

Proceedings and Recommendations of The 9<sup>th</sup> NEE Congress-2018

## Climate Smart Agricultural Technologies: Innovations and Interventions

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The 9<sup>th</sup> National Extension Education Congress-2018 entitled “Climate Smart Agricultural Technologies: Innovations and Interventions” was held from November 15-17, 2018 at College of Agricultural Engineering and Post Harvest Technology (Central Agricultural University, Imphal, Manipur), Ranipool, Gangtok, Sikkim. The 9<sup>th</sup> National Extension Education Congress-2018 was organized by Society of Extension Education Agra in collaboration with Central Agricultural University, Imphal, Manipur. The congress was supported by ICAR, New Delhi, National Bank for Agriculture and Rural Development (NABARD), Gangtok, Sikkim and North Eastern Council (NEC), Silong, Meghalaya.

Climate Smart Agricultural Technologies: Innovations and Interventions is relevant topic and it is need of future. Climate change has several impacts on ecosystems and societies and we have to protect ourselves from these impacts. But we are not only victims of climate change, we also contribute to it. Human activities, including agricultural sector activities, are causing climate change through increasing concentration of greenhouse gases in the atmosphere. Climate Change exacerbates the already daunting challenges facing the agricultural sector, and this is particularly the case in developing countries. Innovations in agriculture have always been important and will be even more vital in the context of climate change. Climate has obvious and direct effects on agricultural production. Greenhouse gas implications of agriculture are also obvious and large.

The global food system, from fertilizer manufacturing to food storage and packaging, is responsible for up to one third of all anthropogenic greenhouse gas emissions. Agricultural sector contributes

about 20 per cent of global anthropogenic greenhouse gas emissions. *In India, it is estimated that 28 per cent of the greenhouse gas emissions are from agriculture; about 78 per cent of methane and nitrous oxide emissions are also estimated to be from agriculture.* Nitrous oxide is emitted mainly by the fertilizer sector. Every quintal of nitrogen applied in farming emits 1.25 kg of nitrous oxide and globally half of the nitrogen applied to crops is lost to the environment. Another potent greenhouse gas is methane which is emitted in copious amount during paddy cultivation. Another major contributor of greenhouse gases is the burning of crop residue.

Mitigating climate change is about reducing the release of greenhouse gas emissions that are warming our planet. Mitigation can mean using new technologies and renewable energies, making older equipment more energy efficient, or changing management practices or consumer behavior. Sustainable practices such as organic farming, natural farming can help farmers adapt to the changing climate. Integrated farming systems based on locally available resources by including trees, livestock, water management can help mitigate climate change to a large extent and improve the quality of life of the farmers.

Crop rotation and usage of biological fertilizers can increase the soil carbon content and thus help in sequestering carbon. Integrating trees in farms helps in feeding the livestock, as well as improving soil organic content, they also help in minimizing water run-off during rains. Livestock, specially the local breed improve the soil organic content with manure, they can be fed with crop residues without burning. Used as recycled biomass,

crop residues potentially translate into organic carbon. Thus, by implementing soil conservation schemes, changing from mono-cropping to multi-cropping by including legumes, rotating crops, planting tree and harvesting water, we can reduce the carbon footprint of agriculture to a large extent. Climate smart agriculture is an integrated approach to managing cropland, livestock, forests and fisheries that address the interlinked challenges of food security and climate change. Climate smart agriculture aims to simultaneously achieve three outcomes: Increased Productivity, Enhanced resilience and Reduce emissions. The climate smart agriculture in the area of water, energy, nutrient, carbon, weather, knowledge, communication, trade and commerce etc. would pave the way towards agricultural sufficiency and sustainability.

This congress was covered the role of innovative agricultural practices and technologies can play in climate change mitigation and adaptation and aims to address the question: what policy and institutional changes are needed to encourage the innovation and diffusion of these practices and technologies to worldwide and our country? Concerns about mitigating and adapting to climate change are renewing the impetus for investments in agricultural research and are emerging as additional innovation priorities. The numerous developments in the important areas of agro-informatics and precision farming relevant in the present agricultural scenario were deliberated in the conference.

The congress was attended by faculty members, scientists, subject Matter Specialists, extension officers, students and progressive farmers from entire country. The following themes were included in the congress: Climate Smart farming, and food and nutritional security: challenges and strategies; Neo - extension horizon and researches towards climate elegant agriculture; Innovation in farming to address biotic and abiotic stress arising due to change in climate; Post harvest technology, value addition, farm mechanization, nutri-sensitive interventions for women and entrepreneurship in farming; Indigenous Technical knowledge and information and communication Technology in climate smart farming; Engagement of youth in climate smart agricultural and secondary agricultural areas; and Role of soil and water conservation interventions and renewable energy technology in climate smart farming.

The 9<sup>th</sup> National Extension Education Congress-2018 has attracted 500 submissions for oral presentations. The technical committee has accepted only 400 submissions for oral presentation and 50 submissions as posters. The papers presented in this conference are included in the publication published by Society of Extension Education Agra and printed by Digi Max, Siliguri.

*Inaugural Session:* The congress was inaugurated by was inaugurated by Shri Somnath Poudyal, Hon'ble Minister for Food Security and Agriculture Development Department, Government of Sikkim, Gangtok, Sikkim as Chief Guest, Prof. M. Premjit Singh Hon'ble Vice-Chancellor, Central Agricultural University, Imphal, Manipur as Chairman and Prof. N. S. Rathore, DDG (Education), ICAR, New Delhi as Guest of Honour in the kind presence of Dr. K. P. Viswanathan, Hon'ble Vice Chancellor, MPKV, Rahuri, Maharashtra; Dr. M. M. Adhikari, Ex-Vice-Chancellor, BCKV, Kalyani, West Bengal; Dr. M. S. Chauhan, Director, ICAR-CIRG, Farah, Mathura (U. P.); Dr. A. S. Panwar, Director, ICAR-IIFSR, Modipuram, Uttar Pradesh; Dr. D. R. Singh, Director, ICAR-Orchid, Pakyong, Sikkim; Smt. R. Tshering, GM, NABARD, Gangtok, Sikkim; Prof. P. P. Dabral, Dean, CAEPHT, CAU, Ranipool, Gangtok, Sikkim; Prof. J. K. Chauhan, General Secretary, SEE, Agra and Prof. Mahendra Singh Seveda, Organizing Secretary, CAEPHT, Ranipool, Gangtok, Sikkim.

*Keynote Talks :* The following keynote talks were delivered during the congress.

- The first keynote talk entitled "Eco-friendly and Sustainable Farm Equipment" was delivered by Dr. P. B. S. Bhadoria, Professor, IIT, Kharagpur, West Bengal. He dealt with some eco-friendly and sustainable mechanical devices already being in use or in different stages of further improvement aimed at enhancing income and reducing drudgery. These innovations for farmers, rural artisans and entrepreneurs related with fibre and rope making, potteries and food processing will help farmers in achieving the goal of doubling income.
- The second keynote talk entitled "Modern Exotic Fruits and Way Forward for Enhancing Income of Marginal and Jhum Farmers in North-East India – An Overview" was delivered by Dr. K. K. Jindal, Former Director of Research, CAU, Imphal. He

explained the Kiwifruit has bright prospects in our country and has been assessed as one of the important future commercial fruit. It provides high return per unit area and the farmers can earn about Rs.4 to 5 lakhs per hectare annually. Kiwifruit bears heavily every year with no crop failure. The fruit is highly acclaimed for the nutritive and medicinal value. It holds a wealth of health giving property, thus recommended for patients suffering from diabetes and heart diseases. In kiwifruit no serious pests and diseases attack have been observed, thus it has a better scope to become commercial eco-friendly fruit crop of the country.

- The third Keynote talk entitled “Building Climate Resilience and Doubling Farmer’s Income through Safe and Sustainable Wastewater Reuse in Agriculture” was delivered by Dr. Ravinder Kaur, Ex-Director, IARI, New Delhi. She dealt with another area of utmost concern, *i. e.* reduced water availability for agriculture because of consequence of climate change. She enthralled the delegates with examples of how waste water could be recycled and utilized, not only for agricultural productivity but also for drinking purposes.
- The fourth keynote talk entitled “The Role Women in Agriculture” was delivered by Dr. Shova Nagrou, Professor, UAS, Dharwar, Karnatka. He brought the issue of feminization of agriculture that has further worsened in the last decade as a result of migration of male farmers to the urban areas in search of more income resulting in increased vulnerability of rural women to drudgery, security, health and nutrition.
- The fifth keynote talk entitled “Adoption of Climate Change Mitigating Technologies” was delivered by Dr. V. V. Sadamate, Ex Adviser, Planning Commission, New Delhi. He lamented about weak technology transmission system even where appropriate technologies suiting climate change are available. He stressed the need of inclusion of all stakeholders, including the farmers in all climate change initiatives and action plans at different levels up to villages. He suggested that SAUs, CAUs, ICAR and KVKs should collaborate with IITs and Rural Technology Institutes for generation and adoption of climate change mitigating technology.

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- The sixth keynote talk entitled “Role of Renewable Energy Technologies in Climate Smart Agriculture” was delivered by Dr. Mahendra Singh Seveda, Professor & Head, REE, CAEPHT, CAU (Imphal), Ranipool, Gangtok. He explained that the Renewable energy technologies play a role in providing energy services in a sustainable manner and, in particular, in mitigating climate change. Adopted renewable energy is one of options to reduce emission of greenhouse gas from using fossil fuel, especially the economies taking commitment under the climate convention.

*Summary of Oral Presentations and Poster Sessions :*

The key note speeches were immediately followed by technical sessions in four halls and auditorium. A total of 450 papers were submitted and accepted covering all the themes for presentation and discussion in the three days deliberation across.

Over three days, 400 research papers were presented in the areas of Climate Smart farming, and food and nutritional security: challenges and strategies; Neo - extension horizon and researches towards climate elegant agriculture; Innovation in farming to address biotic and abiotic stress arising due to change in climate; Post harvest technology, value addition, farm mechanization, nutri-sensitive interventions for women and entrepreneurship in farming; Indigenous Technical knowledge and information and communication Technology in climate smart farming; Engagement of youth in climate smart agricultural and secondary agricultural areas; and Role of soil and water conservation interventions and renewable energy technology in climate smart farming. Fifty posters were displayed during the poster session. The papers/posters presented in this congress are included in the publication of Society of Extension Education Agra.

*Valedictory Session :* The 19<sup>th</sup> National Extension Education Congress-2018 came to an end with the Valedictory Session on 17<sup>th</sup> November, 2018 that was graced by His Excellency Honourable Ganga Prasad ji, Governor of Sikkim, Gangtok. The dignitaries present on the occasion were Hon’ble Vice-Chancellor, Prof. M. Premjit Singh, Hon’ble Vice Chancellor Central Agricultural University, Imphal, Manipur; Shri Karlo Bhutia, Secretary, Agriculture, Govt. of Sikkim; Dr. D. R. Singh, Director, ICAR-Orchid, Pakyong, Sikkim;

Prof. Jitendra. K. Chauhan, General Secretary, SEE, Agra; Prof. Mahendra Singh Sevda, Organizing Secretary, CAEPHT, Ranipool, Gangtok, Sikkim and Dr. P. P. Dabral, Dean, CAEPHT, CAU, Ranipool, Gangtok, Sikkim. At the very beginning of the session, Prof. Jitendra. K. Chauhan, General Secretary, SEE, Agra welcomed His Excellency, Governor of Sikkim and Honourable Ganga Prasadji, dignitaries on the dais, delegates, guests, press and media. His Excellency Honourable Ganga Prasad ji, Governor of Sikkim, Gangtok in his valedictory remark expressed high hope that the deliberations in the congress by scientists from all over the country-Kashmir to Kerala and Gujarat to Arunachal Pradesh will help the farmers of India, more particularly the farmers of Sikkim in overcoming the problems of production and productivity in Agriculture, environment, flora and fauna caused by climate change and help India achieve the target of Doubling the Farmers' Income by 2022. He expressed his optimism that Sikkim being the first officially declared organic state will specifically be benefitted by the deliberations. Prof. M. Premjit Singh, Hon'ble Vice Chancellor Central Agricultural University, Imphal, Manipur very lucidly explained how zero tillage, conservation agriculture, precision farming and introduction of new plants and fruit trees could help overcoming the climate change risks. Prof. Mahendra Singh Seveda, Organizing Secretary of the Congress presented the key recommendations of the congress. Prof. P. P. Dabral, Dean, CAEPHT, CAU, Ranipool offered the vote of thanks.

## RECOMMENDATIONS

The following major recommendations have emerged from the research papers presented in the 9<sup>th</sup> National Extension Education Congress-2018 entitled "*Climate Smart Agricultural Technologies: Innovations and Interventions*".

- Differential nutritional security across social strata and gender being the most dominant observable phenomenon calls for action on enhanced access and control over resources to women, emphasis on popularization of traditional fruits and vegetables and their nutritional studies; and imparting education and knowledge on nutrition to the farmers, farm women and extension personnel continuously.

### Action:

- i. Govt. for Policies formulation and implementation;
  - ii. Research institutes for studies on nutritional values of traditional fruits and vegetables;
  - iii. Universities, Research Institutes and KVKs for education and training;
  - iv. IT sector for communication technology
- Climate change being a reality affecting both production and productivity in agriculture, fisheries, Veterinary and animal husbandry and other related areas due to changes in biotic and abiotic factors controlling the agricultural productivity is affecting the livelihood of a large population directly. India being a vast country with more than 330 crore population needs to use both the adaptive and mitigation strategies along with indigenous knowledge application for stability and progress. A large number of climate smart agricultural technologies are already available. Further continuous researches and transmission of already developed adaptive and mitigation measures should get emphasis as climate change has already occurred and it is an ongoing process.

### Action :

- i. Govt. for Policies formulation and implementation;
  - ii. Research institutes, Universities and KVKs for research on technology generation for mitigating affect of biotic and abiotic factors on production and productivity,
  - iii. Education and training on affect of biotic and abiotic factors on production and productivity with climate change perspectives.
- A big gap exists about information dissemination and consumption at farmers' levels that are generated at the research system. Extension system needs to incorporate digital technology for quick and efficient information dissemination and feedback. Establishment of advisory service at different levels up to block level on climate change, and adaptive and mitigation strategies along with continuous education and training for awareness development and understanding on climate change for extension personnel and farmers alike is the need of the hour.

### Action :

- i. Govt. for Policy and investment,

- ii. Research institutes, KVKs, Voluntary organizations for change over to digital transmission along with conventional methods.
- Value chain analysis mostly reveals the farmers at the receiving end with poor price realizations compared to price consumer have to pay. A large number of intermediaries harvest benefits at the cost of the farmers. At the same time it is important to strengthen the information dissemination and skill up gradation on post harvest technologies that can help farmers a better bargaining opportunity and develop a value chain with direct relation between farmers and deliverer at consumer level for generating remunerative price to the farmers in real time.

*Action :*

- i. Govt. for Policies on market opportunities and implementation, development of “Win-Win” platforms between market players and farmers,
- ii. Research institutes for development of best value chain and management,
- iii. Continuous knowledge and skill up gradation on post harvest operations and marketing by Universities, ICAR institutes and KVKs.
- Pressure on soil, water, air and forest will continue to grow because of agriculture and other developmental activities. Climate smart technology related with increased water use efficiency, recycled water use in agriculture, maintenance of soil health, restoration and conservation of forest, organic input utilization and gradual withdrawal of CO<sub>2</sub> producing technology in agriculture and industry is important.

*Action:*

- i. Govt. for Policy and Investment,
- ii. Research institutes, KVKs, Private organisation,

*Industries*

- Youths in India are no more attracted to take agriculture as a vocation as its intrinsic values have lost the shine. Entrepreneurship thrives in a supportive environment of technology, skills, logistic, policy, investment and entrepreneurial traits. Emphasis on upholding social status of farming community and a holistic approach for entrepreneurship development is more important now. Simple, cheap and socially viable rural technology for enhancement of income through post harvest activities for entrepreneurship development should be encouraged.

*Action:*

- i. Govt. for Policy,
- ii. Research institutes, KVKs,
- iii. Rural technology centres, Investment institutes
- iv. Collaboration with IITs, Management institutes, Rural Technology centres, Voluntary organizations and funding agencies for entrepreneurship development and enterprise sustainability.
- Integrated Farming System has been found to be applicable under small farm conditions in a better way which helps the farmers to overcome hunger. Different model shows increasing income but not sufficient enough to provide a respectable life compared to other sectors. While encouraging the IFS as mitigating and adaptive measures to climate change till alternative absorption for the farmers for better income is available, it should be continued.

*Action :*

- i. Govt. for Policy,
- ii. Research institutes, Universities, KVKs, Private organizations,
- iii. Investment institutes

