, capacity building and creating awareness to protect the natural resources.
- One-Health concept which means holistic thinking to integrate the health of natural resources to health of plants to animals to human being. The soil health is directly affecting the health of many eco-systems as soil nutrients ultimately affecting the nutrition of plants, animals and human being.
- The deficiency of macro and micro-nutrients in soil ultimately affecting the soil/plant's nutrition having direct impact on animal and human nutrition and thus such nutrient cycling is a key factor in deciding the maintenance of human health and onset of diseases.

RECOMMENDATIONS OF TECHNICAL SESSION- V

1. Application of AI and other high-end technology in agriculture decision support system, traceability in seed and Agri-products, sensor-based technology, remote sensing and GIS, precision agriculture, machine learning, deep learning, internet of things and drone technology, etc. should be used judiciously and introduced in agricultural research, extension and education system.
2. The role of Drone technology in soil and field analysis, planting crops and trees, spraying, irrigation scheduling, crop monitoring, weed identification, crop health assessment, crop Insurance, geo-fencing, livestock management are now well proven, hence financial support for Agri-drone and other potential technologies must be provided in India.
3. New concepts and approaches are required to rethink and redo the way to manage the renewable and non-renewable resources. Agri-voltaic model developed by Junagadh Agricultural University is one of the examples of harnessing the potential of solar energy. Such model needs to be promoted and replicated.
4. The shift in paradigm from deterioration to sustainable production system needs science and technology led innovations and interventions to address the pressing concerns of Indian Agriculture.
5. In order to practice frontier science and latest technologies there is a need to establish COE (Centre of Excellence) in the universities.
6. One-Health concept needs holistic thinking to integrate the health of natural resources to health of plants to animals to human being. The soil health is directly affecting the health of many eco-systems as soil nutrients ultimately affecting the nutrition of plants, animals and human being and thus such nutrient cycling is a key factor in deciding the maintenance of human health and onset of diseases.
7. Deterioration of natural resources has impacted badly to the quality of life. Thus, there is an urgent need to work extensively on regenerative agriculture by the development and application of advanced sciences and technology at the farm level which requires skill, scale, speed, efficiency, knowledge and investments in human capital in agriculture and allied science.
8. In order to preserve and protect the natural resources and humanity in sustainable manner, we have to rely on modern tools of frontier sciences and technologies. In 21st century, nanotechnology, biotechnology and information and communication technology can revolutionize the agriculture and can play pivotal role not only in the soil improvement, crop production but also precision farming and crop improvement, hence, may be promoted with appropriate financial support.

PLENARY SESSION

The Plenary Session of the 11th Brain Storming Session of the Vice Chancellors of Agricultural Universities on “Innovations in Sustainable Natural Resource Management” was organized after successful conductance of five technical sessions. The session was Chaired by Dr. Panjab Singh, Former Secretary (DARE) and DG (ICAR) and Chancellor of the RLBCAU with Dr. A.K. Singh, Vice Chancellor, RLBCAU, Jhansi and Dr. Dinesh Kumar, Executive Secretary, IAU. Dr. S.S. Kushwaha, University Librarian was the Convener of the session.



Inclusion of Private Universities in IAUA

- During the discussion it was raised by one of the members that the IAUA should broaden its horizon and should include the private universities as member.
- If the IAUA decides to broaden its horizon and include private universities, it could potentially bring in new perspectives and ideas from these institutions, which could benefit the agricultural sector in India. Private universities could also contribute to research and development in the field, and provide students with a broader range of educational opportunities.
- However, it is important to ensure that any new member of the IAUA meets certain standards and criteria to maintain the association's quality and reputation. Additionally, there may be concerns about conflicts of interest or bias towards certain private universities.
- Dr Indra Mani, Vice-Chancellor, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani has suggested that the private universities should be reviewed thoroughly on a case-by-case basis to determine their eligibility for inclusion as member in a IAUA list.
- Dr. P.S. Pandey, Vice Chancellor, RPCAU, Pusa suggested that Indian Agricultural Universities Association (IAUA) need to be reviewed to make provision for inclusion of private universities as IAUA member. How is IAUA? During the discussion, it was resolved that determining the eligibility of universities for inclusion requires a thorough and rigorous assessment of various factors, such as the quality of education, faculty, research output, infrastructure, and outcomes. This process may involve evaluating accreditation, rankings, and other indicators of institutional performance.
- It was further discussed and debated that universities accredited by the Indian Council of Agricultural Research (ICAR) may be considered for inclusion in the list. The IAUA guidelines may be helpful to review their accreditation criteria and processes to ensure that any potential inclusion in the list aligns with established standards and best practices.
- Similarly, considering universities accredited by ICAR may provide a useful starting point for identifying institutions with a strong focus on agricultural research and education. Ultimately, any decision to include or exclude universities from a list should be based on a comprehensive and transparent evaluation process that considers multiple factors and is guided by established standards and criteria.

Strengthening of NARS and KVKs

- It was discussed and emphasized that extension education is an integral part of NARES, and Krishi Vigyan Kendras (KVKs) are very important for outreach, dissemination of new technologies, feedback and participatory research.
- It was resolved that KVKs are pilot demonstrations platform for technologies including package of practices developed by the universities and they should not be disintegrated from the system.
- IAUA and ICAR must work together to justify the importance of extension education, particularly the KVKs, as a crucial demonstration unit for agricultural research. The significance of the NARS system and its contributions in food and nutritional security, national economy, developing human resources, facilitating technology transfer, and promoting international collaborations in the field of agriculture must be emphasized.

ARS Qualification

- As per the revised ARS qualification, candidates need a Ph.D. as minimum qualification for recruitment. This was proposed based on UGC decisions, However, UGC has reverted its decision. If the UGC has reverted its decision regarding the minimum qualification for recruitment to Assistant Professor in University and Colleges, then it may be prudent to review the ARS qualification requirements as well to ensure the uniformity and attract the young minds in the agricultural research services.

IAUA Policy Papers on Agricultural Areas

- Policy papers are documents that outline a specific organization's position on a particular issue or topic. They provide information and recommendations to decision-makers and stakeholders, helping to inform and guide future policies and actions. The Agricultural areas are critical for the global food supply and play a crucial role in ensuring food security.
- India, with its vast agricultural areas, is one of the world's largest producers and consumers of food. It is essential to have policies that support the sustainable development and management of agricultural areas. These policies can address issues such as soil health, water management, crop diversification, agro-forestry, and climate change adaptation.
- The Indian Agricultural Universities Association (IAUA) is a body that represents the agricultural universities in India. It can play a vital role in developing and promoting policies that support the sustainable development of agricultural areas. Policy papers can be an effective tool for the IAUA to articulate its position and recommendations on issues related to agricultural sector.

Dr. A.K. Singh, Vice Chancellor, Rani Lakshmi Bai Central Agricultural University, Jhansi

- Dr Singh in his remarks highlighted the innovative compact model that Rani Lakshmi Bai Central Agricultural University has adopted for soil management,
- Water harvesting, and crop diversification. He emphasized that efficient management of cow dung, urine and residues for sustainable development.
- He cited that in the Netherlands, there are regulations regarding non-spreading of manure in the field including cow dung, to prevent emission and protect the environment. Farmers in the Netherlands must follow strict guidelines on when and how they can use manure, including cow dung, on their land. Such practices need to be adopted in India too.
- Research areas on efficient water utilization by animals needs to be identified and prioritized.
- As being done by a small neighboring country like Bhutan carbon emission can be brought down by afforestation and hydropower projects.
- Crop residue burning is a significant environmental issue that can lead to air pollution, health problems, and loss of soil fertility. To address this problem, the government has used satellite mapping to identify areas of crop residue burning. The areas with high levels of crop residue burning can be identified and interventions can be developed to reduce the practice.
- 300+ drones have been given to research institutions. We need to develop protocols for the use of drone for various kinds of diagnostic & farmers operations.
- At the end of his remark Dr Singh expressed gratitude to all the participating universities, Vice Chancellors for their active participation and congratulated organizing team for their efforts for successfully organizing this event.

Dr. Panjab Singh, Chancellor, Rani Lakshmi Bai Central Agricultural University, Jhansi

- The Chancellor appreciated the theme and topic selected for the brain storming session “Sustainable Natural Resource Management” and said that it is an important area of research and innovation that seeks to balance the utilization and conservation of natural resources in a way that ensures their availability for future generations.
- The two days debate touched and shared very interesting and important experiences related to Precision agriculture, Agroforestry, Sustainable fisheries, Renewable energy, Payment for ecosystem services.

Overall, the innovations in this field hold great promise for promoting sustainable development and protecting the planet's natural resources for future generations.

- He mentioned that the agriculture in the future will look quite different from the way it does today. With advances in technology, changes in climate and environmental concerns, the way we grow and produce food may evolve technology significantly.
- The climate change and environmental degradation increase will force the farmers to adopt more sustainable practices to reduce their impact on the environment. This could include using renewable energy sources, reducing greenhouse gas emissions, and implementing regenerative agriculture practices. Overall, the future of agriculture is likely to be shaped by a combination of technological advancements and sustainability concerns.

RECOMMENDATIONS OF PLENARY SESSION

1. The matter of inclusion of private universities in IAUA after detail deliberations concluded that it may be deferred for future discussion and decision.

The extension education is an integral part of NARES, and Krishi Vigyan Kendras (KVKs) are very important for outreach, dissemination of new technologies, feedback and participatory research. It was resolved that KVKs are pilot demonstrations platform for technologies/methods developed by the universities and they should not be disintegrated from the system.

2. IAUA and ICAR must work together to justify the importance of extension education, particularly the KVKs, as a crucial demonstration unit for agricultural research. It must be emphasized that the significance of protecting the NARS system and its contributions in food and nutritional security, national economy, developing human resources, facilitating technology transfer, and promoting international collaborations in the field of agriculture must be emphasized. In the new education policy environment, it is essential for IAUA and ICAR to submit their views to the government.
3. A thorough evaluation and discussion involving all stakeholders may be necessary to determine the best course of action; it was recommended that the ARS qualification should also be reviewed to attract and capture young minds in NARES.
4. The policy papers can be a valuable way for the IAUA to provide guidance on agricultural issues. By developing well-researched and informed policy papers, the IAUA can influence decision-making and contribute to the sustainable development of agriculture in India.
5. The best practices of different organizations, states and countries may be adopted to achieve the objectives related to “Innovations in Sustainable Natural Resource Management”.

Vote of Thanks

The formal vote of thanks was proposed by Dr. A.R. Sharma on behalf of Organizing Committee and by Dr Dinesh Kumar on behalf of IAUA.

SPECIFIC RECOMMENDATIONS FOR INNOVATIONS IN SUSTAINABLE NATURAL RESOURCE MANAGEMENT

1. Mega Soil Health program should be planned and executed in time bound manner for improving soil health and productivity. Carbon sequestration and zero-carbon emissions-based technologies should be developed and up-scaled for sustainable Agriculture.
2. Niche areas for various production technologies like CA, organic farming, natural farming, IFS, etc. should be well identified, mapped and up-scaled in mission mode to harness its potential in sustainable manner along with the provision of incentives as reward for farmers adopting sustainable and renewable technologies like CA, Organic/Natural farming, water harvesting, micro-irrigation, etc.
3. Need of developing policies for use of ground and surface water including some incentives for water harvesting.
4. Considering the importance and potential of deep-sea fisheries (200-2000m depth) wetland and reserve stocking are required to be explored and promoted for conservation of fish resources. Certification of fish seed resources is needed to be addressed for sustainable and certified capture of fish.
5. Fish farming should be promoted adopting ecosystem approach and fisheries sector can help in meeting Sustainable Developmental Goals (SDGs) through fish resources management promoting blue economy.

Harvest technologies should be improved, regulatory and management measures for it should be in place. Partnership should be promoted among different stakeholders for fish resource management.




6. We need to see animal resources as essential component for sustainable future of India. Need to strengthen tools and protocols for enhancing production and reproduction in livestock sector. More focus should be on Genomic selection in breeding programme and develop the tools for selection of animals based on input efficiency and gene banks to manage genetic diversity.
7. Need to strengthen the Biosafety of farm, surveillance of diseases and pests to prevent the entry of infectious diseases, addressing the issues of antimicrobial disease resistance (AMR) through animals' food.
8. Intellectual Property Rights and Traditional knowledge of germplasm needs to be secured. There is need of strengthening policy and legal framework, implementation of seed act. Encourage public-private-partnership, strengthening infrastructure, promote *ex-situ* and *in-situ* conservation and capacity building of stakeholders. Reforms in policies are needed to conserve available genetic resources.
9. Monoculture in grasslands should be discouraged. Drone technology to be utilized to assess the type of grassland spread in Bundelkhand region
10. Benefits of microbial diversity for natural and organic farming need to be utilized through regenerative agriculture, bio-intensive agriculture. Wild relatives of microbes should be collected and preserved.
11. NMSA need to be strengthened and farming system / landscape-based watershed-based approach to be adopted for better resilience of agro ecosystem. Climate resilient agriculture with eco region specific smart agricultural practices for land utilization, land capability classification or land use scheme to be adopted in letter and spirit.
12. Agroforestry or tree/ perennial based farming/ fruits orchards is important to meet the national mission of sustainable agriculture. IFS model and such systems to be developed and promoted on farms and also integration of planning by different agencies dealing with climate change.
13. The shift in paradigm from deterioration to sustainable production system needs science and technology led innovations and interventions. The innovation in agriculture in the area of Decision Support System, traceability in seed and agri-products, sensor-based technology, remote sensing and GIS, precision agriculture, machine learning, deep learning, internet of things and drone technology, etc. are the need of time and to be promoted with financial and policy support.
14. Application of AI and other high-end technology should be judiciously introduced and adopted in agricultural education. The role of drone technology in soil and field analysis, planting crops and trees, crop spraying, irrigation scheduling, crop monitoring should be more intensified and up-scaled for increasing input use efficiency, crop productivity, eco-friendly and farmers income, weed identification, crop health assessment crop Insurance, geo-fencing, livestock management are now well proven and thus financial support available for Agri-drone and other potential technologies must be provided.
15. One-Health concept needs holistic thinking to integrate the health of natural resources to health of plants to animals to human being. The soil health is directly affecting the health of many eco-systems as soil nutrients ultimately affecting the nutrition of plants, animals and human being and thus nutrient cycling is a key factor in deciding the maintenance of human health and onset of diseases. This is need of strengthening research for development of nano-formulation based agrochemicals for increasing the efficiency of the products. Automation technologies should be made more practical and economically feasible and up-scaled to increase the input use efficiency.
16. Deterioration of natural resources has impacted badly to the quality of life. Thus, there is an urgent need to work extensively on regenerative agriculture by the development and application of advanced sciences and technology at the farm level which requires skill, scale, speed, efficiency, knowledge and investments in human capital in agriculture and allied science. New concepts and approaches are required to rethink and redo the way to manage the renewable and non-renewable resources

GENERAL RECOMMENDATIONS FOR IAUA

1. The matter of inclusion of private universities in IAUA was discussed and after detail deliberations it was concluded that it may be deferred for future discussion and decision, may be taken in AGBM-2023.

2. It was argued that NARS system has its unique strengths, developed and strengthened over the years, with efforts of the scientific community need to be strengthened for research infrastructure, promoting interdisciplinary research, developing human resources, facilitating technology transfer, and strengthening international collaborations. In the new education policy environment, it is essential for IAUA and ICAR to submit their views to the government.
3. A thorough evaluation and discussion involving all stakeholders may be necessary to determine the best course of action; therefore, it was recommended that the ARS qualification should be reviewed to attract & capture young and talented minds in agriculture research.
4. The policy papers can be a valuable way for the IAUA to provide guidance on agricultural issues. By developing well-researched and informed policy papers, the IAUA can influence decision-making and contribute to the sustainable development of agricultural sector.
5. The best practices of the different organizations, states and countries may be adopted to achieve the objectives related to “Innovations in Sustainable Natural Resource Management”.

Dignitaries for the 11th Brain Storming Session of Vice Chancellors of Agricultural Universities

S. No.	Name	Designation	E-mail	Contact No.	Photo
1.	Dr. R.S. Paroda	Chairman, Trust for Advancement of Agricultural Sciences (TAAS) & Ex DG, ICAR and Secretary, DARE New Delhi-110 012	raj.paroda@gmail.com	9810191486	
2.	Dr. Panjab Singh	Chancellor, Rani Lakshmi Bai Central Agricultural University, Jhansi-284003 (Uttar Pradesh)	panjabsingh03@yahoo.com	9651666613	
3.	Dr. P.L. Gautam	Ex-DDG (Crop Sciences), ICAR, New Delhi	plgautam47@gmail.com	9459376233 7018322344	
4.	Dr. P. Das	Ex. DDG (Extension), ICAR, New Delhi	pdasicar@gmail.com	9717990120	
5.	Dr. A.K. Singh	Vice President, National Academy of Agricultural Sciences (NAAS), NASC, New Delhi-110 012	aksingh.icar@gmail.com	9425702142	

S. No.	Name	Designation	E-mail	Contact No.	Photo
6.	Dr. S.K. Chaudhari	Deputy Director General (Natural Resource Management), ICAR, New Delhi-110 012	ddg.nrm@icar.gov.in	9729559063	
7.	Dr. J.K. Jena	Deputy Director General (Fisheries Science), ICAR, New Delhi-110 012	ddgfs.icar@gov.in	9453019735	
8.	Dr. R.C. Agarwal	Deputy Director General (Education), ICAR, New Delhi-110 012	ddgedn@gmail.com	011-25841760	
9.	Dr. A.K. Srivastava	Vice Chancellor, Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go Anusandhan Sansthan, Mathura-281 001 (Uttar Pradesh)	duvasuvc@gmail.com	9813041980	
10.	Dr. B.S. Dwivedi	Member, Agricultural Scientists Recruitment Board, DARE, New Delhi-110 012	bsdwivedi@yahoo.com	9811365124	


S. No.	Name	Designation	E-mail	Contact No.	Photo
11.	Dr. Anupam Mishra	Vice Chancellor, Central Agricultural University, Lamphelpat, Imphal West-795004 (Manipur)	vc@cau.ac.in	7566012887 9425151947	
12.	Dr. Rameshwar Singh	President, IAUA Vice-Chancellor, Bihar Animal Sciences University Patna-800 014 (Bihar)	vc-basu-bih@gov.in vicechancellorbasu@gmail.com	9472864654	
13.	Dr. P.S. Pandey	Vice Chancellor, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur-848 125 (Bihar)	vc@rpcau.ac.in	9718395398	
14.	Dr. Arun Kumar	Vice Chancellor, Swami Keshwanand Rajasthan Agricultural University, Bikaner (Rajasthan)	vcrau@raubikaner.org	0151-2250488, 2250443	
15.	Dr. B.R. Kamboj	Vice Chancellor, Chaudhary Charan Singh Haryana Agricultural University, Hisar	vchauhisar@gmail.com vc@hau.ac.in	01662-231640 01662-255258	

S. No.	Name	Designation	E-mail	Contact No.	Photo
16.	Dr. B.C. Deka	Vice Chancellor, Assam Agricultural University Jorhat-785 013 (Assam)	vc@aau.ac.in	9435050050	
17.	Dr. Indra Mani	Vice Chancellor, Vasantao Naik Marathwada Krishi Vidyapeeth, Parbhani Basmat Road, Parbhani-431 402 (Maharashtra)	vcvnmkv@gmail.com	9868656885	
18.	Dr. K.K. Singh	Vice-Chancellor, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut-250 110 (Uttar Pradesh)	vc2016svpuat@gmail.com vc@svpuat.edu.in	7583028993	
19.	Dr. N.H. Kelawala	Vice Chancellor, Kamdhenu University, Gandhinagar-382 010 (Gujarat)	vc@kamdhenuuni.edu.in	7573035101 9825426268	
20.	Dr. P.L. Patil	Vice Chancellor, University of Agricultural Sciences, Dharwad-580 005 (Karnataka)	vc@uasd.in	9448861025	

S. No.	Name	Designation	E-mail	Contact No.	Photo
21.	Dr. Parwinder Kaushal	Vice Chancellor, Veer Chandra Singh Garhwali Uttarakhand University of Horticulture & Forestry, Bharsar, Pauri Garhwal-246 123	vc@uuhf.ac.i	8476004127 (PA to VC)	
22.	Dr. S.K. Chakrabarti	Vice Chancellor, Uttar Banga Krishi Viswavidyalaya, P.O.: Pundbari, Cooch Behar-736 165 (West Bengal)	vc@ubkv.ac.in	9400014400	
23.	Dr. T. Janakiram	Vice Chancellor, Dr, YSR Horticultural University, Venkataramannagudem- 534101, WG Dist. (Andhra Pradesh)	vc@drysru.e du.in	7382633666	
24.	Dr. V. Reddy	Vice Chancellor, Administrative Office, Dr. YSR Bhawan Sri Venkateswara Veterinary University, Tirupati-517 502 (Andra Pradesh)	vcsvvu@gmai l.com	9989051540	
25.	Dr. Amaresh Chandra	Director, ICAR-Indian Grassland and Fodder Research Institute, Jhansi-284 003 (Uttar Pradesh)	amresh.chandr a@icar.gov.in director.igfri@ icar.gov.in	9450041285	

S. No.	Name	Designation	E-mail	Contact No.	Photo
26.	Dr. P.M. Pandey	Director, Bundelkhand Institute of Engineering and Technology, Jhansi-284 128 (Uttar Pradesh)	director@bietjhs.ac.in		
27.	Dr. Ravi Shankar	Director, ICAR-Central Institute of Fisheries Education ICAR, Versova, Andheri (West), Mumbai-400 061 (Maharashtra)	director@cife.edu.in director.cife@icar.gov.in	9446474368	
28.	Dr. V.K. Singh	Director, ICAR-Central Research Institute for Dryland Agriculture, Santoshnagar, Hyderabad 500 059 (Telangana)	director.crida@icar.gov.in	9821349639	
29.	Dr. Anupama Singh	Joint Director (Edn.), IARI, New Delhi	anupama@iari.res.in	8920154670	
30.	Dr. Dinesh Kumar	Executive Secretary, IAUA Pusa Campus, New Delhi-110 012	esiaua.newdelhi@gmail.com	9811129226	

S. No.	Name	Designation	E-mail	Contact No.	Photo
31.	Dr. T. Ahlawat	Director of Research & Dean Post Graduate Studies, University Bhavan, Navsari Agricultural University, Navsari-396 450 (Gujarat)	dr@nau.in	9426897242 9913166480	
32.	Prof. Indira Sarangthem	Dean, College of Agriculture, Iroisemba, Imphal-795 004 (Manipur)	dean_collegeagri@yahoo.co.in		
33.	Dr. Ng. Iboyaima Singh	Dean, College of Food Technology, Lamphelpat Constituent College of Central Agricultural University, Imphal-795 004 (Manipur)		9845704011	
34.	Dr. P.M. Chauhan	Registrar, Junagadh Agricultural University, Junagadh-362 001 (Gujarat)	registrar@jau.in	0285-2672080 0285-2672090 9879104660	
35.	Dr. S.M. Haldhar	Associate Professor, Department of Entomology, COA, CAU, Imphal-795 004 (Manipur)			

S. No.	Name	Designation	E-mail	Contact No.	Photo
36.	Dr. L.K. Mishra	Associate Professor (Biochemistry), Department of BPME, College of Agriculture, Central Agricultural University, Imphal-795 004 (Manipur)			

11th Brain Storming Session of Vice chancellor of Agricultural Universities






7-8 April, 2023

Organization Committees & Team

S. No	Name of the Committee	Chairman	Members
1	Core/Reception Committee	Dr. A. K. Singh	Dr. A.R. Sharma, Dr. Anil Kumar, Dr. S.S. Singh, Dr. S.K. Chaturvedi, Dr. V.P. Singh, Dr. B.K. Behera, Dr. S.S. Kushwaha, Dr. Mukesh Srivastava, Dr. M. J. Dobriyal
2	Invitation Committee	Dr. A.R. Sharma	Mr. Kushal Prasad Sinha
3	Technical Programme Decoration Committee	Dr. S.K Chaturvedi	Dr. Yogeshwar Singh, Dr. P.P. Jambhulkar, Dr. Artika Singh
4	Stage Management and Decoration Committee	Dr. Mukesh Srivastava	Dr. Artika Singh, Dr. Amit Jain, Dr. Tanuj Mishra, Er. Sahil Gupta
5	Transport Committee	Dr. M.J. Dobriyal	Dr. P.P. Jambhulkar, Dr. Ashutosh Sharma, Dr. Rakesh Chaudhary, Mr. Martand Pratap, Dr. Pankaj Lawania
6	Accommodation Committee	Dr. V.P. Singh	Dr. Yogeshwar Singh, Dr. R.P. Yadav, Dr. Yogendra Mishra, Dr. Govind Vishkarma
7	Food and Refreshment Committee	Dr. Anil Kumar/ Dr. S.S. Kushwaha	Dr. Susheel K. Singh, Dr. Meenakshi Arya, Dr. D.V. Singh
8	Registration & Logistics Committee	Dr. B.K. Behera	Dr. Meenakshi Arya, Dr. Rumana Khan, Dr. Nishant Bhanu, Dr. S.K. Shukla
9	Media/Photography Committee	Dr. S.S. Singh	Dr. Ashutosh Sharma, Dr. Prabhat Tiwari, Dr. Alka Jain, Dr. Tanuj Mishra
10	Report Compilation and Finalization of Recommendations	Dr. Anil Kumar	Dr. Gaurav Sharma, Dr. Alka Jain, Dr. Pawan Kumar, Dr. Ashish Gupta

Chairman of the various committees, 11th BSS at RLBCAU, Jhansi

S. No.	Chairman of Organization Team	Designation	Email & Contact No.	Photo
1.	Dr. A.K. Singh	Vice Chancellor, RLBCAU, Jhansi	Email: vcrlbcau@gmail.com Mob. No. 9582922324	
2.	Dr. A.R. Sharma	Director Research, RLBCAU, Jhansi	Email: directorresearch.rlbcau@gmail.com Mob. No. 9425807290	
3.	Dr. Anil Kumar	Director Education, RLBCAU, Jhansi	Email: directoreducation.rlbcau@gmail.com Mob. No. 7409960028	
4.	Dr. S.S. Singh	Director Extension Education, RLBCAU, Jhansi	Email: Directorextension.rlbcau@gmail.com Mob. No. 7897463399	
5.	Dr. S.K. Chaturvedi	Dean, College of Agriculture, RLBCAU, Jhansi	Email: deanagriculture.rlbcau@gmail.com Mob. No. 9336214977	

S. No.	Chairman of Organization Team	Designation	Contact No.	Photo
6.	Dr. M.J. Dobriyal	Dean, College of Horticulture & Forestry, RLBCAU, Jhansi	Email: manmohandobriyal@gmail.com Mob. No. 9408851285	
7.	Dr. V.P. Singh	Dean, College of Veterinary & Animal Sciences, Datia (M.P)	Email: deanveterinary.rlbcau@gmail.com Mob. No. 9412738300	
8.	Dr. B.K. Behera	Dean, College of Fisheries, Datia (M.P)	Email: deanfisheries.rlbcau@gmail.com Mob. No. 9617383851	
9.	Dr. Mukesh Srivastava	Registrar, RLBCAU, Jhansi	Email: registrar.rlbcau.com Mob. No. 9839818899	
10.	Dr. S.S. Kushwah	Librarian, RLBCAU, Jhansi	Email: library@rlbcau.ac.in Mob. No. 9617383851	

Abbreviations and Acronyms

AAU	:	Assam Agricultural University
AI	:	Artificial Intelligence
ASRB	:	Agricultural Scientists Recruitment Board
BSS	:	Brain Storming Session
CA	:	Conservation Agriculture
CAFRI	:	Central Agro-Forestry Research Institute
CAU	:	Central Agricultural University
CCSHAU	:	Chaudhary Charan Singh Haryana Agricultural University
CIAE	:	Central Institute of Agricultural Engineering
CIFE	:	Central Institute of Fisheries Education
CoF	:	College of Fisheries
CoFT	:	College of Food Technology
COP-26	:	Conference of the Parties
COVAS	:	College of Veterinary and Animal Sciences, Parbhani
CRIDA	:	Central Research Institute for Dryland Agriculture
DBT	:	Department of Biotechnology
DDG	:	Deputy Director General
DST	:	Department of Science & Technology
DUVASU	:	Pandit Deen Dayal Upadhyaya PashuChikitsa Vigyan Vishwavidyalaya Evam Go-Anusandhan Sansthan
FDD	:	Food and Dairy Division
GBPUAT	:	Govind Ballabh Pant University of Agriculture and Technology
GHG	:	Green House Gas
GIS	:	Geographical Information System
IARI	:	Indian Agricultural Research Institute
IAUA	:	Indian Agricultural Universities Association
ICAR	:	Indian Council of Agricultural Research
ICRISAT	:	International Crops Research Institute for the Semi-Arid Tropics
IFS	:	Integrated Farming Systems
IGFRI	:	Indian Grassland and Fodder Research Institute
IIT	:	Indian Institutes of Technology
IoT	:	Internet of things
JAU	:	Junagadh Agricultural University
NAARM	:	National Academy of Agricultural Research Management

NAAS	:	National Academy of Agricultural Sciences
NAIP	:	National Agricultural Innovation Project
NARES	:	National Agricultural Research and Extension Systems
NBA	:	National Biodiversity Authority
NGOs	:	Non-Governmental Organizations
NICRA	:	National Innovation on Climate Resilient Agriculture
NMSA	:	National Mission for Sustainable Agriculture
PGR	:	Plant Genetic Resources
Ph.D.	:	Doctor of Philosophy
PPVFRA	:	Protection of Plant Varieties and Farmers' Rights Authority
RLBCAU	:	Rani Lakshmi Bai Central Agricultural University
SAU	:	State Agricultural University
SDG	:	Sustainable Development Goal
SKRAU	:	Swami Keshwanand Rajasthan Agricultural University
SPAD	:	Soil Plant Analysis Development
SVPUAT	:	Sardar Vallabhbhai Patel University of Agriculture and Technology
SVVU	:	Sri Venkateswara Veterinary University
UAS	:	University of Agricultural Sciences
UBKV	:	Uttar Banga Krishi Vishwavidyalaya
UGC	:	University Grants Commission
VC	:	Vice Chancellor

