

**Proceedings of National Seminar on  
“Sustainable Food Production Systems for Self Reliant and Climate Resilient  
Agriculture” held at University of Agricultural Sciences Dharwad,  
on the occasion of birth Centenary of Celebrations Dr.S.V.Patil  
during 16-17 July, 2022**

**Theme – 1: Resource Conservation Technology for Sustainable Production**

Chairman : Dr. M. Madhu, Director CSWTRI, Dehradun  
Co-Chairman : Dr. B. N. Patil, Former, Associate Director of Research, UAS, Dharwad  
Rapporteurs : Dr. S. S. Hallikeri, Principal Scientist (Agronomy)  
Dr. V. B. Kuligod , Professor of Soil Science

1. Plenary Speaker: Dr. G. S. Dasog, Former Dean (Agri), UAS, Dharwad , His topic was on  
**‘Water resource management and its efficiency in India – An Overview’.**

He discussed on various issues related to India’s resources of water and change of scenario over years narrated. India though accounted 18 % of world population but it is enclosed with only 4% of world fresh water resources. Nearly 54% of India’s groundwater wells are decreasing with time. After independence irrigated area in the country increased from 20.85 mil ha in 1950-51 to 68.4 mil ha in 2014-15. Though India is a world leader in irrigation infrastructure, still half of the cropped area (51%) remains rainfed. He stressed that ground water is the predominant source of irrigation water in Karnataka and minor irrigation tanks contribute only 10 per cent of total irrigation water requirement. It was elaborated that water use efficiency is lower and not sustainable. This can be bettered by adopting suitable crop and variety, by deficit/supplemental/precision irrigation, by improved water management and also by timely and precise use of non water inputs. It was also stressed that participatory irrigation management (PIM) is need of the hour and PIM needs to be enacted through law. The farmers’ produce organization (FPO) should be made responsible for efficient water management and creation of irrigation facilities. The speaker also presented case studies of Dammur (Bagalkot: Dist) and Ramthal micro irrigation project.

In the interaction session Dr. B. S. Yenagi asked about the Ramathal Micro irrigation project by use of 0.6m laterals instead of 1.2 m. Here the WUE is reduced. Presenter answered that the arrangement of laterals was based on designing and investment.

Dr. Kummur, Former AGM, NABARD asked about the participation of Agril. Scientists in CADA activities instead of only engineers, who will design and operate the whole command

area programme. Presenter said that the participation of Agril. Scientist involved wherever required. The house opined that irrigation engineers be given the primary role in irrigation management in command areas. It was also felt that the farmers be encouraged to use solar pumps in pumping the ground water.

2. Dr. Madhu, Director, CSWCRTI, Dehradun presented on **‘soil and water conservation and watershed management to enhance eco system services’**.

Presenter divided the topic in to Major challenges for land degradation for production in the country. Land degradation status in the country, impacts of land degradation, Land degradation neutrality and different methods for watershed management. Mission was to develop technologies for controlling land degradation and enhancing productivity on sustainable basis for ensuring food, environmental, economic and livelihood security of stake holders.

3. Dr. P. L. Patil, Director of Research, UAS, Dharwad presented on **‘Land resource information system for sustainable food production’**.

He explained about the importance of land resource information system for the whole country. Around 7.0 mill ha land area is degraded and demands on land resources and requires effective remedial interventions for sustainable food production. In the recent base concept of watershed development has emerged as potential approach which can arrest land degradation besides conserving soil and water and lead to higher productivity. In the recent past concept of watershed development has emerged as potential approach which can arrest land degradation besides conserving soil and water and lead to higher productivity. GIS and remote sensing can be employed for development of land resources. This information can be used for implementation of recommended soil and water conservation measures. Selecting suitable crops and crop planning under aberrant weather situation. He also discussed soil test based on site specific nutrient recommendation and enhancing productivity at individual farm level.

4. Dr. S. Dharumarajan, Sr. Scientist, NBSSLUP, Bengaluru, Presented on the topic of **‘Digital soil mapping; State of art and perspectives’**. He presented on the basic concepts of digital soil mapping, the global soil map programme and some Indian case studies.

Digital soil mapping is a new approach based on the soil cover spatial data now available. It ensures the traceability and adoptability of the soil mapping processes and provides the end user an estimation of the mapping uncertainty. The soil data is required to organising the systematic collection of maps, profiles and soil analysis involving soil sensing tools. It also introduces more knowledge to the soil surveyors in digital soil mapping activity.

In the interaction session Dr. B. S. Yenagi asked about the practical use of the study to the end user. Presenter narrated the broader applications of the technology at farm level by digital mapping technique for various objectives.

5. Dr. Umesh Madolli, Karnataka University, Dharwad, presented on study of '**Drainage characteristics and its implications for watershed management. A case study of the Dharma River basin, Karnataka, India**'.

A case study of Dharma watershed was analysed to understand the hydrological behaviour of a watershed by conducting morphometric analysis using GIS and remote sensing technique. It was inferred that overland flow is predominant, generated surface runoff will take a longer duration to achieve peak rate and the basin has a low peak runoff. Therefore, geometric forms are not ideal to increase the flood velocities, which contribute less available kinetic energy at streams, and erosion and transportation capacities. Thus watershed is less prone to soil erosion. The study will provide insights to the soil water resource planning and management over the Dharma watershed.

The co-chairman made his remarks and appreciated all the speakers for having presented good papers. The chairman thanked all the presenters, rapporteurs and also thanked delegates for their active involvement in discussion.

## **Theme 2: Organic, Natural and Ecological Agricultural Production Systems**

Chairman : Dr. A. K. Yadav, Former Director, NCOF and Advisor MoA&FW, NewDelhi

Co- Chirman : Dr.N. Devakumar, Former Dean, College of Agriculture, Hassan

Rapporteurs : Dr.Hosmath J.A, Professor of Agronomy

Dr.T.Sudha, Professor of Agronomy

In this session there were five presentations (two online and three offline)Plenary Speaker was Dr.Ratan Lal, Director, Carbon management and Sequestration Centre, ohio State

University, USA spoke over online on “Carbon Sequestration and its benefits to the small and marginal farmers.” He said that food grain production has increased in India from 1947 to 2021 was 50 to 307 by a factor of 6.2, gross sown area by 50%, fertilizer use by 30% and net irrigated area was more than doubled. He was of the opinion that land area could be increased for irrigation by adopting drip irrigation. Indian agriculture should avoid over and unbalanced use of fertilizers, indiscriminate use of pesticides, unnecessary plowing and burning of crop residues. 14% of the total population in India are undernourished due to access and not proper distribution of food. He gave the information about the challenges facing Indian agriculture are malnutrition/hidden hunger, water quality and renewability, air quality, climate change and soil health. Some options for Indian agriculture as given by the speaker were diversifying farming system, produce more from less and reduced use of fertilizers.

Dr. N. Ravishankar, Principal Scientist, IIFSR, Modipuram, spoke over online on “Organic and Natural for Resilient and sustainable food production. The lead speaker opined that the crop yield reduction was repeated 4 to 50% by adopting organic farming practices. However, from 2003-04 to 2020-21 the area under organic farming increased in Sikkim and Meghalaya for cultivation crops. Adoption of Integrated organic farming system (IOFS) model in nine adopted farmers field of MEGHALAYA AND chattisgarh indicated that the production and productivity of different crops and live stocks were enhanced and also their income

The invited lead lecture was given by the Dr. A. K. Yadav, Former Director, NCF and Advisor MoA&FW, New Delhi. He spoke on principles of organic farming, four pillars of organic farming, organic Vs natural farming practices. He said that the area transformed to organic under PGS certification was 6.19 lakh Ha and number of farmers involved were 15.47 lakh in India. He also briefed about organic systems in India, NPOP under ministry of commerce and industry and PGS India programme under ministry of agriculture and farmers welfare. He gave detailed information about current market status (India as whole), export statistics, regulatory scenario for import and domestic market, FSSAI rules for imports and approaches for National mission on natural farming, major constraints and core issues to be addressed.

The oral presentation was given by Dr. H.B. Babalad, University librarian and Professor of Agronomy, UAS, Dharwad on “Comparative evaluation of natural farming and other production practices in Greengram - *Rabi* sorghum cropping system in Northern dry zone of

Karnataka”. He said that total land degraded in India is 120.7mha. He gave the process of land degradation and soil regeneration activities involving soil building practices and increasing crop and animal diversity. The speaker also touched on alternate farming systems and its objectives. The experiment was conducted on Green gram –*Rabisorghum* with the objectives of comparative evaluation of NF system for its productivity, profitability and stability in different farming system and other objective was to assess the soil health dimension (physical, chemical, biological) and value addition in different production systems. The conclusion of the experiment was integrated, organic and conventional systems were productive and profitable compared to chemical farming,

The other oral presentation was on “Comparative studies of desi and cross breed jeevamrutha for their efficacy and productivity in maize+ pole bean intercropping system” given by Dr.H.K.Veeranna, Professor of Agronomy, KSNUAHS, Shivamogga. The speaker spoke on Characterization of nutrient concentration and microbial load in desi and cross bred cow dung and urine as compared with other organic wastes, Characterization of nutrient concentration and microbial load in desi and cross bred cow in beejamrutha, Ghana jeevamrutha and jeevamruthaas compared with other organic wastes and microbial population in jeevamrutha of desi and cross bred cows at different intervals. The experiment was conducted with the objective of Comparative studies of desi and cross breed jeevamrutha for their efficacy and productivity in maize+ pole bean intercropping system. The conclusion of the experiment is nutrient contents and microbial biomass were higher in desi cow dung and urine, enhanced microbial activity was noticed in jeevamrutha at 7<sup>th</sup> day of its preparation and significant improvement in maize and pole bean equivalent yield and uptake of major nutrient in package of practice treatment was noticed. The soil enzymatic activities were enhanced in jeevamrutha treatments.

### **Session 3: Agricultural Innovations and Smart Farming**

Chairman : Dr. M. Moni, Former Director, NIC

Co Chairman : Dr. P. L. Patil Director of Research, UAS, Dharwad

Rapporteurs: 1. Dr. C. P. Chandrashekar Principal Scientist (Agronomy), AICRP (IFS-OFR)

2. Dr. M. S. Shirahatti Principal Scientist (Agricultural Engineering), AICRP

(DLA)

The session consists of plenary speech, 3 invited lead and 4 oral presentations. The Chairman of the session Dr. M. Moni invited the speakers to present their paper. The plenary speaker Dr. David Mulla given the virtual speech on “Precision Agriculture history and impacts on crop production and nitrogen leaching losses”. He highlighted the use of crop sensors like SPAD, chlorophyll sensors, CROP SCAN, OPTICAL SENSORS, N sensitive index (NSI), Optical NIR grain protein sensor, UAV’s used for detection of crop nutrient deficiency and sufficiency, stress detection and crop condition assessment. He revealed the history of Precision Agriculture with key advantages of Grid sampling, soil spatial management, yield monitors, tractor mounted GPS, LANDSAT RS data, management zone concept, precision irrigation, herbicide application and the role of DGPS and detection of temporal yield variability in crop yield through plant phenotyping by using digital technology, crop scouting for insect pests, Nitrate N contamination, variable N determination to determine the optimum rate to get NDVI optimal value, Machine learning for variable rate N management (VRN) and to predict N stress. In the concluding remarks he highlighted the variety of spectral indices now exist for various precision agricultural applications, applications of machine learning have the potential to revolutionize precision agriculture. He also emphasized the progress made from farming by soil to farming by grid cell to farming by management zone, and now the challenge is to manage individual plant in real time. Spatial resolution of aerial and surface remote sensing imagery has improved from 100’s of m to sub meter and cm accuracy. Temporal frequency of remote sensing imagery has also changed dramatically with emphasis on imagery collected multiple times a year from multiple platforms in order to conduct near real time soil, crop and pest management. Remote sensing applications in precision agriculture began with sensors for soil organic matter, salinity and have quickly diversified to include satellite, aerial, UAV, UGV and hand held sensors. Spectral band width has decreased dramatically, enabling advances in hyper spectral remote sensing.

**Dr. M. Moni delivered invited lead paper on Digitalization of Agriculture in India: Pathway for Agricultural Innovations and Smart Farming.** He emphasized on Precision Farming, Precision Nutrient, Water, Weed and Pest management, and input use efficiency. Remote and GIS, Sensor based Technologies, Big data Analytics, Unmanned Aerial vehicle (Drones) for Crop Management, Robotics and Automation. In his opinion, the emerging GRIN

(Genomics, Robotics, Informatics and Nanotechnology) Paradigm facilitates digitalization process in agricultural system very intensively, and has generated a great demand for agricultural informatics professionals, to bridge gap of ever increasing and evolving human resources for IT StartUps in farming sector throughout the Country, for attaining possible efficiency gains in the Agricultural Value System.

- India requires about 100,000 “agricultural graduates-ready” through Agricultural Informatics, for undertaking S&T based agricultural development, and rejuvenating and ushering in agricultural dynamism in the country, by 2025.

In his concluding remarks he stressed on **University of Agricultural Sciences Dharwad (USAD)** to develop future research strategies and recommendations based on available knowledge to address the emerging matrix of the agricultural problems in a holistic manner with potential to promote eco-friendly sustainable agriculture under a changing climate scenario.

His Suggestion was to establish a Centre for Agricultural Informatics and e-Governance Research Studies to launch an M.Tech Course on Agricultural Informatics (2-Year programme) to motivate the rural youths to undertake agricultural transformation of Indian agricultural system through Agriculture Innovation and Smart Farming technologies, and adoption of Farm Extension 4.0.

**The lead speaker Dr Adinarayana, CSRE, IIT, Bombay delivered the lecture on “Innovation through smart agriculture”,** during his presentation he emphasized on the following aspects;

- Smart Agriculture – huge opportunities for intelligent farming and innovations through disruptive tools and techniques (including data sciences) for developing state of the art Geo-informatics
- Target towards Scale-Independent Precision Agriculture (SIPA)
- Green to Digital Revolution through SMART (Scientific, Marketable, Affordable Reliable & Time-saving) infrastructure for better implementation of knowledge intensive and Smart Agriculture.
- Need for inter-disciplinary and inter-stakeholders collaborations to scale-up infrastructure and improve informatics & sharing culture in Agriculture/Rural systems (Ex: Need-based Industry-lead R&D Projects) –
- DSFS- Data science based farming support system for sustainable crop production

Chairman Dr M.Moni intervened and asked to bring the smart technologies to the notice of Dr Ashok Dalwai, chairman of committee on the doubling the farm income. Further, Dr V.C. Patil asked the feasibility of using the LIDAR data in the smart farming.

**Dr. V. C. Patil, Former Dean (Agri.), UAS, Raichur presented an invited paper on Blockchain Technology Applications in Indian Agriculture.**

He expressed the potential applications of the blockchain fund transfers, selling, trades, voting, supply chain etc... and Features of blockchain as Decentralization, Immutability, Improved security, Distributed ledger, Consensus and Faster settlement. Blockchain has great potential- it is not a panacea for all problems. He concluded that the Blockchain has great potential- it is not a panacea for all problems. The right ecosystem and stakeholders are needed to sustain any kinds of solutions. Blockchain solution development without careful assessment of the existing challenges faced would unnecessarily increase the overheads substantially and result in the initiative failing miserably.

**Dr D.V. K. Nageshwar Rao, Principal scientist, IIRR, Hyderabad delivered the lecture on “Temporal observation of NDVI and SAVI of rice derived from Sentinel 2 bands”** in his presentations, he made the following points;

- Precision agriculture includes precise use of information and we need more information at finer resolution. Freely available Sentinel 2 imagery can add more to information that can certainly be used.
- He also emphasised on the make use of free open source GIS & RS softwares viz., QGIS and SNAP.

In the oral paper presentation **Dr. Netra presented a paper on Green synthesis of zinc oxide nanoparticles and its role in drought tolerance in sorghum (*Sorghum bicolor* L.Moench)**

She concluded that the application of Nano ZnO can mitigate the drought stress and maintains the yield as compared to the bulk application of ZnSO<sub>4</sub> fertilizer. Her study highlights the importance of ZnO Nano particles and its application to Sorghum Crop may help in increasing the Zinc content in leaves as well as in grains which would in turn gives an ability to tolerate stress.

**Dr. N. Kambrekar presented his paper on Field evaluation of an Unmanned Aerial Vehicle (UAV) Sprayer-Effect of spray volume on the control of insect pests in soybean and concluded that**

- ✓ The UAVs are unarguably superior over the conventional knapsack sprayers with maximum penetration and distribution of the insecticides
- ✓ Large area coverage in less time, labor saving, very less quantities of pesticide solution and immediate response well before the pest incidence exceeds the economic thresholds
- ✓ UAVs have great potential to revolutionize agriculture and ensures the worlds food security in this burgeoning global populace by substantial increase in the crop production.

At the end, the chairman of the session summed up all the presentations and made the following remarks;

- Development of policy paper on National block chain frame work policy.
- Block chain technology may be successfully used in the co operative sector for the proper coordination and removing the corruption.
- The policy makers and the bureaucrats should be educated towards the new technologies such as blockchain and artificial intelligence etc.
- Agro informatics should be bring in the curriculum of graduation and post graduation courses.

#### **Theme 4: Crop intensification and diversification**

**Chairman:** Dr. S. Bhaskar, ADG (Agronomy, Agroforestry and Climate change),  
ICAR, New Delhi

**Co Chairman:** Dr. R. Basavarajappa, Director of Education, UAS, Dharwad

**Rapporteurs:** Dr. V.S. Kubsad Professor of Agronomy  
Dr. S.S. Nooli Scientist (Agronomy)

The chairman welcomed the speakers for the presentation. There were totally seven speakers were listed for the presentation, out of seven,six speakers presented their research findings. The proceedings of the session arenarrated as bellow.

1) The plenary speaker Dr. B.M. Chittapur, former Director of Research, UAS, Raichur delivered the lecture *on* “**On-Farm Diversity for Sustainability, Resilience and Profit in Farming**” during his presentation he emphasised on the following aspects;

- Diversified farming system (DFS) helps to maintain the sustainability in terms of soil, income, productivity and ecosystem.
- DFS enhances the efficient use of natural resource.
- DFS imparts resilience to change in climate.
- DFS needs to be dynamic one depending on resources available, market demands, domestic requirements, government policies etc.
- Systems involving legumes, vegetables, medicinal, aromatic and high value crops need consideration in view of globalization agriculture.

Chairman suggested to plenary speaker to add some more data on sustainability of the diversified farming system to link with climate change.

2) The invited lead speaker Dr. V.V. Angadi, former Professor of Agronomy, UAS, Dharwad delivered the lecture *on* “**Crop intensification, diversification and Integrated Farming Systems to sustain farm productivity and income with climate resilience**” during his presentation he emphasised on the following aspects;

- Location specific diversification of cropping involving alternative efficient crop combinations in spatial and temporal dimension is necessary.
- Refine the proven traditional systems wherever necessary using advances made in the fields of crops, soils and agronomy.
- Develop systems with in-built organic recycling for long term sustainability.
- Besides productivity gains, also explore the possibility of enhancing bio ecosystem quality and preservation of eco biodiversity.
- Farmers’ participatory approach in technology generation needs to be adopted for development of practicable systems and their subsequent adoption.

Chairman suggested to identify crop diversification for other zones of Karnataka for comparing sustainability. House suggested to identify suitable cropping systems based on weather forecasting.

Dr. Pratibha Singh, SKNAU, Jobner, Rajasthan presented the research findings on **“Effect of Diversified Cropping Systems on Crop Yield and Soil Properties”**.

- On the basis of two years study presenter concluded that for increasing the farm income and profitability, Ground nut (table purpose) followed by *Rabi* Onion or Groundnut followed by Wheatcropping system found viable.
- Crop diversification may be adopted as a strategy for profit maximization through reaping the gains of farm produces or equating substitution and price ratios for competitive farm produces.

Dr. U.K. Hulihalli, UAS, Dharwad presented the review work on **“Buckwheatan underutilized under rated multi-benefit crop”**.

- Presenter narrated the verities and agronomic investigations on buckwheat for cultivation in tropical climate situation.
- He emphasized that buckwheat as new crop for crop diversification for climate resilience.

Dr. C. P. Chandrashekar, UAS, Dharwad presented the research findings on **“Crop diversification in sugarcane under natural, organic and conventional farming practices”**.

The salient research findings indicated that

- Sugarcane yield reduction was 47.32 and 29.18 % in natural and organic farming, respectively over RPP.
- RPP with intercropping of sugarcane + turmeric resulted in higher sugarcane equivalent yield (158.3 t/ha) compared to other treatments.
- Intercropping of sugarcane + turmeric followed by sugarcane + onion found better than sole sugarcane to diversify the sugarcane cropping system.
- In natural farming, the cost of cultivation can be saved to the extent of 41.42 % over organic farming, 26.63 % over RPP and 1.00 % over chemical farming.
- Organic and natural farming enhance the biological activity and diversify the rhizosphere microflora than RPP and chemical farming.

Sri. Suresh Desai, Progressive farmer, Belagavi dist, presented the innovative technologies for higher yield in field crops. The speaker presented the innovative technologies such as

- Green manuring.
- Optimization of seed rate in crop like wheat through raising the nursery and transplanting nipped seedlings.
- Pronging/Nipping of crops such as groundnut, cowpea, turmeric, paddy, blackgram, cotton, marigold and sugarcane resulted in higher yield.

The chairman opined that, indices are required to analyses the performance of crops in crop diversification. He stressed that crop diversification should be given priority for achieving sustainability which is the need of the hour. At the end the Chairman and Co-chairman thanked all the presenters and concluded the session.

#### **Theme-5 Climate Resilient Agriculture**

Chairman: Dr. Geetha Lakshmi , ViceChancellor, TNAU, Coimbatore

Co-Chairman: Dr. O. Sridevi, Dean (PGS), UAS, Dharwad

Rapporteurs: Dr. V. S. Surakod, Professor of Agronomy(Rtd.)

Dr. H. T. Chandranath, Professor of Agronomy

Dr. Ganajaxi Math, Principal Scientist (Agronomy)

Chairman welcomed the Dignitaries and Delegates and requested the Plenary Speaker and invited lead speakers to deliver the lecture.

As plenary speaker, Dr. Geetha Lakshmi gave a talk on “Climate Resilient Agriculture”, she gave climate change scenario with respect to Global and Indian conditions due to rise in day temperature and minimum temperature which affected the food production especially in the equatorial region. Under Indian sub continent, if the same situation continues food production will be affected upto 20 percent. Among different sectors, agriculture also contributes nearly 13% of Global CHG emission. In South Asian Region, post production food loss is about 37% which can be reduced by proper handling of the post harvest activities.

Due to climate change, the future challenges to be faced are with respect to increasing the food production; decrease in the length of growing season; Drought and Floods etc.

These challenges can be met by adaptation through changing cropping pattern, Resistant and carbon sequestration, weather advisories; nutritional and preventive vaccination to cattle and poultry; Availability of Scientific technologies etc.

Weather based farm decision needs to be taken with respect to heat tolerant crops, short duration crop varieties, adjusting sowing windows, improving water nutrient use efficiency, carbon sequestration through agro-forestry etc. to climate vagaries can overcome by climate smart options such as weather smart, water smart, seed smart, carbon/nutrient smart and institutional changes.

The presentation was concluded with the following points: Indian Agriculture is likely to suffer losses due to heat, erratic weather and deviated irrigation availability which can be overcome by adopting climate smart strategies. Further it needs research, funding and policy support.

Dr. Jaywant Arakeri, presented the topic on “Leaf mimics – a novel device for fast measurement of transpiration rates” – Application to agriculture and Meteorology he has highlighted the low cost, portable device for measuring the evapo- transpiration rates.

Dr. Vilas Tonapi gave lead talk on “Nutri cereals for climate change crop diversification and Nutrition security”. He presented the scenario of millets in India and world, its health benefits, the water requirement of millets etc.

He explained issues and strategies to main stream millets which involve supply side factors; demand side factors; price factors; policy factors. To increase the area under millets and productivity the following policy supports are needed, MSP to be linked to procurements by states; inclusion of millets in mid day scheme, PDS, ICDS programmes; Incentives to FPO in millet growing areas; Exemption of GST on value added products.

Dr. S.S. Balloli gave a talk on “Soil health management in contest of climate change”. He explained the importance of soil management for obtaining sustainable, profitable, high quality food and fodder for better human and animal health, soil biodiversity and to mitigate climate vagaries. He also highlighted the challenge behind SOC and SOC-centred sustainable soil management practices. Further he explained the measures to reduce green house gases, emissions

from soils through reduced biomass burning and increasing the recycling of biomass in soils, urease inhibitors, nitrification, use of nano urea, adaption of zero/ minimum tillage. He suggested the policies viz., investment of private sector in soil health programmes under CSR, and one compost pit for every land holder, government need to spend on new innovative metrics such as DNA sequencing and remote sensing to monitor changes in organic matter in real time.

Dr. Shirahatti presented on “Managing weather Abbreviations through Real time contingency planning and preparedness: A case study of AICRP DA-NICRA. To enhance the resilience of Indian Agriculture to Climate Change and Climate uncertainty through strategic research and technology demonstrations viz., adoption of real time contingency measures and preparedness for climate variability. The weather observations were addressed through change of crop/varieties. Thinning, weeding/ intercultural operations, foliar spray, supplemental irrigation. The preparedness for weather observations were rain water management, crops and cropping system, energy management, IFS and land management units, the adaption of the above practices has yielded 20 to 31 % higher yield in *kharif* and *rabi* crops.

Dr. Sagar, in his oral presentation on “mRNA expression profile of heat responsive and reproductive genes in fall armyworm (*Spodoptera frugiperda*), under thermal stress” highlighted the economic loss to various crops due to this pest. He also explained the impact of hot events on the expression of genes and their detrimental effects on reproductive traits of fall army worm.

Ms. Megha presented the topic on “Effect of climate change on growth and phyto chemistry of cowpea (*Vigna unguiculata*)”. She explained the results of increased CO<sub>2</sub> concentration @ 550 ppm with 2<sup>0</sup>C rise in temperature on growth and yield of cowpea. The results indicated a positive effect on growth and yield of cowpea. This would help in developing climate resilient crops as well as crop simulation pest and diseases forecasting models.

### **Theme 6 : Secondary Agriculture**

Chairman : Dr. Ashok Dalwayi, CEO, NRAA, New Delhi

Vice-chairman: Shri. M.I.Ganagi, Former Chief General Manager, NABARD ,Bengaluru

Rapporteurs : Dr. S.S.Dolli, Professor, Department of Agril. Extension, UASD

Dr. Rajkumar, Professor, Department of Agronomy, UASD

## Recommendations:

- Primary processing is necessary and should be promoted among small and marginal farmers
- Micro processing at the cottage level needs a boost by state departments
- Farmers' collectives in the form of FPO or farmers' co-operatives have to promote and develop good models for up scaling
- A separate board for the promotion of FPO needs to be established
- University to set up Rural Business Incubation center
- Capacity development on financial literacy to FPO is necessary and it should be carried out by professional organizations
- There are ample opportunities for agriculture waste recycling, universities to work in collaboration with private organizations in PPP mode
- There is a need to explore the possibilities of converting fiber and other cereal waste into useful products that add value and benefit the rural community
- Rooftop harvest opens up many opportunities not only for recycling water but also for value addition apart from generating employment opportunities. The corporations to initiate the schemes with civil society.

**Plenary Session:****Chairman:** Dr. Ashok Dalwayi, CEO, NRAA, New Delhi**Co-Chairman:** Dr. H. B. Babalad, University Librarian and Professor of Agronomy**Rapporteurs:** Dr. B. N. Aravindkumar, Professor of Agronomy

Dr. M. P. Potdar, Professor of Agronomy

Dr.H.B.Babalad, Organising Secretary presented a brief report on three days National Seminar. He informed the house that nearly 300 delegates representing State Agricultural Universities, ICAR institutions, Central and State Government agencies, Banking Sectors, NGO's, Private Institutions, PG students, Progressive farmers participated in the seminar and made the event a grand success. During the seminar eminent scientists/academicians/administrators delivered six plenary lectures, fourteen invited lectures and twenty two oral presentations with respective themes. Dr,Ratan Lal , Awardee of World Food Prize and authority over Carban Sequestration, Ohio State University, USA and Dr.David Mulla Professor and W.E.Larson Chair for soil and water resources, University of Minnesota, USA delivered plenary lecture through online platform.

The rapporteurs presented proceedings of the respective sessions and the same will be endorsed by the house.

Details of Theme wise abstract received and poster presentations as follows.

<b>Theme</b>	<b>Abstracts</b>	<b>Poster Presentations</b>
Resource conservation technologies for sustainable production	18	14
Organic, Natural and Ecological Agricultural Production Systems	29	17
Agricultural Innovations and Smart Farming	79	64
Crop Intensification and Diversification	25	12
Climate Resilient Agriculture	17	5
Secondary Agriculture	32	17
<b>Total</b>	<b>200</b>	<b>129</b>

Results of Best Poster Awards as follows

Theme	First Place	Second Place	Third Place
Resource conservation technologies for sustainable production	Dr.P.S.Kanannnavr	Ms.Geetha G.P	Dr.S.S.Deshmukh
Organic, Natural and Ecological Agricultural Production Systems	Dr.U.K.Shanwad	Ms.Sowmya	Dr.S.N.Bhat
Agricultural Innovations and Smart Farming	Ms.Vinuta	Mr.Saleemali Kanahalli	Dr.Sourabh Munnolli
Crop Intensification and Diversification	Dr.Prateebha Singh	Dr.U.K.Shanwad	-
Climate Resilient Agriculture	Dr.Aravind B	Dr.P.S.Pattar	Ms.Sneha
Secondary Agriculture	Dr,B.S.Yenagi	Dr.Renuka Salunke	Dr.S.D.Kallolgi

Dr. Ashok Dalwayi, CEO, NRAA, New Delhi in his remarks highlighted the overall success of the seminar and submission of recommendations of the seminar to the government. Dr.H.B.babalad Organising Secretary , thanked one and all who directly and indirectly involved in succce of three days National Seminar.