Souvenir & Abstracts

1st National Convention-cum-Seminar

Doubling Farmers' Income & Farm Profitability by 2022

Venue

Babasaheb Bhimrao Ambedkar University, Lucknow

October 28-29, 2017

Organized by

Royal Association for Science-led Socio-cultural Advancement (RASSA)

Supported by NABARD

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October 2017

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GOVERNMENT OF INDIA

20 OCT 2017

संदेश

यह जानकर हर्ष हो रहा है कि रायल विज्ञान सेवित सामाजिक सांस्कृतिक उन्नयन संस्था (रासा) अपना पहला राष्ट्रीय सम्मेलन व सेमिनार 'किसानों की आय व क्षेत्र की लाभप्रदता को 2022' तक दोगुना करना नामक विषय पर बाबासाहिब भीमराव अंबेड़कर विश्वविद्यालय, लखनऊ में दिनांक अक्टूबर 28-29, 2017 को आयोजित कर रहा है। यह विषय हमारे यशस्वी प्रधानमंत्री जी के आह्वान से भी जुड़ा है। आशा है कि ग्रामीण अंचल में रह रहे युवा वर्ग के लिए कृषि आधारित रोजगार सृजन की संभावनाओं पर विस्तार से चर्चा होगी। इस सेमिनार में विभिन्न संस्थानों से आए वैज्ञानिकों, विद्यार्थियों, उद्यमियों व किसानों के आपसी समन्वयन से किसानों की आमदनी को दो-गुनी करने के लिए जो सुदृढ़ उपाय प्रस्तावित करेंगे उसकी संस्तुति कृषि एवं किसान कल्याण मंत्रालय को अवगत करावें।

मैं आयोजक को सहर्ष बधाई देता हूँ व सफल कार्यक्रम की शुभकामना देता हूँ।

(राधा मोहन सिंह)

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दिनांक- 25-10-2017

संदेश

यह जानकर प्रसन्नता हुई कि ''रायल विज्ञान–सेवित सामाजिक सांस्कृतिक उन्नयन संस्था ''रासा'' द्वारा बाबा साहब भीमराव अंबेडकर विश्वविद्यालय लखनऊ में दिनांक 28,29 अक्टूबर 2017 को ''कृषि उत्पादकता द्वारा किसानों की आय 2022 तक दुगना करना'' विषय पर दो दिवसीय सेमीनार का आयोजन किया जा रहा है। मेरी कामना है कि यह सेमीनार किसानों के लिए बृहद स्तर पर लाभप्रद हो, उनको कृषि उत्पादकता में सुधार और आय वृद्धि के उपयोगी सुझाव प्राप्त हों।

इस अवसर पर प्रकाशित स्मारिका एवं संगोष्ठी आयोजन की सफलता के लिए मैं शुभकामनाएं प्रेषित करती हूँ।

Swati

(स्वाती सिंह)

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Dated: 18th October, 2017

MESSAGE

I am happy to know that Royal Association for Science-led Socio-cultural Advancement (RASSA) is organizing two days seminar on 'Doubling Farmers' Income & Farm Profitability by 2022' at Babasaheb Bhimrao Ambedkar University, Lucknow from October 28-29, 2017.

Government of India has set target to double the income of farmers by the year 2022 will require to boost the annual growth. The drivers of income growth for farmers are diversification of farm activities towards high value crops, technology upgradation and mechanization, knowledge based enterprise development, irrigation (micro-irrigation) will double the productivity, value chain management and market. The application of science in sustainable manner will make it possible to realize the dream faster than expected.

I am hopeful that fruitful deliberations would give an effective option for the planners, entrepreneur and farmers to doubling the farmers' income.

I wish the seminar a grand success.

(S.K. Malhotra)

भाकृअनुप
ICAR

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MESSAGE

It is learnt that Royal Association for Science-led Socio-cultural Advancement (RASSA) formed by Scientists/Engineers/technical, business persons and farmers is pursuing the dream of development of society with application of scientific knowledge.

I am happy to know that the Society is organising it's first National Seminar-cum Foundation day at BBAU, Lucknow on 28-29 October, 2017 to deliberate and workout a road map for Doubling the Farmers' Income by 2022. Scientific advancements enriches the living of huiman beings and contribute significant in preserving the natural sources on sustainable basis. The application of science makes it possible to realize the dream faster than expected. Many of the technologies developed in laboratories do not find opportunities of application in field due to various reasons. The problem faced by the Indian farmers are multifarious. The orientation of science and technological options as per local needs are crucial to the success. However, other than the technology, the opportunities in organising people, building their confidence and creating an environment for sustainable development are equally important. Doubling farmers' income has to be objectively looked into in real terms and efforts made to address the stresses faced by the farmers.

I am sure that the National Convention-cum-Seminar will provide opportunity to the participants to deliberate upon the issues concerning on doubling farmers' income.

16/10/2017

Dated : 16.10.2017

(A.K. Singh)

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October 18, 2017

Message

I am happy to know that the RASSA society is organizing its first National Convention-cum Seminar at Lucknow during 28-29 October, 2017. The theme of National Convention 'Doubling Farmers' Income % Farm Profitability by 2022' is the need of hours for discussion amongst various stakeholders (scientist, Industries, Farmers and Students) to make firm step towards achieving its goal.

It is true, application of science and technology makes it possible to realize the dream faster than expected. Therefore standards of education, ecology, environment, renewable energy sources, health, road, communication, infrastructure, strategies for increasing production, profitability, profitability and processing and value addition shall have to be strengthened further so that all its stakeholders will get its benefits. In addition to it, villagers will have to be empowered to take their own decisions to realize their dream.

I hope all deliberations to be held in this convention cum seminar will be towards drawing strategies for doubling farmers' income. On this occasion, I convey my best wishes to the organizers and delegates for success of this 1st convention cum seminar.

Rathore

(N.S.Rathore)

भाकृअनुप-भारतीय गन्ना अनुसंधान संस्थान
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डॉ0 अश्विनी दत्त पाठक
निदेशक
Dr. Ashwini Dutt Pathak
Director

Message

I am happy to know that Royal Association for Science-led Socio-cultural Advancement society is organizing National Convention-cum Seminar at Lucknow on 28-29 October, 2017. The theme of National Convention-cum-Seminar is as per the current need of country. Hon'ble Prime Minister of India's call for doubling farmers' income by 2022 is possible by proper application of scientific interventions. There are many technologies available for sugarcane farmers that can help in meeting the target. The discussion on various aspects of agricultural technologies will be discussed during the period.

I hope that this National Convention-cum-Seminar will be helpful for all the stakeholders involved in increasing the farmers' income by 2022.

I convey my best wishes to the organizers and delegates for successful conduct of programme.

(Ashwini Dutt Pathak)

Message from President…

I am delighted that Scientists / Engineers / Technical and Business Persons / Doctors / Teachers, Social workers and Farmers have come together to form an association called Royal Association for Science-led Socio-cultural Advancement (RASSA) with the aim to realize the dream of development of society with application of scientific research which are in synchronization with the nature. Scientific advancements have enabled the nature to enrich all living beings on a sustainable basis and that is the reason for our survival, betterment and advancement of society and social order seamlessly.

I am happy to inform you that our society is organizing its first **National Seminar-cum Foundation** day in Lucknow from 28-29 October, 2017. We will discuss, deliberate and workout a road map for doubling of Farmer's income by 2022. The task visualized by our Hon'ble Prime Minister though looks tough to many, considering the rate of development experienced by the country during the last seven decades is not impossible either, given the present scenario of agriculture and rise of investment in rural India and its potential. It is only a matter of time when processes are escalated and tasks and projects eventually completed at a faster pace than the normal and routine time frame.It is the application of science that makes it possible to realize the dream faster than expected. Many of the technologies developed in laboratories could not find application in the field due to various reasons but now the country cannot wait for indefinitely and if India has to progress, our rural base has to be strong socially, mentally and economically. Standards of education, health, power, road, communication and infrastructure for processing for value addition shall have to be strengthened and 70% people living in villages shall have to be empowered to take their own decisions to realize their dream.

I have seen the zeal of members in organizing the Association and enrolling committed members and starting with a training and Vegetable seed distribution to some 200 farmers in a village of Aligarh to now organizing this National seminar within one year of its formation. This gives us the needed confidence and determination to work for the Mission and Vision of the Association with a greater zeal in future. I am thankful to my team in Delhi and Lucknow for their untiring efforts in organizing this seminar. All the members elsewhere in the country too deserve appreciation for their cooperation and positive bent of mind, unity in thought and commitment towards the Mission of the Association. I am sure that the Mission and Vision of the Association, once taken in its true spirit will make advancement in health, education and culture and business activities in Rural areas. The development of agriculture, horticulture, animal husbandry and dairy and processing Industry will go a long way in raising their income and also the standard of living which will contribute in national GDP.

I congratulate all the members and office bearers and call upon them to be torch bearers in their respective area for the people waiting for light in their life.I am hopeful that the deliberations in the seminar will give us a roadmap for sustainable development of rural India with better linkages with our cities as partners of growth and give rural India their pride back. They will take pride in their role as masters of the land and animals and holders of processing industries that feed the whole nation. This situation, once realized shall not only remove the poverty in rural areas but also prepare a force for national development and a social order with HAPPY, HEALTHY and PROSPEROUS India full of respect for each other needed for peaceful co-existence in the society.

JAI HIND

(**Awadhesh Kumar Singh**)

President, RASSA

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Dr Jyotsnendra Singh
Principal Scientist
ICAR-IISR, Lucknow

From Convener's Desk

In India condition of farmers remained static since long time. There is marked improvement in other field but agriculture remained neglected and was never in the centre of development. The goal of doubling farmers' income by year 2022 has been possible and realistic by some experts. Some commentators have produced calculations that agriculture will require annual growth of 14.86 percent per year for five years to get farmers' income doubled. The possibilities of doubling the farmers income lies in improvement in productivity, resource use efficiency or saving in cost of production, increase in cropping intensity, diversification towards high value crops, shifting cultivators from farm to non-farm occupations, and improvement in terms of trade for farmers or real prices received by farmers.

Royal Association for Science-led Socio-cultural Advancement (RASSA), a Registered National Society, is organising a National Convention-cum-Seminar on **'Doubling Farmers' Income & Farm Profitability by 2022"** at Babasaheb Bhimrao Ambedkar University, Lucknow from October 28-29, 2017. This seminar will primarily deal with sharing of the latest technologies, techniques etc that may enable improving the farmers' profitability. I hope that very significant recommendation will emerged from this National Convention-cum-Seminar.

The financial assistance from research and Development fund of National Bank for Agriculture and Rural Development (NABARD) towards publication of journal/ printing of proceedings of the Workshop is gratefully acknowledged.

I wish the National Convention-cum-Seminar a grand success

Dr Jyotsnendra Singh
National Convention-cum-Seminar

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Key Note Address

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Lead Paper

Key Note Address

Approaches in Transition for Doubling Farmers Income

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In the event of pursuing sustainable agriculture, food security, rural employment, and environmentally sustainable technologies are essential for holistic development. Indian agriculture and allied activities have witnessed a green revolution, a white revolution, a yellow revolution and a blue revolution. But in the years to come challenges to agriculture will continue to increase because large population is to be fed from declining land and water, in the scenario of climate change. Agriculture, with its related sectors, is indisputably the largest livelihood provider in India, more so in the massive rural areas. It is well known that more than 58% of the rural households is dependent on agriculture, thus primary focus of the government has been on rural development to improve the livelihood of rural people. Agriculture, along with fisheries and forestry, is one of the largest contributors to the Gross Domestic Product. As per the advanced estimates by the Central Statistics Office, the share of agriculture and allied sectors which include agriculture, animal husbandry, fishery and forestry, is expected to be 17.3 per cent of the Gross Value Added (GVA) during 2016-17 (2011-12 base prices). Large portion of the farming is still dependent on monsoon, given there is mere 45% irrigation penetration. It is worth mentioning that two consecutive years (2014-15 and 2015-16) of scanty rains have negatively affected farm income. It has been witnessed recently during *kharif* 2016 that a good monsoon can itself drive agriculture growth to as much as 8%. It is also evident that good rains can only help in the short run, but long term solutions are needed through water saving infrastructures and technologies. Last year in the Union Budget 2016, the Finance Minister announced that the government would strive to double rural income by 2022. Excerpts of the speech are depicted here as such that doubling rural income in nominal terms is possible by increasing agri output & minimum support prices (while keeping inflation below 5%), doubling rural income in real terms would be a daunting task considering increasing agri output by 12% every year with no additional land likely to be utilized for agricultural activity. There is every possibility not only to double the income of farmers through enhancement in productivity, changes in cropping pattern, inspire additional income through many supplementary activities but also provide stability in farmers income. There is need to think beyond food security and give our farmers a sense of income security.

Indian agriculture supports livelihood to over 600 million people and retains the dominant role in Indian economy, though it contributes only 14% to Gross Domestic Product (GDP). Over 50% of population depends directly or indirectly on agriculture for their livelihood. It is 70% of primary source of income in rural areas. During the last more than six decades, Indian agriculture witnessed a remarkable increase in production of food grains from a modest 51 million tonnes in 1950-51 to 275.7 million tonnes in 2016-17 and touched an all time high production. Some of the recent achievements have been possible due to spirit of our farmers, their hard work even in adverse conditions and in countable initiatives of the Government of India, like, National Food Security Mission, Rashtrya Krishi Vikash Yojna, Mission for Integrated Development of Horticulture as well as several research initiatives. We have been highly comfortable on our food front, when many countries have experienced shortages of food during global crisis of 2008-09.

The present population of 132 crores is likely to increase to 145 crores by 2030 in the country. Thus there is increasing demand for diversified production of food grain, pulses, fruits, vegetables, milk & live stock. By 2030 in India, cereal demand is expected to grow by 11 percent but demand for vegetables will grow by 37 percent, milk and dairy by 52 percent and poultry by over 100 percent. By 2030, we need to produce 300 million tonnes of food grains against present level of about 272 million tones and 320 million tonnes of fruits and vegetables against 287 million tonnes will be required. The increase in production can only come from increase in productivity. Our productivity and income levels can be substantially increased by better use of technology and adoption of newer method. The world over, the shifts is from agricultural to industrial economies and towards information and knowledge driven ones that creates a new service society with new objective. We must take these trends into consideration and recognize the fact that less

and less people will have to produce more and more in the coming decades to feed our millions with high profitability considering income security above the food security.

In order to realize this concept, active collaboration between all stakeholders from public and private sector involved in food system would need new approaches and innovations to be adopted. Such interventions would need integrated value chains that connect farm to fork, competitive markets that provide better prices to farmers and an enabling environment that supports innovation and action. Besides, it has unveiled strategies ranging from irrigation to crop insurance. But if the food value chain is to undergo true transformation, it needs to move from a production-driven system to one driven by demand, one that increasingly link consumers with producers.

To achieve this target of doubling of farmer's income by 2021-22, this Department has constituted a Committee under the Chairmanship of Additional Secretary (Policy) to examine issues relating to doubling of farmers' income by year 2021-22. The broad mandate of the Committee is i) To study the current income level of farmers/agricultural labourers; ii) To measure the historical growth rate of the current income level; iii) To determine the needed growth rate to double the income of farmers/agricultural labourers by the year 2021-22, iv) To consider and recommend various strategies to be adopted to accomplish (iii) above, v) To recommend an institutional mechanism to review and monitor implementation to realise the goal and vi) To examine any other related issue.

The Government of India has taken appropriate measures to increase farm income, stabilize production and, consequently, improve small farm productivity. The government's focus on improving farm productivity led to the initiation of a variety of new schemes related to area of soil health care, micro irrigation, water harvesting, high quality seeds, credit & insurance availability, creation of a vibrant e-market and encouraging livestock & bee keeping with the support of the food processing industry. The approaches are,

- Enhancing productivity in crop production
- Increasing availability of quality seeds and planting material for adoption of high yielding varieties and hybrids
- Integrated Farming System:
- Water use technology for high efficiency
- Electronic National Agriculture Market (e-NAM) for enhanced income to farmers
- Branding of Indian food and agri produce for export promotion
- Post harvest management for reducing post harvest losses (Food saved is food produced)
- Covering risk through crop insurance will bring stability in farm income
- Earning ancillary and supplementary income

Farmers' income can be improved when productivity goes up, cost of production comes down, if agricultural commodities produced get a remunerative price through a transparent price discovery mechanism. It can also happen due to improved income from allied activities to agriculture and non-farm sector or even wage employment during the agricultural off season. The strategy must integrate them all. Doubling of farmers' income must be attempted by creating a framework where all related agencies come together and work in harmony, with a maestro conducting that orchestra. In its initial years of reforms started by China between 1978 and 1986, witnessed growth of 14% per annum in farm income. This led to a reduction in poverty by half by generating demand for industrial products in rural areas. Doubling rural income in nominal terms is possible by increasing agriculture output & minimum support prices (while keeping inflation below 5%), doubling rural income in real terms would be a daunting task considering increasing agriculture output by 12% every year with no additional land likely to be utilized for agricultural activity. However, a long term solution remains faster execution of policies that could develop infrastructure to support irrigation system and reduce the dependency on rains. There is every possibility not only to double the income of farmers through enhancement in productivity, changes in cropping pattern, inspire additional income through many supplementary activities but also provide stability in farmer's income. There is need to think beyond food security and give our farmers a sense of income security.

Key Note Address

Reforms in Agricultural Extension in India and Policy Issues

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Reforms in the public extension system envisage a pluralistic extension system that is more broad-based and holistic in content and scope beyond agricultural technology transfer. Its normal task of transferring and disseminating appropriate technologies and agronomic practices will not be sufficient. Extension agencies, services and workers will need to exercise a more proactive and participatory role, serving as knowledge/information agents in which they initiate and facilitate mutually meaningful and equitable knowledge based transactions among agricultural researchers, trainers and primary producers. All this needs to be done in an effective and cost efficient manner. Technology generation and its application will have to focus more strongly than before on the themes of optimization of resources available to producers, sustainability and adaption of technology to cope with diversity. More specifically, agro-ecological or social circumstances are aimed at the creation of a policy environment that promotes profitable, productive and sustainable farms (Singh et al., 2013).

The broad typology of the extension systems in India are mainly Field Extension System and Frontline Extension System. Whereas field extension system is concerned with large-scale agricultural technology dissemination to the large number of Indian farmers by development departments and agencies; frontline extension system of Indian Council of Agricultural Research (ICAR) and State Agricultural Universities (SAUs) focuses on the adaptation and demonstration of the technologies and capacity building of the related stakeholders. There are five main public extension players *viz.*, the Department of Agriculture and Cooperation (DAC) and the related ministries of rural development through its network of agricultural and related departments at state, district, block and village level; frontline extension systems by KVKs, ICAR institutes and SAUs; Extension services by different commodity boards; Agribusiness houses and input agencies and extension services by the Voluntary Organizations of the country.

During the past 60 years, the Indian extension system has evolved to reflect national priorities. The changing economic scenario in India and the need for appropriate agricultural technologies and agro-management practices to respond to food and nutritional security, poverty alleviation, diversifying market demands, export opportunities and environmental concerns is posing new challenges to technology dissemination systems. Public extension by itself can no longer respond to the multifarious demands of farming systems. Agricultural extension plays a crucial role in meeting the holistic needs to increase agricultural production in a sustainable manner. Reforms in the public extension system were envisaged during 1990s as pluralistic extension system that is more broad-based and holistic in content and scope – beyond agricultural technology transfer. Reforms in extension system also led to innovative institutional arrangement. Policy reforms in agricultural extension envisage replacement of the old single-discipline, commodity-oriented approach of the Training and Visit (T&V) system by the farming systems approach and later farmer participatory approach for participation of farmers as a stakeholder in technology development and dissemination.

The move from a policy of food security to a strategy that focuses on agricultural diversification aimed at increasing farm income and rural employment carries with it implicit risks for the small-scale farm households that are expected to benefit from this approach (Singh, 2015). Increasing the effectiveness of the extension system in meeting its objectives will require readdressing of the above policy and programmatic interventions. Finally, the financial dependence of the states on central government needs to be gradually reduced to enable the states, and ultimately the farmers, to take ownership of their reformed extension systems (Babu et al. 2013). There is need to re-evaluate the capacity of agricultural extension to effectively address the contemporary and future needs of the farming community. As the nature and scope of agricultural extension undertook fundamental changes, India looked for a whole new policy mix to nurture pluralistic extension system in India (Singh et al. 2013).

Subsequently, in order to introduce reforms in the public sector agricultural extension system and increase its relevance, accessibility, and efficiency of knowledge sharing among various actors, players, and stakeholders, the Agricultural Technology Management Agency (ATMA) was introduced. ATMA is seen as the key intervention for

reforming the extension system in India. It was introduced to replace T&V to overcome some of its weaknesses and has been quite successful attempt for ensuring convergence of extension by different service providers through a legally-constituted body. The World Bank funded Innovations in Technology Dissemination (ITD) component of National Agricultural Technology Project (NATP), under which the ATMA had been introduced, focused on bottom-up planning process for technology assessment, refinement and dissemination in order to make the whole extension system demand-driven and farmer accountable. This has helped to strengthen research and extension capabilities, restructure public extension services and test new institutional arrangements for technology transfer with the involvement of all the stakeholders of Government and Non-Government agencies at the district level (Singh, 2015). Its innovative approach in providing autonomy and fund flow mechanism made it possible to win back the confidence of all the stakeholders including farmers, towards the public extension system.

In the changing agri-rural environment the role of extension education and technology delivery system has also changed. Harnessing advances in frontiers of science in selected priority areas with larger spin-off benefits by focusing on basic and strategic research also assumes significance. Need has been felt to search for alternatives to the public agricultural extension system in the country. A paradigm shift from single discipline orientation to multi-disciplinary approach is critical for research in the discipline. National Commission on Farmers (NCF) indicated that farmer-to-farmer learning and technology transfer is most frequent and is found to be reliable. Farm schools at the farms operated by farmer-achievers should be established in large number in different agro-climatic zones and farming system regimes. Farm School and Farmer Field School can be effective tools in farmer led extension. It has become an absolute necessity to shift extension focus from production-orientation to market-led extension resulting in increasing farm income by adopting end-to-end approach. Market-led extension help the farmers to minimize the production costs, improve the quality of farm produce, increase the product value and marketability resulting in increasing of income to the farmers. Linking farmers to markets is a pre-requisite for augmenting farm production and farmers' income. Role of innovative institutions would be critical in this context to reap the benefits of emerging opportunities.

The ICAR and Ministry of Agriculture have initiated some very pioneering schemes for strengthening the extension in India. One such scheme is Attracting and Retaining Youth in Agriculture (ARYA), which is an innovative initiative of ICAR to develop a comprehensive model for sustainable development of youth in agriculture with the objectives of attracting and empowering the youth in rural areas to take up various agriculture, allied and service sector enterprises for sustainable income and gainful employment in selected districts, to enable the farm youth to establish net work groups to take up resource and capital intensive activities like processing, value addition and marketing and to demonstrate functional linkage with different institutions and stake holders for convergence of opportunities available under various schemes/programmes for sustainable development of youth.

Ministry of Agriculture started an ambitious programme called as *Mera Gaon Mera Gaurav* (My village, my pride) in which the scientists of Indian Council of Agricultural Research will adopt villages and introduce the technologies developed by ICAR in the villages. Each scientist will adopt a village nearby his institute and make regular visits to the village and extend technical guidance to the farmers and develop the farmers so that they adopt the improved practices. In future it is planned to extend this programme to the level of students of agricultural universities in India. Through this effort model villages will be developed which will act as a catalyst to develop the neighbouring villages. There are about seven lakh villages in the country. About 6000 scientists of ICAR are serving in ICAR. About 20,000 scientists of national agricultural research system including ICAR and State Agricultural Universities (SAUs) and 50,000 agricultural students of SAUs can cover 70000 villages and transform these villages into model villages.

ICAR-Indian Agricultural Research Institute, New Delhi has developed an Innovative Extension Model for dissemination of information & technology among farmers using rural Postman as a Change Agent. In its initial stages, the Institute has provided quality seeds of various crop varieties to the farmers of different remote areas in the country through Post Offices and Postman. Under the Scheme, rural Postman and farmers have been trained on improved agricultural practices by the regional KVKs. After the successful testing of this innovative model the Indian Council of Agricultural Research has renamed the model as *Krishi Dak* (Agri Post) and planned its expansion in 14 states covering 100 districts.

In conclusion, several of the institutional innovations that have come up in response to the weaknesses in public research and extension system, have given enough indications of the emergence of an agricultural innovation system

in India. This has resulted in the blurring of the clearly demarcated institutional boundaries between research, extension, farmers, farmers groups, NGOs and private enterprises. Extension has to play a very important role of facilitating the nodes to generate access and transfer knowledge between different entities in the innovation system. It also has to create competent institutional modes to improve the overall performance of the innovation system. Inability to play this important role would marginalize extension further. A robust extension policy is essential for ensuring convergence in pluralistic system to design stakeholder coordination mechanism and framework. The policy should also spell out who will provide what kind of product or service to whom at what quality. Long-term commitments, capacity building of stake holders and a strong system for monitoring and evaluation are indispensable prerequisites for successful implementation of convergence. If all the extension organizations are converged at different levels according to their relative advantage area, farmers will be motivated and mobilized to adopt better technologies provided by coordinated and converged extension approach.

Key Note Address

Reforms in Indian Agricultural Education

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Agriculture sector has given the status of priority to the Indian economy because directly or indirectly more than 50% of the total work force is employed in this sector. Agriculture contributes about 14% in national GDP and responsible for about 12% export. Agricultural field is a diverse discipline which introduces improved farming techniques to increase and sustain agricultural production quality and quantity wise and to reduce drudgery. Education is an act or process of imparting or acquiring knowledge, developing the powers of reasoning and judgment. Agricultural education provides couple of educational activities with the primary aim of achieving human resource development throughout the rural economies of almost all nations. It covers the learning needs of all associated aspects of agricultural and allied sciences. India has acquired status of first green revolution by increasing about 5 times grain production, 9 times horticultural production, about 9.5 times milk production and 12 times fish production. Perhaps it is because of deep rooted agriculture education in this country. However, in present context, Agriculture Education need new challenges of broadening scope of its operation, bridging gap between demand and supply, having proper cooperation & collaboration among different stakeholders and proper documentation and dissemination of technologies across different stakeholders. Further, there is need to energies the agriculture sector by enabling new education technologies. Education should lead to development of Skilled Human Resource, basic research for knowledge generation, applied research for development of technology, system and package of practices.

Today we need skills, not just degrees, with the ability to assimilate, adapt, apply and develop new technologies. Today we need high quality agricultural graduates equipped with problem solving and creative skills and ability to think and improve productivity of agricultural sector. Apart from the technical and generic skills, our graduates need leadership and entrepreneurial skills to build leading teams, and put innovations into practice and respond to competitive environments. There is need to articulate four T's *i.e.* Tradition, Technology, Talent and Trade to make agriculture as alternative field for livelihood and sustainable development. Traditional means what is our status as far as agriculture is concerned in our country, technology means what is present state of art of devices, system, process and package of practices available indigenously and internationally. The concept of talent is how to use innovation and creativity among all stakeholders of agriculture to make this profession remunerative and finally there is need to introduce concept of trading in agriculture field i.e. how to federate farmers into business group.

It is observed that education must include knowledge (basics, fundamental, theory, practices,) to know what to do, skill to know how to do, ability to make work simple & convenient, experience for increasing efficiency and finally attitude & resources for doing work in actual. Thus we need updated Syllabus with proper articulation of quality and reform. Quality assurance in higher agricultural education in the country has been achieved through policy support, accreditation, framing of minimum standards for higher agricultural education, academic regulation, personnel policies, review of course curricula and delivery systems, development support for creating/strengthening infrastructure and facilities, improvement of faculty competence and admission of students through All India competitions. As first and most important step for quality improvement of education, the Indian Council of Agricultural Research has been periodically appointing Deans Committees for revision of course curriculum. In the series, recommendation of Fifth Deans Committee had been made considering contemporary challenges for employability of passing out graduates and to adopt a holistic approach for quality assurance in agricultural education and declaring Agriculture as professional degree. The committee has recommended that in first year of each sub sector of Agriculture courses related to traditional, in second year courses related to technology, in third year courses related to increase in talent of students and in final year courses related to trade or federating students into business group should be planned. Further, the Committee has also recommended to introduce ICAR funded 'Student READY programme (Rural Entrepreneurship Awareness Development Yojana) in each UG courses for one complete year period to promote skill development in the graduating students for specialized jobs in view of market needs and demands.

Number of innovative steps has been taken by ICAR in order to attract talented students and creating visibility of Agriculture Education in India. These are as follows:

- Declaring Agriculture Education as Professional Degree. All degrees in the disciplines of Agricultural Sciences are declared as professional courses.
- Launching of New Agriculture Under graduate Course and syllabus based on Vth Dean's Committee.Courses of Agricultural sciences are designed through integration of Knowledge, Skill, Ability and Experience.
- Articulation of Tradition, Technology, Talent and Trading components in 11 different major group of Agriculture Education at Under graduate level.
- Started new program at undergraduate level i.e. Biotechnology, Sericulture, Home Science revised as Community Science and Food Nutrition & Dietetics.
- Starting a new one year program for entrepreneurship leading to 'Student READY (Rural Entrepreneurship Awareness Development Yojana) in under graduation. This is meant for entrepreneurship development through integration of Experiential Learning with business mode, Hands-on training (HOT) / Skill development training, Rural Agriculture Work Experience, In Plant Training/ Industrial attachment and Students Projects.
- Enhanced scholarship from the present Rs 1000 to Rs. 3000 pm/student for six months in student READY scheme.
- Attracting talented students in B.Sc. (Hon). Agri by allowing Mathematics students along with Agriculture and Biology students at 10+2 level.
- Celebrating December 23 as Agriculture Education day in every agriculture institute.
- Quality assurance in AU'S through National Agriculture Accreditation Board.
- Setting Norms and Standard for Quality education, Rigor in Accreditation Process and Granted Accreditation to 60 SAU's.
- Linking Strengthening and Development Grant with accreditation of university.
- Evaluation & Monitoring for Quality Education for last plan.
- Started unstructured education for farmers, growers, milk men and entrepreneurs for Organic Farming, Natural Farming and Cow based Economics under Unnet Bharat Abhiyan.
- Initiated Pt. Deen Dayal Upadhyay Unnet Krishi Shiksha Yojana through 100 training centres.
- Established 426 Experiential learning centers for Student READY Scheme.
- Formulation of World Bank sponsored National Agriculture Education Project for enhancing Faculty Competency, attracting Talented Students, creating visibility of Universities among different stakeholders and for Infrastructure Development as per present needs.
- Implementation of revenue generation at AU's through Capacity building, Training, Consultancy, Testing, Certification and Technology outreach approach.
- Development of Centre of Excellence in frontier areas as Information Technology and Artificial Intelligent, Safety, Security and Surveillance of networking, WRRRS and pollution control, Climate Change Mitigation, GIS and Remote Sensing, Nanotechnology, Biotechnology, Food technology and Energy Management and Conservation Technology and Management for Precision, Secondary improved, Speciality, Vertical Development etc
- Implementation of Green Initiatives as per global needs i.e. Rain water harvesting, Solar Energy Utilisation, Composting, Waste water recycling and e- governance.
- Ranking of Agricultural Universities and initiated Score card for the same.

- Developed DPRs for establishment of colleges by integrating the recommendations of Committees on Minimum Standards on Higher Education in terms of faculty strength, land requirement, departments and infrastructure.
- ICAR supports massively for enhancing student amenities through development grants for Student Hostels (Girls hostel), Repairs and renovations to hostels, Instructional Labs, Smart class rooms, Computer and internet facilities, State of art equipments and instruments, Educational museums, Sports and recreational facilities and Digital Library etc.
- Initiated draft bill for establishment of National Council for Higher Agricultural Education.
- Started National Talent Scholarship at PG level as well at the rate of Rs 3000/- p.m.
- Enhanced National Talent Scholarship at UG level from Rs 1000/- to Rs 2000/- p.m.
- Started Emeritus Professor Scheme on the line of Emeritus Scientists to attract retired Professor to continue in teaching work.
- Processed 9 more CAFT training centers.
- Initiated Extramural Research Projects addressing acute and felt needs to enhance the quality of agricultural education in identified thrust areas.
- Implementation of model act in AU's for Good Governance.

It is expected that Agriculture education in India will produce competent human resource for research and for ever green revolution in society, for adequate Employment and Entrepreneurship, for inducting World class IT capability in different practices and for ultimate increasing efficiency in inputs & thus higher productivity, enhanced income and environmental protection. Quality education for global competitiveness and creating models to play a key role in 'Digital Initiative', 'Skill Initiative' and 'Make in Initiative' of Govt of India will be motto of ICAR.

Key Note Address

Role of Advance Biotechnologies for Enhancing Farm Productivity

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In the present Indian scenario huge economic disparity has led to great rural-urban divide where Agriculture sector employing 46 percent of the population produces only 17 percent of the national GDP. The average income of a farmer is about one-third of the average city dweller, which is the major factor leading to rural to urban migration. While this trend will continue with the industrial development but at slow pace, hence there is strong need to enhance the income and profitability of a farmer to bring in the socio-economic equity, which is must for a peaceful and vibrant society. Diversification of the present crop centric Agriculture to include horticulture, dairy, poultry and fisheries, husbandry, affordable farm mechanization through custom hiring, value addition by post-harvest processing near farm clusters, storage facilities and good market linkages are the key ingredients for enhancing farm income. On top of these positive steps for increasing farm productivity, joining the *'Pradhan Mantri Fasal Bima Yojana'* will safeguard against the losses due to drought, flood, hailstorm, disease epidemics and other unforeseen causes. Availability of quality seeds of new high-yielding, input-efficient, climate resilient and nutritionally bio-fortified crop varieties at an affordable cost will play a crucial role in improving total factor productivity of farm produce. Biotechnology is playing increasingly important role in serving the seed sector. Following are some important areas where it can and is making tremendous impact internationally and Indian farmers have a right of access to these technologies at affordable price.

Quality control of seed and planting materials through DNA fingerprinting: The technology of DNA profiling has revolutionized our criminal justice system particularly with respect to the paternity disputes and identification of criminals based on traces of blood, semen and hairs at the crime scene. It has also become routine to use DNA profiling for disease diagnostics. Similarly, the DNA fingerprinting has huge potential for the identification quality assurance of seed and planting materials to deal with the common spurious supplies of farm inputs. State seed certification agencies must adopt it rapidly to safeguard the farers interests. It can also help in positive monitoring the popularity and spread of new varieties among farmers. High throughput cost effective technologies are now available for this purpose.

Mass propagation of quality planting material through tissue culture: Tissue culture multiplied planting materials have become routine in case of sugarcane, banana and potato and are being rapidly adopted for other fruit and horticultural crops with long juvenile phase. Tissue culture is helping in fast multiplication of elite planting material, which is also free from diseases.

Genomic selection is helping develop new improved breeds of cattle, poultry and fish: This is a new methodology of breeding farm animals and horticultural crops with long juvenile phase, where regular breeding is may take years to give results. Analysis of cleverly designed training populations with help of genome wide DNA markers helps determine the breeding values of each marker, which in turn helps select the superior genotypes with best combination of alleles from a segregating breeding populations. The technique has already been used in the western countries for improving the milk and meat production in cattle. In India so far we do not have any variety or breed developed through this advance breeding methodology but efforts are underway at a few leading institutions involved in crop and animal breeding.

Genomics-assisted breeding of new climate resilient varieties will halve the time taken for developing new varieties: This as proved tremendous success globally including India and varieties developed though DNA marker-assisted backcross breeding and pedigree breeding have been released in rice, wheat and maize. Rice varieties like flood tolerant Swarna-Sub1, Samba Mahsuri-Sub1, Ranjit-Sub1, drought tolerant DRR Dhan 50 and bacterial blight and blast disease resistant varieties, Improved Pusa Basmati and Samba Mahsuri and Pusa 1637 and quality protein maize variety Vivek QPM 9 have become very popular among farmers. There are many more varieties of other crops are also in the pipeline as the technique becomes routine with the availability of genome information and DNA marker-trait associations in these crops.

GM technology for introducing traits not possible through conventional plant breeding: This is the most advance breeding tool that allows transfer of genes from across the species barrier and therefore useful genes available in other crops or even bacteria can be transferred. After thorough biosafety evaluation the varieties or hybrids are approved for commercial cultivation. Bt-cotton has been a resounding success globally including India, which has become the largest producer and second largest exporter of cotton after the adoption of Bt-cotton. Use of chemical pesticides is reduced significantly as a bacterial protein that is now produced by the cotton plant itself kills the insects. Though with the passage of time resistance population of insect build up and new Bt genes are required, also new pests emerge as the Bt gene is very specific and does not kill all the insects. GM technology has the tremendous potential to produce plants with production capacity never seen before in terms of productivity, quality and biosafety. So far it has proven safe for the human and the environment, but there are strong oppositions to this powerful technology by certain social groups, raising bio-safety concerns. These concerns have to be addressed if this technology is to find its place in alleviating the farming miseries.

Key Note Address

Manage Your Time: Some Strategies

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People who have some purpose in life always feel scarcity of time. They feel they would have achieved greater heights if had some more time to their disposal. Time is such a unique resource, that it is equally distributed every day to every individual irrespective of his background, educational and economic status. However, if people don't have a defined purpose in life, then passing time becomes a big challenge for them. In general, we Indians don't give much importance to being on time and remain punctual. A lot of disciplinary cases in organizations are related to frequently late coming and unauthorized absence. This article addresses the problem of minimizing the wastage of time and enhances the motivation to utilize the time more effectively and efficiently. There will be no such time when you will feel that you have got sufficient time and resources to meet all the challenges of your role.

Importance of time has been emphasized in our culture from quite early days. Kabir Das has aptly said:

Kaalkare, so aajkar, aajkare so ab; pal me parlay hoygi bahuri karage kab.

The very simple meaning of the couplet is: What are you want to do tomorrow, do it today. Whatever you want to do today, you should do that now. There can be devastation at any moment; then when can you do the work? Despite such a profound statement about time and suggestion of *proactive strategy* about completion of projects, such consciousness about time is still missing from our action. One argument is that we are primarily agrarian society, where completion of work just in time may be important, but for that we fail to plan. For example, we most often study hard only when examination dates are declared. We pay our bills only close to the last day. Even national productivity is the highest in the last quarter. Perhaps, we are adrenaline addicts, we become active when there is rush of adrenaline in our blood stream. Additionally, we spend considerable amount of extra resources to complete the work at last minute. It is common knowledge that for organizing Common Wealth Games in Delhi, we spend exorbitant amounts for purchasing petty things in order to complete work on time. The importance of time management can't be overemphasized.

Since everybody has on 24 hours in a day, how some people have created a success story of their lives and whereas others have failed to do so is always interesting to know. After observing the habits and behavior of highly effective people following few tips are forwarded for time management:

1. **Time Management is Self Management:** Time management is nothing but 'Self Management' which includes keeping check on habits and behavior that waste time of self and others. You have to determine what your goal in life and work is. Based on your goals, you have to decide where to spend more time and where to devote time sparingly.

2. **Set Your Goals Regularly:** Decide what you want to achieve in life and work. Divide this broad goal into set of small goals and targets in terms of yearly, quarterly, monthly and weekly goals. Your daily goals should be geared towards achieving weekly goals. Weekly goals should be geared towards achieving monthly goals and so on. There should be a contingency plan ready to take alternative course of action if the existing plan is not working.

3. **First Thing First:** Priorities your goals of life and work and whatever is most important goal focus your energies on that goal. Covey has proposed a 2X2 matrix having four quadrants based urgency and importance. First quadrant is urgent and important. Works classified in this quadrant is termed as crisis management. People are fire fighting to salvage the situation. Second quadrant is composed of important but not urgent. The work belonging to this quadrant is quality work. It is recommended that maximum possible time should be spending here. Health, relationship, learning, planning, networking etc. may not be urgent but are important for life and work. The third quadrant consisting of urgent but not important work termed as deception. We receive many urgent messages and we get involved into that, although they may not be related to our work and life goals. We

should indulge less frequently into this quadrant. The fourth quadrant consisting of neither important nor urgent situation thus it is called waste. Effort should be to minimize involvement in this quadrant.

An experiment has been performed to demonstrate how if you accommodate big priorities first, other smaller things are accommodated later. Experimenter first asked the subject to put some big rocks, some rubbles, sand particles and water in a jug. The subject starts with sand, rubbles and water in that order and fails to accommodate big rocks in the jug. The experimenter changes the order. Starts with big rocks, then shakes the jug and puts rubbles into it. Then again shakes the jug and then puts sand particle in the jug. And finally water is also poured in. All the things are accommodated in the jug. Then he loudly asks what the lesson is? Lesson is to put big rocks first. Big rocks are like big priorities of our life.

4. **Have Good Assessment of Time that a Work Takes:** It is said whatever you want to improve, you should measure that. If you want to complete a task you must have a good assessment of time it will take. If you don't have that, whatever time you have to your disposal that will be taken away by the work at hand. Good time assessment, will give you the indication how much more can be achieved in the given time.

5. **Break Large Projects into Smaller Projects**: Many times we feel intimidated by sheer size of the projects, thus procrastinate till the large free time will be available. That's not a good strategy. Instead break the big project into small identifiable milestones and try achieving that. Suppose you want to read full *Ram Charit Manas,* this is very large book. You may be discouraged who has so much time to read such a large book. You can break whole book into thirty parts and can make a month long project to complete the reading with spending of one hour daily.

6. **Avoid Procrastination**: We have the tendency to postpone our work project as the same is too boring, there is chance of failure or losing face. Such reasons for procrastination are not justified. If there are two things to be done: one is interesting and the other is uninteresting. The normal tendency is to jump on the interesting one. That's not right strategy. Instead we should take uninteresting work first and interesting work later. This way you will be able to enjoy the value of interesting work more.

7. **When It is Alright to Postpone the Work:** There are occasions when postponing the work is alright. So don't feel guilty for postponing your work for following reasons. When you are angry, or fatigued or don't have the information, it is better to postpone the work to buy some time. Let the temper cool down, recover from fatigue, and get the information and skill to complete the job. Similarly in terms of priority, if work of higher priority comes in hand, the work of lower priority may wait. For example, if you have to choose between helping injured person to hospitalize vs reaching office on time, it is better to hospitalize the injured person at the cost of being late to the office.

8. **Avoid Time wasters**: There are so many time wasters like telephone calls, emails, involvement in trivias, drop in visitors, social media indulgence etc. Develop habit of restrained us age of time on these. Technology like email, social media, whatsapp etc. should be utilized as tools of enhancing efficiency, but should not be allowed to become addiction.

9. **80-20 Principle:** This works in many walks of life. Twenty percent of people may be having more than 80 percent of wealth of the world while 80 percent people may be having only less than 20 percent of the wealth. Similarly 20 percent of the cases are giving 80 percent of the revenue, while 80 percent of cases give only 20 per cent or less revenue. 80-20 principle is also applicable in the domain of time management. Some work which is precious, they contribute to 80 percent of your results while other 80 percent of work contributes to only 20 percent of the results. It is recommended that work which contributes to relatively higher percentage of results should be given higher priority. Such work should be scheduled in the time when you are bursting with energy and feeling fresh. Other works may be scheduled in your routine time.

10. **Have Meetings with Starting and Closing Time and Agenda:** A large part of executive time goes into meetings. A meeting without agenda is a gossip meeting. Have opening and closing time of the meeting, as people will be certain when they will be free from meeting so that they plan their other schedules accordingly. Further, only those people should be invited to the meeting who are concerned with the agenda and can meaningfully contribute to the issues at hand. It has been reported that critical decisions are taken only in last 15 minutes of the meeting. If closing time is known, people will be aware that when need to rush through agenda.

11. **Never Overstuff your time:** Don't pack too much in too little time, otherwise you will feel miserable for not completing the works planned. Sometime should be allowed meet contingency situations. If you are going to airport, driving time is 30 minutes, at least 20 minutes time should be budgeted as contingency time to meet foreseen eventualities, like flat tire or traffic jam etc.

12. **Learn to Delegate**: A good manager gets things done through others. Thus train and coach people working with you. Empower them and then delegate part of your work to your colleagues and subordinates. This will make your time free to undertake work of greater importance such as visioning and expansion of organization etc.

No way is it claimed that above mentioned time management strategies are exhaustive. They are some of salient strategies of time management many successful people recommend and used. A strategy not strictly classified as a time management strategy is “Reflection and Meditation”. Through reflection and meditation you can manage your stress and gain clarity of thought which will further help all of us in managing our time.

Lead Paper

Abiotic Stress Management for Maximising Crop Productivity and Farmer's Income

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Abiotic stress can be termed as the negative impact of environmental factors on the organisms in a specific situation. It is a natural phenomenon that occurs in multiples and interdependent, and its impact varies across the sectors of agriculture. Abiotic stress is the primary cause of crop loss worldwide, reducing average yields for most major crop plants by more than 50%. Drought and salinity are becoming particularly widespread in many regions, and may cause serious salinization of more than 50% of all arable lands by the year 2050 (Wang 2003). Environmental stresses such as erratic and insufficient rainfall, extreme temperatures, salinity, alkalinity, aluminium toxicity, acidity, stoniness and others limit yield and productivity of many cultivated crop plants. This leads to a series of morphological, physiological, biochemical and molecular changes that adversely affect plant growth and productivity. Some of these changes will likely be shared globally – most places will get hotter – but other changes will vary geographically. For agriculturally important agro-ecological zones, higher level forecasting of daily weather extremes (frosts, the intensity and form of precipitation, extreme temperature, etc.) is crucial but even more demanding. In this paper, we tried to link the impact of future climate on influencing the various abiotic stressors, and the policy decision to be taken to avoid, adopt and mitigate those climatic vagaries.

Under changing climate scenario and increasing climate variabilities, Prime Minister Shri Narendra Modi's aim of doubling farmer's income by the year 2022, has evoked strong responses from various analysts, experts and the media. The goal has been dubbed as impossible and unrealistic. It is the responsibility of all agriculture stakeholders to make it possible so that India will produce sufficient food to achieve food and nutritional security. For this we have to work in scientific and holistic manner so that we may increase the agriculture production besides increasing the input use efficiency in eco-friendly manner. Indian agriculture is passing through difficult times due to two consecutive drought situations in several parts of the country, thereby resulting into wide spread distress among farmers. The rural areas in these parts are facing food and livelihood crisis, more specifically the shortage of fodder and drinking water. Despite the earlier history of famines and continuing patterns of droughts, remarkable successes have been achieved towards food security at the national level. Yet the country continues to face challenges in terms of availability, access, balanced diet, diversity and equity associated with consumption of nutritious food at sufficient levels. For meeting requirement of the burgeoning population, the country will need an estimated 400 million tonnes of food grains by 2050, from a current level of about 260 million tones, current population is 1.21 billion, it is projected to reach 1.6 billion by 2050.

Agricultural production continues to be vulnerable to unexpected and extreme weather events, the incidence and intensity of which is increasing with climate change (IPCC 2014). Abiotic stresses such as drought, salinity and extreme temperature together with the growing population and per capita food consumption are challenging sustainability of food security. With substantial water consumption in agriculture, quality and quantity of ground water is becoming more critical for human as well as soil health with 1/3 of the geographical area prone to degradation due to soil erosion, flood, waterlogging etc. Expansion of agricultural land is a remote possibility. With 2/3rdof the cultivated area prone to drought, uncertainty looms large over stability of food production and price. Consequence of adverse impact of drought on agricultural crops and forages are evident even in livestock production and also reflected in the reduction of inland fisheries. India experienced trails of unusually widespread and untimely drought, flood and most recently hailstorm events on frequent basis. The increased frequencies of these adverse events demand appropriate measures to minimise their impact on agricultural crops. On one hand side conservation agriculture should be promoted on large scale and other side more research is needed on micro-irrigation strategies like partial root zone drying and drip irrigation and fertigation systems. These measures are critical to develop location/situation wise recommendations for achieving the goal of sustainable agriculture production by harnessing maximum per unit

applied water. Remote sensing and GIS tools are becoming increasingly useful tools to delineate abiotic stress at regional level. With further inputs like edaphic factors derived from soil maps, cropping pattern and their responses to stressors, regional models can be put forth for forecasting abiotic stresses using GIS based statistical tools.

Development of stress tolerant transgenics using gene transfer approaches needs much more understanding of plant stress-tolerance and gene-regulatory network systems. Apart from feeding regimes and dietary strategies, genetic improvement of livestock is essential to ensure permanent and cumulative changes in performance and this can be accomplished through biotechnological interventions.

Some of the measures including nutritional supplement, plant bio-regulators and canopy management should be developed on location and case specific to minimise yield losses and increase farmer's income. Plant bioregulators (PBRs) play key role in the ability of plants to adapt under changing climatic conditions, by mediating growth, development, nutrient allocation and source sink transitions. With the use of specific bioregulators, crops can be grown under various abiotic stresses namely drought, salinity and heat with minimum yield losses. Yield losses in arable crops under drought stress can be minimized by 15 to 20 % with the use of bioregulators. The future prospective is to identify the crop and condition specific bioregulators as well as optimization of the dose, frequency and stage of sprays for achieving the maximum benefits under stress conditions. In these aspects attempts have already been initiated to identify suitable agrochemicals/plant bioregulators like KNO_3, spermidine, thiourea, salicylic acid, ortho-silicic acid etc to minimise the adverse effect of heat, drought and water logging stress in arable and orchard crops as per level and nature of stress.

In the recent past, India experienced trails of unusually widespread and untimely hailstorm events during February–May 2014 and 2015 (Rathore, 2016). These events have caused a large scale destruction of crops in Indian states mainly North and Central part, being the worst hit with varying levels of damage. There is need to adapt low cost protected structures for cultivation of high value crops like grapes and pomegranate to check the losses incurred due to frequent hailstorm incidences. Attempts have also been initiated to identify beneficial microbes thatcan contribute in minimising stress impact on crop performance under harsh agro-ecologies. Since microorganisms represent the significant fraction of molecular and chemical diversity in nature. Microbes contribute to basic ecosystem processes such as the biogeochemicalcycles and food chains, as well as maintain vital relationships with higher organisms and plants. Conservation Agriculture (CA) is a strategy for mitigating climate change and as an adaptive mechanism for alleviating climate change effect. CA practices can help in sequestering atmospheric CO_2 in the form of soil organic matter, as well as reduction in GHG emissions through efficient production system. CA facilitates soil management without excessive disturbance, protection from erosion, compaction, aggregate breakdown, loss in organic matter, leaching of nutrients etc.

Organic Agriculture is a possible option for stress mitigation and adaption to climate change. It is an alternative sustainable, eco-friendly production system that assists in biological pest control and crop rotation, supply green manure and composts/FYM to maintain soil fertility. According to an estimate, organic agriculture combined with reduced tillage techniques has the potential to sequester 500 kg C/ha/yr. This maximum organic scenario would mitigate about 4 Gt CO_2 equivalents/yr or 65 per cent of the agricultural GHG. There are opportunities to use this approach for sustainable and eco-friendly farming models that meet on-farm requirement of organic inputs through biochar, biomass transfer from agroforestry for direct application on farm and composting for farm nutrient recycling.

It is the need of hour to uncover complexity of harsh agro-ecologies and in-field variabilities through modern technologies and accordingly adaptation options through combination of key traits and genes for genetic improvement in tolerance to stress. In addition micro-irrigation strategies, mitigation options through conservation agriculture along with use of second generation machines, organic farming, use of plant bio-regulators, nano-particles and other relevant technologies are essential for addressing the issues of increasing farmer's income under resource limiting climate change era. Beside these above mentioned aspects, attempts should also be focused in scaling up the proven technologies like use of stress tolerant varieties, conservation agriculture, integrated farming system, fertigation etc. to build up the confidence amongst farmers that agriculture can be a fruitful business with the assistance of Pradhan Mantri Fasal BimaYojana.

Lead Paper

UP Arable Wasteland Management and Climate Resilient Agriculture Project

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Rural India is real India and exactly so is the case with Uttar Pradesh. It is the most populous State with population of 22+ crores. The prosperity of the State comes from the villages and farmers field. Gandhiji always advocated larger production by larger hands (i.e. 92% of small and marginal farmers). The overall prosperity of UP will largely depend upon how we utilize its available natural resources, i.e., 5-Js- 'Jameen' (Land), 'Jal' (Water), 'Janwar' (Animals), 'Jungle' (Forests), and above all 'Jan' (Human Resources). Horizontal & vertical development through wasteland treatment adopting farming system approaches to double the income of farmer is the need of the hour. For sustainable and holistic development of UP and to provide balanced food and nutritional security to heavily populated human resources in project area through conservation & management of its natural resources, a Concept Paper titled *"UP Arable Wasteland Management and Climate Resilient Agriculture Project"* has been conceived by UPBSN for the financial assistance from the World Bank.

Vision of the project is "to spearhead and build a prosperous & sustainable Agriculture Sector by developing barren & low productive culturable wastelands into productive green lands through adoption of measures that enables farmers to enhance productivity & production through efficient and cost effective management of available resources and realize higher returns for their produce ultimately doubling farmers' income by the end of the project." The mission of the project is to develop low productive arable waste lands into productive green lands through adoption of low cost eco-friendly technologies including climate resilient agriculture and organic farming.

- To promote economically viable, self sustaining farmer producer organizations and self help groups in the project area and involve them in the implementation of the project.
- To provide support to the groups, SHGs and farmers of the project area in the form of financial, technical knowledge input support, infrastructure etc.
- To provide and enable farmers, Producers organization and SHGs access to the market both as buyers and sellers.
- To create an enabling environment for all its stake holders
- To empower women and youth for strengthening livelihood support.
- To ensure balanced food and nutritional security by promoting organic agriculture with Zero Hunger and Poverty Alleviation.
- To develop UPBSN as Centre of Excellence with a win-win situation for all its stake holders.

The goal is to double the farmers' income and ensure balanced food and nutritional security with Zero hunger & poverty alleviation to all the farmers of targeted area through reclamation/treatment of barren, low productive arable waste lands, enhancement in productivity and production, value addition, cost reduction, adoption of eco-friendly technologies and enabling favorable environment where farmers are able to get profitable price for their produce in a sustainable manner.

UPBSN was established in the year 1978 with the goal to increase agricultural productivity by reclamation of Sodic lands. First phase of UP Sodic Lands reclamation project was implemented during 1993-2001 in 10 districts with the World Bank assistance and reclaimed 68,000 ha of sodic lands. Simultaneously, one more EU funded project for alkali lands reclamation was implemented during 1994-1999 and reclaimed 28,000 ha of lands.

UPSLRIIP was implemented during 1999-2007 with the assistance of the World Bank and reclaimed 1,89,00 ha of sodic lands in 18 districts.

UPBSN is now implementing UPSLRIIIP with the financial assistance from the World Bank in the form of IDA share. The third phase of UP Soidc lands reclamation project was designed to reclaim 1,30,000 ha of sodic land in 32 districts along with a pilot on ravine lands treatment of 5,000 ha in 2 districts, viz, Kanpur Dehat and Fatehpur. After successful treatment of about 11,000 ha of ravines in first five years. The ravine pilot was extended in 10 more districts of the State in the year 2016. It is expected to treat about 42,000 ha of shallow ravines of these 12 districts.

Therefore, UPBSN has achieved expertise in sodic lands reclamation in last 24 years by implementing three phases of the World Bank assisted sodic lands reclamation projects and one project funded by EU and there by reclaiming about 4.17 lakh ha of sodic lands.

On an average Kharif Paddy productivity has increased from 0 to 35 qt/ha and that of Rabi Wheat from 0 to 30 qt/ha. Cropping intensity has increased from 45% to 203% in the project area resulting in an incremental production of Paddy and Wheat to the tune of 2.85 million tons with an estimated value of Rs 4059.64 crores under UPSLRIIIP against an expenditure of Rs 1081.79 crores incurred on project implementation by the end of the financial year 2016-17.

In order to ensure balanced food security and doubling the income of the farm families/ beneficiaries in the State it is now the need of the hour to develop remaining scattered patches of sodic lands, undertake treatment of undulated and water logged wastelands, ground water recharge, increase in crop production and productivity. "UP Arable Wasteland Management and Climate Resilient Agriculture Project " has been conceived to achieve above mentioned goals and objective by UPBSN.

The project is now proposed to be implemented in 36 Districts- Agra, Aligarh, Auraiya, Allahabad, Azamgarh, Amethi, Balia, Barabanki, Bulandshahar, Deoria, Etawah, Etah, Faizabad, Fatehpur, Farrukhabad, Firozabad, Gazipur, Hardoi, Jaunpur, Kanpur Dehat, Kanpur Nagar, Kasganj, Kannauj, Kaushambhi, Lucknow, Mainpuri, Mau, Mathura, Pratapgarh, Raebareli, Bhadohi, Shahjahanpur, Sitapur,Sultanpur, Unnao& Varanasi. Target Area to be reclaimed/ treated:- 1,00,000 ha. The expected Outcomes are-

- Doubled income of farm families/ beneficiaries.
- Increased Cropping Intensity in reclaimed sodic lands up to 200 %
- Increased Cropping Intensity in treated Eroded Lands from 60% to 175%
- Increased productivity in reclaimed Sodic Lands:-
- Paddy upto 35 qt/ha
- Wheat upto 30 qt/ha
- Increased Area of Oil Seeds, Pulses and Coarse Grains in undulated lands
- Value of land is Doubled
- Increased Soil Carbon (Carbon farming)
- Organic farming in 5% area
- Diversification of 5 % land available due to increased productivity in cereals, for production of Oil Seeds and pulses.
- Cost : Benefit ratio 1 : 3

Proposed Project Duration is 7 Years / Cohorts (July 2018 to June 2025).

Lead Paper

Mechanization, a Viable Option for Cultivation and Processing of Sugarcane for Increasing Income and Profitability

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Sugarcane is an important industrial crop in India. It is cultivated in an area of about 5.1 million hectare with annual production of about 355 million tonnes and productivity of about 70 t/ha. It is an energy as well as labour intensive crop. In the life span of 10 to 12 months, this crop requires about 400 man-days/ha to carry out different cultural operations. Earlier most of the cultural and post- harvest operations of sugarcane used to be carried out traditionally with the help of age old tools and thereby involving a high cost of cultivation and human drudgery. Mechanization of sugarcane cultivation, till recent past has been confined to the land preparation and to some extent ridges/furrows were employed for metering furrows to facilitate subsequent planting operations manually. Number of power operated equipment for mechanization of sugarcane cultural operations viz. planting, inter-culturing, earthing up, harvesting, de-trashing operations and managing ratoon crops; and also for processing to produce various value added products have been developed by various research organizations and a few private manufacturers.

Combination tools (cultivator + harrow) for land preparation have also been developed by research organizations giving a saving of 25-30%. IISR initiated efforts for planting operation of sugarcane, as after land preparation, it is the first and most important operation, which needed to be mechanized. Sett cutting machines and various types of animal/tractor drawn semi-automatic/automatic billet type planters were developed. Since, the sett cutting was done separately, these planters were not found economically viable due to which they could not be adopted by the farmers in early 1990's.

With introduction of sugarcane cutter planters on the scene, where cutting of whole cane into setts was also done simultaneously, planting through machine became a viable proposition. Ridger/ disc type, two/three row, PTO/ground wheel driven sugarcane cutter planters were developed, tested/evaluated at IISR and demonstrated in the farmer's fields. These planters have now become popular among the cane growers and as a result, number of commercial manufacturers have come forward and taken up the manufacturing of IISR design sugarcane planters. The cost of sugarcane planting with these planters could be reduced by about 60% as compared to conventional system of cane planting. Tractor operated sugarcane cutter planter with seeder attachment (Strip-Till Planter) and tractor operated raised bed seeder-cum- sugarcane cutter planter (RBS planter) were developed for planting of sugarcane simultaneously with sowing of other crops such as wheat, lentil etc. for companion cropping. Recently, wide spaced paired row planter, taking ground as the reference point for cutting whole cane into setts and to facilitate planting in subsequence has also been developed, tested, evaluated and field demonstrated and had wider acceptability.

During early stage of crop growth (up to 50 cm of crop height) intercultural operations can easily be mechanized by using conventional 9 tyne cultivators, engine operated walking type rotary weeders or tractor operated rotary weeders. These equipment are commercially available. There is a need to create awareness among the cane growers. A multipurpose equipment has been developed at IISR which takes care of the important cultural operations required to be performed for raising good ratoon crop. A ratoon management device (RMD) has also been developed at IISR having rippers for off-barring and intercultural operation. Proper use of ratoon management equipment leads to improved ratoon productivity. Three roller horizontal mechanical crushers developed at IISR, TNAU Coimbatore and also a few private manufacturers had improved juice extraction efficiency of60 to 65%.

IISR developed an improved three pan furnace with special features for effective air supply and convex bottoms of pans for uniform heat distribution and better combustion of fuel and self-emptying system for juice, gutter pan, chimney and air preheating provisions. This system of heating, boiling and juice concentration had over all heat utilization efficiency of above 34% and required only 02 laborers against 04 of earlier methods, reduced drudgery in

operation and also saved minimum of 30 kg bagasse per batch which could be utilized for some other more useful purposes and has hygienic environment of working. Though jaggery itself is rich in natural nutrients of sugarcane juice, but combination of jaggery with various spices and condiments enhances market value of the product. Jaggery added with spices and dry fruits are being sold as sweets at high prices. IISR, Lucknow, RS and JRS (MPKV), Kolhapur and RARS (ANGRAU), Anakapalle experimented extensively and standardized development of value added solid, liquid, and granular jaggery respectively, while jaggery chocolate was standardized at GBPUA&T Pantnagar which has great market potential. Adopting above developed equipment, processes and technologies farmers income as well as farm productivity can be significantly enhanced.

Lead Paper

Biopesticides: A Safer Alternative for Farmers

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It is now widely recognized that biopesticides can be successfully exploited in modern agriculture especially within the framework of integrated pest management (IPM) system without affecting our precious ecosystem. This technology is consistent with the goal of sustainable and conservation agriculture. There is now a need for the agriculture

Sector to under go technological transformation and adopt modern methods which reduce the dependency on monsoons and ensure more productive use of the available resources and thereby serve the nation efficaciously.

The Indian crop protection industry is estimated to be~INR 27,000Cr (~USD 4.25Billion) in FY'14 and is expected to grow at a CAGR of 12%t or each ~INR47,000Cr(~USD 7.5Billion)by FY' 19.Out of this, the domestic market is ~INR 14,000Cr. (~USD 2.25Billion) in FY'14. Insecticides are largest sub-segment of agrochemicals with 60% market share whereas herbicides with 16% market share are the fastest growing segment in India. Going ahead, opportunities for Indian crop protection industry will come in the form of exports, grow thin generic products, product portfolio expansion, and growth in herbicides and fungicides. However, the Industry face several challenges. Some of the key challenges are stringent environment regulations across the world, low focus on R&D due to high costs, longe station period for new products and is ingsale of non-genuine products. Non- genuine products are not only a challenge to agrochemical industry but also to the overall Indian economy, resulting in loss of revenues for farmers, agrochemical companies and Government.

To withstand the industrial challenges agrochemical companies can use some of the possible levers such as; adopting product innovation strategies, providing end to end comprehensive service offerings to the farmer, developing effective marketing and distribution strategies and leveraging on the existing IT and telecommunication infrastructure, which can help them to expand their presence amongst the end users and promote use of agrochemicals. In order that the crop protection industry achieve its objectives, government support on various levels is extremely critical. Continued infrastructural support from the government is necessary for companies to improve their speed to market. Policy initiatives by the government should also provide implementation support in terms of stricter punitive measures and supervision to contain the menace of non-genuine products. Adequate support is also required for encouraging the industry to invest in R & D activities and develop innovative solutions.

Thus, to harness the potential of agrochemicals by cultivating outlined opportunities, a collaborative and comprehensive approach from the various stakeholders- the Industry, the Government and the regulatory bodies is essential. This concerted and collaborative approach can help to over come the demand-supply constraints and provide the much-needed thrust to a Second Green Revolution that can lead to a surplus and self-sufficient agricultural sector in the country.

The Indian crop protection market is dominated by Insecticides, which form almost 57% of domestic crop protection chemicals market. The major applications are found in rice and cotton crops. Fungicides and Herbicides are the largest growing segments accounting for 19% and 17%, respectively of total crop protection chemicals market respectively. As the weeds grow in damp and warm weather and die in cold seasons, the sale of herbicides is seasonal. Rice and wheat crops are the major application areas for herbicides. Increasing labor costs and labor shortage are key growth drivers for herbicides. The fungicides find application in fruits, vegetables and rice. The key growth drivers for fungicides include a shift in agriculture from cash crops to fruits and vegetables and government support for exports of fruits and vegetables. Bio-pesticides include all biological materials organisms, which can be used to control pests. Currently bio-pesticides constitute only 4% of Indian crop protection market; however, there are significant growth

opportunities for this product segment due to increasing concerns of safety and toxicity of pesticides, stringent regulations and government support.

As environmental safety is a global concern, we need to create awareness among the farmers, manufacturers, government agencies, policy makers and the common men to switch-over to biopesticides for pest management requirements. It is also believed that biological pesticides may be less vulnerable to genetic variations in plant populations that cause problems related to pesticide resistance. If deployed appropriately, biopesticides have potential to bring sustainability to global agriculture for food and feed security. Agriculture is adversely affected by numerous pests like bacteria, fungi, weeds and insects, leading to reduced yield and poor quality of the produce.

Since 1960s, the most common method for pest control has been the intensive use of synthetic pesticides. Such pesticide was adopted in 1940s with the use of dichloro-diphenyl-trichloroethane (DDT), followed by other organophosphate and carbamate pesticides. Thereafter, Green Revolution technology of crop production could increase food production in developing countries through the intensive use of inputs like chemical fertilizers and pesticides etc. Albeit, the use of the agrochemicals helped a lot in increasing agricultural productivity; they have caused adverse effects on soil health, water quality, produce quality and developed problems like insect resistance, genetic variation in plants, toxic residues food and feed. Moreover, dependence on chemical pesticides and their indiscriminate use caused several detrimental effects on the environment.

Recognizing the ill effects of the agrochemicals such as pesticide resistance, pest resurgence, outbreak of secondary pests, pesticide residues in the produce, soil, air and water, it has become important now to develop alternatives of these synthetic agri-inputs. The need of the day is to produce maximum from the diminishing natural resources and protect the produce from post-harvest loses without adversely affecting the environment. Use of biofertilizers and biopesticides can play leading role in dealing with these challenges in a sustainable manner. Biopesticides and biofertilizers, the naturally occurring formulations made from the substances that control pests by nontoxic mechanisms and in ecofriendly manner, are not newer technologies. They have been used in various forms since human civilization. Biopesticides being a living organism (natural enemies) or products there of pose less threat to the environment and to human health, hence can be used for the management of pests.

One of the most widely used microbial biopesticides is *Bacillus thuringiensis,* popularly known as Bt. Potential benefits of the use of biopesticides to agriculture and public health program are considerable. Demand for biopesticides in India is forecast to exhibit high growth in terms of both volume and value, estimated at respective compounded annual rates of 18.3% and 19% over the 2015-2020 period. Other key drivers in the market are increasing consumer demand for organic products thus encouraging organic farming practices and governments promoting bio control products. The market however is mainly constrained by the grower's low awareness on the use of bio control agents and availability of the products. Also low shelf life of products results in farmer's frequent application of Biopesticides thus resulting in increased costs.

Lead Paper

Farm Production and its Profitability: Farmer centric focus

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The decline in contribution of agriculture sector to Indian GDP has largely been due to falling production levels in this sector over the years. The contribution of Agriculture & allied, Industry, and Services sector was 51.81%, 14.16%, and 33.25%, respectively at current prices in 1950-51. Share of Agriculture & allied sector has declined at 18.20% in 2013-14. Share of Services sector has improved to 57.03%. Share of Industry sector has also increased to 24.77%.The prospects for achieving an envisaged growth rate viz. 4% or more in agriculture production seems to be bleak. There are ominous signs that we are overstretching our natural resources to achieve the unachievable with the current mix of agro-technologies. The other factors for the decline in agriculture production growth have been identified as infrastructure limitations, farm size, farmer capacity and worsening standards of outreach programmes. The agriculture production also remains dependent on adequacy of monsoon rains due to predominant rainfed areas. Notwithstanding there is debate whether we should focus on enhancing agriculture production per se or farm profitability or perhaps both. While the options for increasing production are dependent on greening of the green revolution, there is tremendous scope for improving farm production profitability and this farmer's income.

The agriculture technology development has taken place at fast rates. But how much of this technology has been farmer, area or situation specific is a big question mark. Many a times we find that the innovative technologies are not scale neutral. While large or medium farmers are beneficiaries of the innovative technologies, the small are left out of its ambit. Then there is also mismatch in out stretching technologies developed for assured irrigated to the rainfed or dry land areas. The situation is further confounded by low adoption capability of small and marginal farmers whose numbers are predominant in rainfed and dryland areas. There has been focus on developing rainfed and dryland agriculture technologies but still more has to be done. Although there are no outer limits to technology advancements but we have observed limitations in their adaptation and adoption by farmers. There are no studies in this regard but the indicators show how the limitations can be overcome by handholding the farmers for breaking the barriers in agriculture production and profitability.

The focus of agriculture sector in India is shifting from production oriented system to farmer income realisation system. It has now been perceived that unless the farmers have the profitable crop production it will difficult to achieve targets of food production or even to sustain it at its current levels. The cost of production of crops has risen in the recent times due to escalation in farm inputs, labour and other prices. The prospects of fiscal interventions seem remote and hence the only way out is the efficient and just use of natural resources and the farm inputs.

More than ever there is need for a paradigm shift in development of agriculture technology. Thus far the focus of agriculture technology development was on how to go on increasing agriculture production. Now there is need that we fine tune the agriculture technology so that the farmers can achieve better crop production together with accruing handsome income. Let us not forget that the question of farm profitability is linked famers' livelihood. Further it may be pertinent to point out that thus far objective of research was in developing generic agriculture technology. There is need for a change in research system so that area and natural resource specific technologies are developed. So much so that scale neutral agricultural technologies are predominantly dished out to the farmers. The small and marginal farmers are not to be left out of the ambit of these technologies. Needless to emphasize that the adaptation and adoption of agriculture technologies by farmers will rest in their practicability and profitability.

Even a system of “handholding” the farmers has been explained in terms of increasing farm production and profitability. Our current system of agriculture extension is far from satisfactory. There is need to rejuvenate it and this is the call of the time if we have to make agriculture production system profitable for the farmers for sustained increase in food production for self-reliance. Finally, the agriculture sector is waiting for policy change which will give level playing field to all farmers. We must go away from input subsidy regime to financial incentives on higher production and productivity as profitable venture. There will not be any need for support prices of farm produce if the farmers have the freedom to sell in an open competitive market.

Lead Paper

Emerging Issues and Challenges of Rural Development and Plant Agriculture in Era of Climate Change

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The rural economy of India is primarily dependent on plant agriculture. Multiple socio-economic and agro-climatic factors, like poisoning of soil, water, air and food items with pesticides and other xenobiotic non-biodegradable chemicals, small and fragmented land holdings, enhanced disease incidences and uncertainty of climate, etc are challenging the crop productivity and agrarian economy in many ways. High input cost of the so-called green revolution package for crop production and poor market linkages with unstable pricing mechanisms have made agriculture an unattractive profession for rural and urban youth.

The climate change and global warming caused by anthropogenic emissions of the green house gases has added up the Indian Agrarian Crisis very severely being agriculture as one of the most climate vulnerable sector and the country having large areas with arid, semi-arid tropics and sub-tropics. The recent climate crisis has grow up rapidly due to the fast expansion of densely populated and ill managed towns, cities and metros and ill planned industrial emission and discharges, very large quantity of vehicular emissions and release of GHGs due to refrigerators and ACs etc. The carbon budgeting has yielded negative credits due to the deforestation, decline in green belts and degradation of the natural resources. Drought, heat strokes, floods and storms are increasing and availability of the safe water ad clean air are decreasing. Land is leading towards low carbon and low biodiversity containing support system.

The agriculture is contributing to the climate crisis and contamination of natural resources through the burning of fossil fuel in heavy farm machinery, consumption of water through the flood irrigation, emission of CH_4, NOx, SOx and CO_2 due to the excessive use of chemical fertilizers and organic manures, increasing frequencies and indiscriminate uses of toxic pesticides, herbicides and other agro and house hold chemicals and monoculture based loss of agro-biodiversity. The climate change and global warming are severely affecting this most climate vulnerable sector. This vicious cycle is adding to both, the agrarian crisis and climatic extremes.

The agriculture based on seed and agrochemicals produced and promoted by the giant multinational companies by all kinds of hooks and crooks have been proved to be unsustainable from ecological, economic and safe food security point of views. The degraded and contaminated agro-ecosystems are producing contaminated food items with poisons in eating bowls and life threatening diseases in the farmers, consumers and livestock.

The villagers are migrating to towns, cities, metros and gulf countries in an unprecedented scale due to unsuitable and un-attractive rural economy of the day. These undesired migrants providing a cheap labor in the urban and industrial vicinities on the cost of their dignity, honor, culture and soverity and constituting ugly and unhygienic slums in the peri-urban areas. The rural population once, known for honesty and simplicity are now considered as crime raising nuisance in the cities. Their journey from rural area to urban Iceland in want of jobs, money and better life is leading towards unpleasant, unwanted future for most of them.

Though the public and private investments for rural development and agriculture sector are decreasing, the government investment in agricultural research, technology development innovations and extension is huge. The fruits of agricultural science is not benefiting the farmers, adequately, hence the farmers suicide are increasing year by year. The global market is flourishing rapidly by sale of exclusively branded seeds, pesticides, herbicides, fertilizers and processed canned food items. The scientist in the government establishments complain that their technology is not reaching to the farmers. The extension machinery complains that the technology is not adoptable in the rural agro-climatic and socio-economic variations in the Indian Agrarian Ecosystems.

The huge gaps in perceptions, plans, perspectives, practices and authentic outcomes beyond the files and reports have made the Indian Agrarian Crisis more vulnerable. The breakthrough and weakest points have not been identified as yet. The governments are getting helpless, when farmers or communities with large agrarian base like Jats, Patels etc are agitating. There are no simple solutions for the complex happenings. Science has most worthy concepts, right methods and authentic tools and techniques for authentic review and analysis of the problems and to develop workable remedies. Let us believe on the potentials of science not only as a tool and technology, but also as a way of identifying the problems, planning for solutions and resolving the problems with multistep multifocal review and analysis.

We can analyze the potential and limitations of certain viable alternatives and grassroots innovations in the agriculture sector to draw the new plans and policies. Though the ecological agriculture represent a philosophy of organic agriculture, it emphasizes on the soverity of agro-ecosystems to develop its own strength for a sustainable agricultural yield, self repair and renewability of its precious resources. It is low input cost procedure to produce safe, natural and uncontaminated food items. The conservation of resources in and around the agro-ecosystems, maintenance of biodiversity and natural competition based ecological succession with overall elimination of the toxic and non-degradable xenobiotic chemicals from the food systems. The philosophy of ecological agriculture also considers socio-economic concerns of small and marginal land holders and agricultural laborers and emphasize to evolve a harmonious agrarian society with co-operation and concerns for all its living and non-living components.

The concepts of controversies on chemicals from organic forms are superfluous problem. Both the molecular forms are inter conversable in the ecosystems and complete the ecosystem functioning with flow of energy and materials with help of microbes, plants and animals.

The major problem are excessive use based losses of chemicals and non-biodegradable xenobiotic compounds from the source to sinks and their contamination in water, air, food and other living and non-living ecosystem components. If these losses, unwanted accumulations and use of non-degradable xenobiotic compounds can be avoided, the ecological agriculture can sustain the agro-ecosystem, agrarian economy and social harmony with incorporating new advances in science, technology and innovations. It can provide a sustainable and safe food security with justice to ecology, growers, consumers and trading in the agricultural sector with concept of social business.

New climate resilient seeds can be selected from nature or after exercising the scientific genetic improvement practices and can be multiplied and maintained locally for production of foundation seeds. Low cost microbial consortia, organic carriers, slow release and customized fertilizers and bio-pesticides can be produced in rural small scale industries with technical training and minor financial support. Non-pesticidal management of pests and pathogens can be executed with adopting various NPM practices. Water conservation can be adopted by drip irrigations and water harvest and storage in field ponds. Small scale semi mechanical agricultural appliances can be developed and used. Zero tillage and non herbicidal weed management with diversification of agriculture, multiple cropping, horticulture and animal husbandry can help the farmers to support their economy in the multiple ways. New technologies like multitier horizontal farming, poly houses and green houses, tunnels and green protecting boundaries of the agricultural fields with multipurpose shads and small trees can help the farmers to manage the extreme climatic innovative engineering and technological devices can be develop solar energy based food processing, canning and storage of agriculture produce.

Organizational setups, peoples' participation, local need based plans and consistent review of input and output ratio is essential to draw a success story. Small farmers' co-operatives and sharing of knowledge and experiences, as well as healthy competitions, in the different farmer groups can help the rural to come out from their crisis. The green protection boundaries of the agricultural fields can save the crops from wild animals and natural calamities. Due to loss of common land, forests and grasslands man-animal conflicts are also costing heavily to the agricultural losses.

Farmers groups can develop their own marketing networks for sorting, packaging and marketing of good quality non-contaminated and fresh food with reliable local branding. It will create significant job opportunities to the rural youth and landless population.

We are attempting to establish multiple Rural Research Centers, Rural Libraries and Chetna Kendras and Adhaar School networks at block, district and state level to guide, interact and support the farmers with amicable and technical and financial support systems by associating rural youth, retired and experienced elders as guide and non government, Government based working experts along with self motivated activists, organizers, manager, leaders and donors. A few stories can be showed with successful experiences at this beginning stage.

Lead Paper

Farming Systems Approach for Doubling Farm Income of Small Holders

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Farming system can be simply defined as a positive interaction of two or more components within the farm to enhance productivity and profitability in a sustainable and environmental friendly way. A judicious mix of two or more of these farm enterprises with advanced agronomic management tools may compliment the farm income together with help in recycling the farm residues. In Farming system, the enterprise interactions occur either natural or intentional depending upon the cultivators need and available resources. Natural integration is one that exists in the farm households while intentional integration aims for higher profitability through better recycling and reduced external inputs. Vertical expansion in small farms is possible by integrating appropriate farming system components requiring less space and time and ensuring periodic income to the farmers. In general, farming system approach is based on the following objectives:

Integrated Farming System (IFS) is considered to be powerful tool and holds the key for ensuring income, employment, livelihood and nutritional security in a sustainable mode for small and marginal farmers who constitute 84.97 % of total operational holdings in India and has 44.31 % operational area. Integrated farming system meets the above goals through multiple uses of natural resources such as land, water, nutrients and energy in a complimentary way thus giving scope for round the year income from various enterprises of the system. Overall IFS approach aims at:

- Sustainable improvement of farmhouse hold systems involving rural communities
- Farm production system improvement through enhanced input efficiency
- Raising the family income
- Satisfying the basic needs of farm families

In India, 19 pre-dominant farming systems exist with majority as crop + livestock (85%). Livestock is a major source of supplementing family incomes and generating gainful employment in the rural sector, particularly among the small and marginal farmers and farm women besides serving as nutrient source. The results of on-farm farming system modules evaluated in various NARP zones through AICRP on Integrated Farming Systems promises 6.8 times increase in net returns over variable cost of interventions in improved farming systems with value of household consumption (produced within the farm) increasing by 51.4 %. Further the recycling of wastes increases by 40-45 % against the < 20 % in the naturally integrated systems.

Integrated farming system also provides a better scope for efficient water use by putting the same water for several uses like producing crop, fish, dairy, mushroom, poultry, duckery etc. simultaneously within a farm. Multiple uses of water are best possible through diversification of farming systems. On-farm studies reveals that integration of fishery and piggery gave maximum water productivity (net returns of Rs 5.67/m^3, 1.23 kg grain of rice/m^3 of water). The technologies viz., adoption of furrow irrigation instead of check basin or border method of irrigation, raised bed planting technology, pressurized irrigation system, laser land leveling etc. are suitable under diversified farming systems and lead to considerable amount of saving in water use.

Lead Paper

Climate Resilience in Bundelkhand Agriculture through Soil Moisture Conservation Crop Diversity

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ICAR-IGFRI, Jhansi

Bundelkhand is a hilly region which is spread over seven and six districts of the states of Uttar Pradesh and Madhya Pradesh, respectively covering area of 70000 km. the region is primarily rainfed, diverse, under invested and vulnerable. The Bundelkhand region is characterized by rocky undulating plans with some parts of *Vindhyan range*. The soils are mixture of black and red, yellow soils. The climate is hot and semiarid with frequent weather extremes making farming seasonal risky and less production enterprise. The average annual precipitation ranges between 7700 to 1000 mm with 80-90% of it being received during July to mid September. The region faced a chronic drought during 2003-2010 and unseasonal rainfall in *Rabi* 2014. Crops like chickpea, wheat, oats, barley and mustard are common in Bundelkhand region of central India. The soils of Bundelkhand region of India are medium to low in fertility with low organic matter content and poor water holding capacity that limits the fodder and food productivity. Therefore, adoption of resource conserving technologies is essential for cropping. Light soils are put under groundnut, black gram, green gram, sorghum, maize or Sesame during kharif and heavy soils are left fellow for cultivation during *Rabi* season. However in medium to heavy soils cropping intensity and diversity can be promoted through adoption of suitable and limited water demanding crop species with moisture conservation strategy. Keeping view to the above points On-station experiment was conclusion to evaluate the performance of crops in *kharif* season.

An experiment was conducted during kharif 2015 at CR farm, IGFRI, Jhansi. The soil was loamy in texture, neutral in reaction with low in-organic carbon, available N, P and K. the treatments consisted of eight crop species viz., C1 (Fodder sorghum), C2 Fodder Cowpea, C3 Black gram- Shekhar-3, C4 Maize, C5 Black gram-Azad-2, C6 Sesamum T-78, C7 Sesamum- JTS-8 and C8 Groundnut; and three Moisture conservation methods: M1 (Deep summer plaughing + Crop residue mulching + Weed mulching), M2 (Life saving irrigation) M3 (Farmers) productivity was worked out fodder equivalent yield of kharif season crops grain yield. All the packages and practices were followed deep summer ploughing+ mulching moisture with weeds and three ton locally available biomass mainly non-edible grasses. The experiment was laid out in split plot design allocating crop species main plots and moisture conservation methods in subplots with three replications. The crop received 518.9 mm rainfall during the growing period.

The performance of the crops was evaluated by converting the yield in fodder equivalent yield, as they differed in terms of economic output. The data in table-1 indicates that groundnut proved most producing, remunerative as well as recorded maximum RWUE (1.13) followed by sorghum. The C4 (Maize) proved least productive as the rainfall was scarce and season encountered a long dry spell during 34-37 SMW and 39-40 SMW. Singh *etal.,*(2009)reported superior performance of maize over groundnut and fodder crops under normal conditions.But Denmead and Shaw (1960), reported 25% moisture stress at sowing may reduce the seed yield of by 50% it as most vulnerable to moisture stress.

	Fodder eq. yield (q/ha)	Total returns (Rs/ha)	RWUE (kg/ha/mm)
C1	401.92^{b}	60288^{b}	0.72
C2	308.31^{e}	46247^{e}	0.55
C3	252.74^{d}	37912^{d}	0.45
C4	100.20^{f}	15030^{g}	0.18
C5	212.65^{f}	31897^{f}	0.38
C6	206.31^{f}	30947^{f}	0.37
C7	228.87^{e}	34331^{e}	0.41
C8	630.90^{a}	94635^{a}	1.13
Mean	**292.73**	**43911**	**0.52**
M1	293.14^{b}	43970^{b}	0.52
M2	304.64^{a}	45696^{a}	0.54
M3	280.44^{c}	42066^{c}	0.50
Mean	**292.73**	**43911**	**0.52**

In summary, the groundnut proved most productive and efficient in terms of rain water use efficiency under semi arid region of Bundelkhand.

Lead Paper

Doubling Farmer's Income in Submergence and Drought Prone Areas

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Globally 20 million ha (Mha)area is under flood prone rice. In Asia alone, the flood pronerice is 15 Mha, and in India, 7.5 Mha. This includes deep water and coastal flood prone areas also in India. Under flash floods, rice crops either remains submerged under water to a depth of one meter and above, or plant elongates to survive above water surface in deep water and floating rices. In first case, after recede of flood water, plants survive due to presence of single dominant gene *Sub-1A*, which slows down the carbohydrate utilization in plant parts. Improved rice varieties with *Sub-1A* gene has been developed at IRRI Philippines, which confers complete submergence for about two weeks in mega varieties like Swarna, Samba Mahsuri, IR 64, and CR 1009 in India; Thadokkam1 (TDK1) in Cambodia; BR 11 in Bangladesh, and Ciherang-Sub1 in Indonesia. The gene was incorporated through molecular assisted backcrossing (MABC) approach. [2, 3, 5] Under STRASA project, these varieties are being promoted in flood prone areas of India, Bangladesh, Nepal and other countries. In 2009, rice variety Submarino 1 (IR 64-Sub1) in Philippines, and Swarna-Sub1 in India and Bangladesh (as BRRI Dhan 51) were released. Later in 2010, BRRI Dhan 52 (BR 11-Sub1), and BINA Dhan 11 (Ciherang–Sub1); and in 2015, Samba Mahsuri-Sub1 as BINA Dhan 12in Bangladesh, and Samba-Sub1 in India were released. [1] Their yield potential is up to 5.0 tha^{-1} under non-flooded condition but depending upon duration and times of flooding, the yield reduces during submergence. Recently, Ranjit-Sub1 and Bahadur–Sub1 were released in Assam, India in 2017. Most of the flooded land remains fallow during Kharif, and only during Rabi (dry) season wheat, mustard, potato and other crops are grown. Uttar Pradesh (21.9%), followed by Bihar (12.7%), Assam (9.4%), West Bengal (7.9%), and Odisha (4.2%) have major area under flood.

Rice production is drastically reduced by drought and floods. New varieties and Integrated Crop Management (ICM) technologies are constantly being revised to increase the rice production from different rice ecologies. CRD is involved in on-station, on-farm research, and developing ICM package for new submergence and drought tolerant varieties.CRD is working with farmers since 2013 in five north-eastern districts of Uttar Pradesh viz., Gorakhpur, Kushinagar, Deoria, Maharajganj and Siddharthnagar. Swarna-Sub1 was earlier grown for its submergence tolerance, but has poor eating quality. Samba-Sub1 in 2016 Kharif was evaluated in one acre plot in village Rampur- Gopalpur, Chargawa Block, Gorakhpur district; and in 30 acres in 2017 Kharif in village Jungle Aktaha in Rudrapur block, Deoria district. Ithad very good submergence tolerance for 10 to 14 days, respectively. In Siddharthnagar, Maharajganj and Kushinagar on-farm sites also, it had submergence tolerance for 10 days. It is two weeks earlier than Swarna-Sub1, and has better eating quality. It can be direct seeded or transplanted. Its duration is 135 days, and had maximum paddy yield of5.0 tha^{-1}.Other varieties like BR 11-Sub1, BINA Dhan 11 (Ciherang-Sub1),IR 64-Sub1,CR Dhan 801, Ranjit-Sub1, and Bahadur-Sub1 are also being evaluated. For drought prone areas, new self- pollinated varieties like CR Dhan 202, IR 64-Drt1, and DRR 44 are performing well under limited water, and can be grown as direct seeded aerobic condition with application of pre- and post- emergence weedicide. It reduces water requirement by 40%, required for puddling. New drought tolerant varieties are 120-125 days duration, and yield up to 4.0 tha^{-1} as paddy. Hybrid rice cultivars like KRH 4, PA6444, PA 6444 Gold, JK RH 3333,PAC 837, Loknath 505 were also tested and they performed well in aerobic, and drought prone rainfed lowlands. New cultivars and hybrids will not only provide household food security, but double the farmers income, where there was no crop or complete crop failures in past.

With the breach of river embankments, and sudden release of water from dams, the paddy crop is damaged in otherwise non flood prone areas. The flood prone/ affected areas have increased from25 million ha in 1952 to 50 million ha in 2014, as per Central Water Commission report. Flood affected area will increase in future due to construction of dams, embankments, highways, rail and road, and obstructions in natural drainage. There is need to promote new submergence tolerant rice varieties in such areas. Bottom up approach is needed in technology dissemination, after giving them the choice of varieties.

Lead Paper

Improving the life of women in rural sector for doubling their Income

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The discussion in the conference in New Delhi in Indian Council of Medical Research dated: 10-08-2017 indicated that our women's health program and work look at health conditions that are specific to Women are more common or serious have distinct causes or manifestations in women have different outcomes treatment or have high morbidity or mortality in women. The Global Burden of Disease (GBD) study has shown that the contribution of communicable maternal, neonatal and reproductive disease to deaths amongst India women had declined from 53% of 1990 to less than 30% in 2013 but Non- Communicable Disease (NCD) have emerged as the largest killers of women in India responsible for 60% of all deaths amongst women in 2013 up from 38% in 1990.Also there are gender differences in society economics and at the work place besides of course in the family which contributes to distinct health needs and health system use. The health of the rural women is more pathetic which needs care to bring the rural women in the main stream of doubling the income. Women play a pivotal role in a family. From behavioural to health education women have their hands on. The health of a woman is very important to have health offspring who are to be worthy citizens of the nation. Its a women who teaches how to behave and how to speak. The woman is the manager of family school who looks after the health of family members, the hygiene of the family and child care responsibilities. The changing paradigm of women can't be overlooked. Their contribution in Agriculture in treatment of seeds in the home, sowing and transplanting the sapling in the field in well known. They give helping hand in weeding irrigation and fertilizer application. Their input is there at the time of harvesting winnowing also. The proper storing of the food grains and their processing is also a part of woman's work along with the household responsibility. In rural India the percentage of woman who depend on agriculture is as high as 84%. Women make up about 33% of cultivators and 47% of agricultural labourers.94% of the female agricultural labour force in crop cultivation wherein the cereal production. While 1.4% worked in vegetable production and 3.72% were engaged in Fruits, Nuts and Spice crops. Women also heavily participate in ancillary agricultural activities. According to Food and Agriculture Organisation, Indian women represent a share of 21% and 24% of all fishers and fish farmers.

Multidimensional role of women is well noticed in both agricultural and domestic activities. In domestic activities, she is involved in cooking, child rearing and household management. She also bears responsibility in helping allied activities like cattle management, fodder collection, milking, to keep the family in happy situation. These works save her income as she does them by herself. All task needs good heath and energy which will save her expenditures.

Despite their dominance of the labour force women in India still face extreme disadvantage in terms of pay, land rights and representation in local farmers' organization. Furthermore their lack of empowerment often results in negative externalities such as lower educational attainment and healthcare facilities for them.

The causes of disparity among women are due to gender division of labour, literacy, access to land and resources, male dominating society. These differences are being removed by government through many schemes. Some of the well known programs and schemes for women healthcare in India are National Rural Health Mission, Reproductive Child Healthcare Program, Janani Suraksha Yojna, Family Welfare Linked Health Insurance Schemes. Beside there are few central govt, and state govt. health schemes running for their welfare. The public healthcare infrastructure from where women can get help include community health center, primary health centers, rural hospitals, civil hospitals, municipal hospitals, specific disease hospitals – a) TB Hospital, b) Leprosy Hospital.

The betterment of rural women can be by helping women improve production while allowing them to shift more of their labour to export production. The changes in legal system must be undertaken in order to enhance women's social and economic contribution to rural development in the long term. Land tenure laws and regulations for women should be improved. Educational policies and funding must be changed to reflect the social and economic returns to women's primary education and literacy. Increase in rural employment will also better her life. The results will give positive impact for the women welfare. If minimum wages to landless labours are fixed; growth of housing facilities will improve their health. Introducing self employment schemes in Horticulture, Animal Husbandry, and handicraft will increase their income. Improving drinking water facilities, public distribution system and increasing power production will reduce her drudgery. Making primary education more effective will bring more awareness of their rights. The holistic development of women will improve the holistic status of the family.

Lead Paper

Doubling the Farmers' Income and Actionable Approach

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Eastern region of India is rich in natural resources but unfortunately poorest among all regions of country with poor productivity. Bihar agriculture can be characterised as low investment, high risk, low productivity and low profitability enterprise with 94% farmers being small and marginal with 60% farmers having landholding less than 1ha land and 38% farmers hold less than 0.5 ha land. Although 68% population derives livelihood from agriculture which contributes 22% of GSDP. There is also very low level of mechanization & local level processing.

The income of farmers can be doubled by socio-technical interventions across a diverse social groups having varied resource base i.e., Medium, small, marginal, sub-marginal and landless farmers with the approach of increasing production and productivity and reducing cost of cultivation of farmers by better and efficient irrigation systems, balanced use of fertilizers and reducing cost of human labour through mechanization. The income of farmers can be doubled by improving productivity by increasing the seed replacement ratio, better grading and packaging of produce, promoting local level processing and better drying and storage.

The eastern states particularly Bihar has the large unharnessed potential. It is considered destination for second Green Revolution in the country. Several reports including the National Farmers Commission have emphasized the need for accelerated development of agriculture in eastern India for securing food security of the country. Dr. A.P.J. Abdul Kalam, the then President of India has described Agriculture as Core Competence of Bihar. Fertile Gangetic alluvial soil, abundant water resources, particularly ground water resources, forms the basis of agriculture in Bihar, where farmers grow a variety of crops like food-grains, oilseeds, pulses, fibre crops, sugarcane, fruits, vegetables and other crops.

The expected outcome of these activities will be seen in increase in overall productivity of rice, wheat and vegetable, fruit, pulses and oilseed by 25-30 %, Proper mechanization compatible to conditions of small and marginal farmers, electrification of irrigation pumps and replacement of poor efficiency pumps by higher efficiency one improvement in soil health as indicated by soil health card, reduction of post harvest loss by adoption of post harvest technologies and value addition activity, increase in income by allied enterprises and post harvest technologies up to 40-50 % and upliftment of socio-economic status of target groups.

Doubling farmers' income in a short period is a challenge, but not insurmountable if the stakeholders follow a comprehensive, multi-pronged and targeted approach encompassing income opportunities and their enabling conditions including investment in agricultural research and infrastructure, and development of institutions and human resources.

ABSTRACTS

Theme 1

Abstracts: Crop management practices to improve factor productivity and farm income (CMP)

T1: CMP- 1

Intensification of mechanization of Sugarcane Planting Operations for Enhancing Income of Cane Growers

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Sugarcane is cultivated in around 5 million ha of area and it occupies about 3.5 per cent of total cropped area, and provides livelihood to around 6 million cane growers.The main concern for sugarcane crop in India is its increasing cost of cultivation which is eating up its margins, and its stagnant yields and low recovery levels. The cost of cultivation needs to be reduced by encouraging mechanization of cane cultivation, either through mechanization of labour intensive planting operations, or through custom/contract hiring of the machinery required for such operations, with active involvement of the sugar-mills. The reduction in one or all production costs of sugarcane cultivation is thus, vital for sustained growth of the sugar sector.Sugarcane is a labour-intensive crop and most of the operations are carried out manually. Sugarcane crop remains in the field for almost a year and right from land preparation to harvesting of the crop and its timely supply to the mill, there is a heavy demand of labour and machinery throughout its crop cycle. Being a long- duration crop of 11-12 months, sugarcane requires about 230 to 325 mandays per ha for its cultivation. The human labour costs constitute around 40 to 50 per cent of operational cost. The use of machinery is limited only for field preparation. As per Cost of Cultivation data, the expenditure on machinery use per ha of cane cultivation was 3.0 to 7.5% of the total operational cost in six major cane growing states. Sugarcane planting consists of two types of sequentially connected labour intensive operations of sett preparation. This operation requires about 35 mandays on an average. Small 35 HP tractor drawn sugarcane cutter planters, developed at IISR, Lucknow, perform all these planting operations as one operation and takes only 4 machine hours along with 8 manhours for planting of cane in one ha. To bring down the cost of production of sugarcane in general and that of planting operations in particular, the solution is to intensify the mechanization of cane planting operations.ICAR-IISR, Lucknow on its own has made efforts to popularise the sugarcane planting machinery either through signing of MoUs with private firms or demonstrating in farmers' fields.The farm machinery developed for sugarcane planting operations, being costly (Rs 0.80–1.25 lacs), is still on custom-hiring basis and that too in a limited area. This weak linkage needs to be addressed on priority so that mechanized cane planting may reduce labour-use and operational cost. A strong linkage of manufacturers, custom service providers with adequate support from the government in subsidizing the costly planting equipments is needed. A system for clusters of demonstration and use of sugarcane machinery on hire purchase basis is needed to develop for fast dissemination of sugarcane machinery. The intensification of cane mechanization will help in generating self-employment in the form of custom hiring services as well as in repair business. This aspect has the potential for skill development of rural artisans as well as for establishing start-ups in developing sugarcane machines. Adequate entrepreneurship development needs to be created by establishing the centres for repairs of sugarcane machinery. A sugar mill level action plan to demonstrate 100 per cent mechanization of cane planting operations in collaboration with cane department and KVK concerned is required.

T1 : CMP-2 Potentials and Limitations of Microbial Bio-pesticides for Bio-Control of Pest and Diseases of Plants

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Plant disease occurrence is a natural phenomenon that affects plants growth and productivity worldwide if it becomes epidemic. Exploiting chemical pesticides is frequent to control plant pests and pathogens; however their indiscriminate and injudicious use has resulted into adverse environmental and health effects.It has been reported that about one-third of the agricultural produce is generated by using pesticides. And only 1% of applied pesticides are reached to the target however, remaining finds way out and contaminates various ecosystems.

Chemical pesticides are toxic in nature; show bio-accumulation in living cells; bio-magnification in food chain; have longer persistence time and non-biodegradability. Intensive use of pesticides has also resulted in development of resistance in target pests and pathogens, generation of new and more virulent strains and/or their dispersal to other habitats in search of suitable environment. This ultimately leads to the increase in incidence of pest infestation and disease occurrence. Long-term exposure to pesticides also deters human health resulting in risk to cancer; neurodegenerative, respiratory and cardiovascular diseases; reproductive and development problems.

There is a need for paradigmatic shift from chemical pesticides to bio-pesticides for sustainable agriculture. Biopesticides are bioproducts derived from living entities that possess ability to provide protection against wide range of pests and pathogens. Microbial biopesticides display plethora of mechanisms including competition for nutrition and space, mycoparasitism, antibiosis and induced systemic resistance for crop protection. Unlike chemical pesticides bio-pesticides are non-toxic, target oriented, bio-degradable products that does not cause environmental pollution. Their use eliminates the risk of development of resistance in pests and pathogens as well as result in production of residue-free food. Hence, use of biopesticides can considered as a greener and safer alternative for controlling pest and pathogens, and food production to feed the growing population of the world.

T1 : CMP-3 Crop Improvement by Chloroplast Engineering

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Plastids are photosynthetically active plant cellular organelles with a ~120-150 kb genome present in 1,000-10,000 copies per cell, encoding 120-130 genes, and maternally inherited in most of the angiosperm plant species. The plastid genome represents an attractive target of genetic engineering in crop plants. It can be engineered by genetic transformation in a number of plant species and this possibility has stirred enormous interest among plant biotechnologists. Chloroplast transformation has become an attractive alternative to nuclear gene transformation due to its advantages: high protein levels, the feasibility of expressing multiple proteins from polycistronic mRNAs, and gene containment through the lack of pollen transmission. Process of chloroplast transformation include- construction of transformation vector, methods for delivering foreign DNA into host genome, integration mechanism (homologous recombination) and efficient selection method to identify transplastome. Chloroplast transformation is an environment friendly approach to plant genetic engineering. It is amazing that more than 120 genes from various sources have been well integrated and expressed via the chloroplast genome. There are many applications of chloroplast engineering which include- insect resistance, disease resistance, herbicide resistance, abiotic stress tolerance. In addition to these the plastid transformation has the potential to improve crop plants in various other ways such as improved photosynthesis through photorespiration engineering and development of male sterile line for hybrid seed production. The benefit of this technology can be harvested not only for the improvement of the agriculture, but also for the growth of pharmaceutical industries for the production of vaccines and recombinant proteins through chloroplast transformation of crops. The plastid transformation offered a good platform of foreign gene expression in higher plants. Chloroplast genome has become the target of many plant genetic transformation efforts due to its enormous advantages over nuclear genome of the plant. Plastid transformation is now routinely carried out only in tobacco while the efficiency of transformation in other plants is still too low. More experiments will be undertaken to move this technology toward practical utilization.

T1 : CMP-4

Breeding for Cane Improvement: A Vision in Doubling Farmer's Income by 2022

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Plant breeding is an art of science and technology for improving the crop species genetically in relation to their economic use for mankind. Information about the amount &distribution of genetic variation in germplasm collection is important for effective management and utilization in plant breeding. In India, sugarcanes have originated through natural hybridisation and were selected by farmers to cultivate under various biotic & abiotic constraints prevalent in the region. Over centuries of evolution these cane varieties were adapted to the peculiar climatic conditions. In the interim of 20th century, breeding and management efforts have increased sugar yield across almost all sugarcane cultivating areas of India. A close analysis of the trends during last decade reveals that the rate of increase in sugar yield is actually slowing down. The plant breeders are constantly working towards the development of new and improved sugarcane varieties to meet the domestic consumption of sweeteners. A national programme involving a multi-disciplinary group of scientists from various research institutes/stations of India for improving canes through hybridisation and selection will help in developing new multi-purpose sugarcane varieties with better adaptability. In view of the above scenario, a field experiment was conducted at multi-location of North-Central & North-East Zones across the country under ICAR–All India Coordinated Research Project on Sugarcane to test four early maturing sugarcane clones (entries) viz., BO 153,CoP 08436, CoSe 09452, UP 09453 with two standards BO 130 &CoSe 95422in Randomized Block Design for yield and quality traits. The mean data (two plant & one ratoon) of four locations viz., Sugarcane Research Station, Gorakhpur; G.S. Sugarcane Breeding & Research Institute, Seorahi; Sugarcane Research Institute (RPCAU), Pusa, Samastipur; ICAR–IISR Regional Centre, Motipurunder ICAR–All India Coordinated Research Project on Sugarcane conceded that sugarcane variety UP 09453 was found best among all test entries and standard cultivars BO 130 &CoSe95422 for quantitative & qualitative traits viz., NMC (130000/ha), cane yield (79.05 t/ha), sucrose% (17.16%), pol% in cane (13.26%), CCS t/ha (9.41t/ha) respectively.This red-rot & smut resistance sugarcane variety (UP 09453)having high yield with surpassed quality and early maturity is developed by cross of Grl 28/92 x CoSe 92423 through hybridization & clonal selection at Sugarcane Research Station, Gorakhpur (Uttar Pradesh), India. The increasing production &productivity along with improved quality of sugarcane variety UP 09453 will play aneffective role in doublingfarmer's incomeby 2022, a time when the nation completes 75 years of independence.

T1 : CMP-5

Gender perspectives in rice based production system in the country

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Women are involved in almost every farm operation in agriculture. Rice farming is an area where participation of women is very significant where majority of farm operations either carried out by women alone or jointly with men. Understanding dynamism of roles and responsibilities of men and women in various farm and household activities is very important to address the gender issues in agriculture. Under a project on 'Gender issues in rice based production system and refinement of selected technologies in women perspective' a study was undertaken in network mode at five states of country to assess farm women's role and responsibilities in rice production system. The study revealed that very less number of house were headed by women with variations of 2.4-12.4% in selected regions of the country. The regions having scarcity of water source have resulted more pressure of fetching water on farm women. Women membership remained restricted mostly up to SHG level; whereas men represented up to district level. Jointly access

over farm resources was also in increasing order. The family women contributed highest hours in storing of seeds followed by winnowing, harvesting, drying of produce and transplanting. Whereas women labour were involved in transplanting followed by other farm operations/activities. Among studied States, Uttarakhand recorded highest mean participation of women across the crops followed by Andhra Pradesh and Madhya Pradesh.

T1 : CMP-6 Effect of nutrient management practices on growth, yield and nutrient uptake of different soybean varieties

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Soybean (Glycine max L. Merrill) is known as "Golden Bean" of the 21st century. An experiment was conducted on "Performance of soybean varieties on different nutrient management practices"with the objectives: (1)To study the effect of different nutrient management practices on growth and yield of soybean. (2) To study the nutrient uptake of soybean.The field experiment was conducted at Instructional Farm of Post Graduate Institute, MPKV, Rahuri, (19° 48' N latitude and 74° 32' E longitude and 495 meters above mean sea level), in afactorial randomized block design with three replications during *kharif* season of 2015. The available nitrogen, phosphorus and potassium were 144.57, 17.24, 388.20 kg/ ha and organic carbon, pH and EC were 0.47 %, 7.72 and 0.25 dS/ mofsoil, respectively. The main plot treatment consists of three varieties *viz.,* V_1: KDS-344,V_2: JS-9305 and V_3: KS-103 and five nutrient management practices *viz.,*N_1: GRDF (50:75:00 N, P_2O_5, K_2O kg/ ha+ 5tons FYM/ ha), N_2: 75% GRDF (37.5:56.25:00 N, P_2O_5, K_2O kg/ ha + 3.75 tons FYM/ ha) + 0.5% foliar spray of grade IInd at 30 and 45 DAS,N_3: 100% GRDF (50:75:00 N, P_2O_5, K_2O kg/ ha+ 5tons FYM/ ha) + 0.5% foliar spray of grade IInd at 30 and 45 DAS, N_4: 125% GRDF (62.5:93.75:00 + 6.25 kg/ ha+ 6.25 tons FYM/ ha) + 0.5% foliar spray of grade IInd at 30 and 45 DAS and N_5: 50:75:30 N, P_2O_5, K_2O+ 5tons FYM/ ha. The crop soybean was dibbled at 30 cm x 10 cm in Istweek of July and harvested at Istto IIIrdweek of October. Common treatments of *Rhizobium* and *PSB* were given at time of sowing and 0.5% foliar spray of grade IInd micronutrient (Fe - 2.5%, Zn- 3.0%, Mn-1.0%, Cu-1.0%, Mo-0.1% and Bo-0.5%) at 30 DAS and 45 DAS of soybean.

The results showed that the variety KDS-344 recorded significantly the highest grain and stover yield of soybean. The grain yield of soybean was significantly higher by application of fertilizer dose of 125% GRDF + 0.5% Grade IInd foliar spray at 30 and 45 DAS than other treatments, however, it was found at par with 75% GRDF + 0.5 Grade IInd foliar spray at 30 and 45 DAS and 100% GRDF + 0.5% Grade IInd foliar spray at 30 and 45 DAS. Similarly, growth and yield attributes *viz.,* plant height (cm), number of branches, number root of nodules, number of pod plant^{-1} and weight of seeds plant^{-1} (g) were recorded maximum under 125% GRDF + 0.5 Grade IInd foliar spray at 30 and 45 DAS. Application of fertilizer dose to soybean 75% GRDF + 0.5% Grade IInd foliar spray at 30 and 45 DAS The total uptake of N, P and K in soybean was recorded significantly the higher by variety KDS-344. The total uptake of nitrogen and phosphorus were recorded significantly higher with application of 125% GRDF (62.5:93.75:00 N:P_2O_5:K_2O kg ha^{-1} + 6.25 tons FYM ha^{-1}) + 0.5% Grade IInd foliar spray at 30 and 45 DAS (kg ha^{-1}) than the rest of the treatments, however it was found at par with treatment of 75% GRDF + 0.5 Grade IInd foliar spray at 30 and 45 DAS and 100% GRDF + 0.5% Grade IInd foliar spray at 30 and 45 DAS. It could be concluded that, the optimum growth, yield and nutrient uptake by the soybean variety KDS-344 can be achieved when fertilized with 75% GRDF (37.5:56.25:00 N, P_2O_5, K_2O kg ha^{-1} + 3.75 tons FYM ha^{-1}) + 0.5 % Grade IInd foliar spray of micronutrient at 30 and 45 DAS.

T1 : CMP-7 Microsatellite marker based DNA fingerprinting and estimation of genetic diversity of maize hybrids and parental lines

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Maize is an important cereal crop of North-western Himalayan region of India. The ever-increasing population demands an increase in maize productivity which can be achieved by adopting various strategies like exploitation of hybrid vigour and improvement of plant type. New hybrids are being released and recommended for the region. However, the use of parental lines with a narrow genetic base by various private and public sector seed agencies may cause a risk of genetic diversity loss. Even the contamination of hybrid seeds may reduce the genetic and physiological quality of seeds leading to decreased crop productivity. Molecular characterization of hybrids and their parental lines by DNA fingerprinting provides knowledge of the genetic relationship among parental lines and hybrids and thus prevent the risk of increasing uniformity in the elite germplasm. The results would also be helpful for molecular identification and hybrid purity testing.The present study was undertaken to carry out microsatellite marker based DNA fingerprinting of ten private sector maize hybrids and their parental lines (33) for molecular identification and assessment of genetic diversity among them. Sixteen polymorphic markers amplified a total of 60 alleles with amolecular weight ranging between 100 and 315 base pairs. The number of alleles per locus ranged from 2 to 7 with a mean value of 3.75. The expected heterozygosity (H_e) ranged from 0.42 to 0.85 with a mean of 0.63. Polymorphic information content (PIC) ranged from 0.37 to 0.83 with a mean of 0.57. The dendrogram was constructed based on Jaccard's similarity coefficient[12] using the data for all the maize genotypes following Unweighted Pair Group Method with Arithmetic Mean (UPGMA) and SAHN clustering.

T1 : CMP-8 Fungicidal management of black scurf disease of potato

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Potato (*Solanum tuberosum* L.) has significant share in the overall agricultural production in the country. Potato, popularly known as 'The king of vegetables', has emerged as fourth most important food crop in India after rice, wheat and maize.The total area under potato cultivation in India is about 1973 thousand hectare with productivity of 211 q/ha. Uttar Pradesh produces potato on 564 thousand hectare with an average yield of 245 q/ha. Among several yield limiting factors, black scurf disease caused by *Rhizoctonia solani* Kuhn is predominant because it not only reduces the quality of potato but also causes 5-40 per cent economic losses. On farm trials were conducted during 2011-12 and 2012-13 on 15 farmer's field with three treatments i.e. farmer's practice without seed treatment (T_1), seed treatment with Pencycuran @ 1.0 l/ha (T_2) and seed treatment with Carbendazim @ 0.75kg/ha(T_3) to assess the efficacy of these treatments on disease incidence, tuber yield and economics. Pencycuran gave the highest tuber yield 320.40 and 338.12 q/ha and the lowest infected tubers 8.52 and 7.8% in 2011-12 and 2012-13, respectively. Carbendazim @ 0.75kg/ha treated tubers wee also gave satisfactory yield (316.90 and 329.20 q/ha) and reduced infected tubers (11.32 and 11.2 %) in 2011-12 and 2012-13, respectively. The lowest yields (295.6 and 301.07 q/ha) and highest infected tubers (21.26 and 23.60 %) were recorded under untreated fields during 2011-12 and 2012-13, respectively. The trend of economic benefits was also found similar to crop yield. Now, Pencycuran and Carbendazim are extensively used in more than 7000 and 10000 ha area of district, respectively.

T1 : CMP-9

Zero budgeting natural farming - anew approach for enhancing farm's profitability

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Approximately 85 per cent farmerspossesssmall and marginal land-holdings andhave limited access to inputs/technology, capital and markets. They are the main providers of food and nutritional security to the nation.Increasing cost of inputs/technologies and decreasing sizes of agricultural land holdings are main factorsresponsible for the deterioration of farmers' income. Among various approaches for increasing farmers' income, zero budgeting natural farming (ZBNF) is one of the new approacheswhich involvesorganic production wherein all thethings required for the crop growth available around the plant root zone. The main components of ZBNF are jiwamitra, bijamitra, mulching,mixed cropping,agniastra, neemastra and brahmastra.Jiwamitra accelerates the cropgrowth and enhances nutritional status of soil whereas bijamitra provides adequate protection to crops from insects and diseases during the initial stages of germination and establishment.Adequate mulching promotes humus formation, suppresses weeds and greatly reduces the water requirement of the crops. Live mulching particularly with leguminous crops is not only a subsidiary source of income but also a safeguard against depletion of nutrients by crops. Mixed cropping, particularly with short duration legumes, vegetables and even medicinal plants increase the profit of farmers. Agniastra and neemastra remove various pests and insects. Brahmastra is used as a preventive as well as curative measure for heavy pest attacks.Thus, the ZBNFsystem is very suited to the small and marginal farmers as itrequires negligible monetary investment for purchase of inputs like seeds,fertilizers and plant protection chemicals from the market. Maintaining optimum levels of production and keeping the cost of cultivation to the minimum wouldconsiderablyenhance the farm's profitability.

T1 : CMP-10

Detection and Management of Viroids in Important Crops

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Viroids are single-stranded, covalently closed, circular, highly structured noncoding RNAs that cause disease in several economically important crop plants. Viroids are small, low molecular weight ribonucleic acids that can infect plant cells, replicate themselves, and cause disease. To date, at least 40 plant diseases have been shown to be caused by viroids (such as,cadang-cadang disease of coconut, potato spindle tuber, citrus exocortis, avocado sunblotch, chrysanthemum stunt and Tomato chlorotic dwarf viroid etc.).They replicate autonomously and move systemically in host plants with the aid of the host machinery. In addition to symptomatic infections, viroids also cause latent infections where there is no visual evidence of infection in the host; however, transfer to a susceptible host can result in devastating disease. While there are non-hosts for viroids, no naturally occurring durable resistance has been observed in most host species. Current effective control methods for viroid diseases include detection and eradication, and cultural controls (viroid-free propagating stock, removal and destruction of viroid-infected plants, and washing of hands or sterilizing of tools after handling viroid infected plants before moving on to healthy plants.). In addition, heat or cold therapy combined with meristem tip culture has been shown to be effective for elimination of viroids for some viroid–host combinations. Several diagnostic methods have been used for the detection of viroids. However, molecular techniques (reverse transcription polymerase chain reaction (RT-PCR) and nucleic acid hybridization) are considered reliable, fast and sensitive detection techniques and could be applied to the large-scale and multiple detection of plant pathogens.

T1 : CMP-11 Integrated use of Organic Manures and Inorganic Fertilizers on Organic Carbon, Available N P and K in sustaining Productivity of Paddy - Wheat Cropping System

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An experiment was conducted by K.V.K. Raebareli to study the effect of different fertilizer recommendation practices on changes in organic carbon, available N, P and K status of the soil and yield of Paddy and Wheat. The crop yield of paddy and wheat increased significantly due to various nutrient management practices over control. The highest paddy yield (4.95 and 5.10 t ha^{-1}) was recorded in treatment of practices where 75% N through fertilizer + 25% N through vermicompost. Highest wheat yields (4.40 and 4.60 tha-1) were also recorded in same treatment, followed by treatment of practices where 50% N through fertilizer +50% N through vermicompost. The increased paddy and wheat yield in the treatment of package and practices was attributed to the beneficial effect of combined use of organic manure and fertilizers as nutrient availability increased through enclosed microbial activity, conversions from unavailable to available forms and also due to improved physical, chemical and bio-chemical conditions. The organic carbon content of soil after the harvest of Paddy and Wheat was higher than the initial content before the experiment. Significant increase in the organic carbon content was recorded after paddy and wheat crops in the treatments where vermicompost had been applied along with inorganic fertilizers. The highest available nitrogen and phosphorus content of soil after the harvest of wheat crop (2016-17) was registered with 75% N through fertilizer + 25 % N through vermicompost, in Paddy-wheat cropping system.

T1 : CMP-12 Yield Performance and Economic Analysis of Pigeon Pea (C*ajnus Cajon*)Through Front Line Demonstration Under Rain Fed Condition of Tarai Region of Uttar Pradesh

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Pigeon pea (*Cajanus cajan*) is an important kharif (rainy) season pulse crop regarding area and production in the country. In India cultivation of legumes forms an integral part of the rain fed production system; however, their productivity over the years has remained low and unstable. Front line demonstration is a systematic and replicable tool to disseminate and evaluate recommended technologies among the farmers. LBS Krishi Vigyan Kendra, Gonda, which comes under Tarai Agro climatic condition of UP had conducted 75 demonstration on Pigeon pea since 2009-10 to 2013-14 in 5 adopted locations. The critical inputs were prioritized on existing production technologies through Participatory Rural Appraisal (PRA), farmer's interaction and feedback. The 5 years data revealed that an average higher yield of demonstration field was obtained 18.31 qt/ha over local check (10.02 qt/ha) with additional yield of 8.29 qt/ha. Similarly, net average economic return of demonstration plot was found Rs. 41652/ha over local check (Rs. 20410/ha) with additional return of Rs. 21242/ha. . Both gross return and net return were recorded in increasing order from 2009-10 to 2013-14.The average technological gap, extension gap, technological index and increased B: C ratio were found 9.69qt/ha, 8.29 qt/ha, 34.61% and 0.95, respectively. The extension gap reflected a remarkable difference between demonstration yield and farmers yield. The extension gap ranged between 6.55 to 9.95 qt/ha during the study period. The trend of technology gap (ranging between 7.25 to 11.20 qt/ha) showed the farmers cooperation in carrying out demonstration with encouraging results in subsequent years. From the findings of 5 years Front Line Demonstration on farmer's field it can be concluded that use of recommended production practice of Pigeon pea can

reduce the technology gap and increase the productivity of Pigeon pea and economic returns to a considerable extent in the district. Moreover extension agencies in the district need to provide proper technical support to the farmers through different educational and extension methods to reduce extension gap for higher Pigeon pea productivity under rainfed condition of Tarai area of district Gonda (UP).

T1 : CMP-13 Effect of nitrogen levels on growth and yield of mustard (*Brassica juncea* Curzen and Cross.) varieties under late sown condition

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A field experiment was conducted during the winter (*rabi*) season of 2015-16 to Study on the Effect of nitrogen levels on growth and yield of mustard (*Brassica juncea*Curzen and Cross.) varieties under late sown condition at Main Agronomy Research Station, Narendra Deva University of Agricultural and Technology, Faizabad. Testing the experiment near alkaline in pH, low EC, Organic carban and available N, medium in available P and medium available K. The experiment was laid out in Factorial randomized block design with fifteen treatments with three replications. Result show that 160 kg ha^{-1}nitrogen and NDR-8510 variety recorded the highest Plant height, Dry matter accumulation, number of stem at harvest stage and LAI at 60 DAS. Highest mustard seed and stover yield recorded with 160 kg N ha-1 and variety NDR-8501. Interaction of nitrogen levels and varieties in case of yield found significant.

T1 : CMP-14 Effect of nitrogen level on growth and development of mustard varieties

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The experiment was conducted at agronomy Research Farm of Narendra Deva University of Agriculture and Technology, Faizabad (U.P.).The experiment consisted of 15 treatments, was laid out in Randomized Block Design (RBD) i.e. (A.) Varieties: i) Vardan; ii) NDR8501; iii) Maya (B.) Nitrogen levels: i) control; ii) 40 kg ha^{-1}; 80 kg ha^{-1};120 kg ha^{-1};160 kg ha^{-1}; with three replication. The various parameters likes' plant height, dry matter accumulation, no of braches $plant^{-1}$ increased significantly with increasing in dose of nitrogen. The maximum plant growth was observed with 160 kg ha^{-1} Nitrogen. Application of nitrogen increased all the yield contributing character significantly viz., no. of siliqua $plant^{-1}$, length of siliqua, no of seed $siliqua^{-1}$ up to 160 $kgha^{-1}$. This might to be due to the fact that nitrogen application increased the root development which enhanced the absorption of nutrients from soil which resulted in better development of source capacity i.e. leaf area and its utilization towards yield contributing characters. Variety NDR-8501 has higher values of all these growth and yield contributing character. It may be the main reason for better yield of NDR-8501. However, oil content in all the varieties was almost similar, which may be due to little variation in genetics characters of verities.

T1 : CMP-15 Increased seed quality due to different levels of nitrogen and phosphorus in coriander (*Coriandrum sativum* L.)

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Quality of seed crop is utmost important trait which decides it's industrial value. High amount of essential oil content, seed viability, good germination % etc., are few of the quality parameters that a seed spice crop must have. Good germination percentage reduces the cost of seed. The oleoresin is used in perfume and pharmaceutical industries, in beverages to flavor gin and liqueurs and it is used as food flavoring compound in perfumery and soap making hence, have a great demand and a good venture opportunity for farmers. Keeping this in mind during the winter season of 2014-2015, An investigation was conducted at the main garden of Department of Horticulture, Dr. PDKV Akola, Maharashtra to determine the influence of different levels of nitrogen and phosphorus on coriander variety HisarAnand for achieving better quality of this crop. Four different levels of nitrogen (40, 50, 60 and 70 kg/ha) and three different levels of phosphorus (30, 40 and 50 k/ha) were applied in the plots. The experiment was laid out in FRBD with 3 replications. There was a significant effect of application of these two nutrients on seed quality of coriander. Test weight (14.21 g), germination % (57.81) and oleoresin content (0.77) was recorded significantly maximum with treatment N_3 (60 kg N/ha).In respect to phosphorus, significantly maximum values for quality traits test weight (12.87), germination % (65.16) and oleoresin content (0.70) was observed with treatment P_3 i.e. 50 kg /ha. Therefore, the fertilizer treatment (N_{60} + P_{50} kg/ha) was observed to be the best for achieving maximum quality of coriander seeds.

T1 : CMP-16 Compatibility of PGPRs and *Trichoderma* for development of consortia for management of wilt of pulse crops

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Pulse rhizosphere favours diverse group of microbial populations. These microbes are capable to enhancing nodulation and suppress a variety of soil borne pathogens. There is a need to explore pulses rhizosphere for exploiting the associated microbes for the development of effective biocontrol agents (BCAs) and deploy them for the sustainable production of pulses. These biological control agents (BCAs) of plants pathogens provide an alternative and attractive preposition as it mimic the natural way of balancing population of living organisms and helps to increase the yield by the suppression of pathogens inoculums, protects plants against infection or increase the ability of plants to resist pathogens and to provide a safe and clean environment. Forty four isolates of *Trichoderma* and 56 isolates of PGPRs were isolated by serial dilution techniques from 25 soil samples collected from different pulses rhizosphere. On the basis of the Gram's staining, 24 bacterial isolates were Gram's positive and 20 Gram's negative rod shaped and 5 Gram's positive and 7 gram negative cocous shaped bacteria. Isolates of *Trichoderma* spp belonged to four different species i.e. *Trichoderma harzianum*, *T. asperellum,T. longibrachiatum* and *T. ressie*. Biocontrol activity of *Trichoderma* spp was tested against wilt pathogens of pulses (*Fusarium udum, F. oxysporum* f. sp. *cireri* and *F. oxysporum* f. sp. *lentis*). Isolates T31, T32, T9, T17, T30, T35, T28, T21, T15, T36, T10 and T16 showed maximum mycelial growth inhibition over control after 7 days of incubation and out of 56 PGPRs, 8 isolates (PGPR 2, PGPR 14, PGPR 10, PGPRS 15, PGPR 4, PGPR 8, PGPR 11 and PGPR 28) were highly antagonistic against *wilt pathogens* under *in vitro* conditions. Compatibility between *Trichoderma* and PGPRs was also investigated. Among 56 PGPRs, 21 showed compatibility with *Trichoderma* spp. Efficacy of 20 potential isolates of *Trichoderma* for growth promotion activity on pigeonpea and chickpea was evaluated. Observation of shoot length, root length and wilt

incidence was recorded after 45 and 60 days of sowing. *Trichoderma* isolates T31, T30, T32, T16, T38, T28 and T21 were identified as promising in enhancing shoot length and root length by 10-25%. Above studies indicate that use of compatible isolates of PGPRs and *Trichoderma* was not detrimental to plants, rather it causes multiple benefits to plants by suppressing pathogens and enhancing growth.

T1 : CMP-17 Growth, yield attributing parameters and seed quality of summer mungbean (*Vigna radiate* L.Wilczk) as influenced by genotypes, date of sowing and seed rate

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An experiment was conducted during the summer season of 2013-14 at ICAR-DSR, Mau to study the effect of genotypes, date of sowing and seed rate on growth, yield attributes and seed quality of summer mungbean. The experiment was laid out in split plot design with 3 replications. The soil was low in organic carbon (0.30%), available N (167.3 kg ha^{-1}), in available P (14.5 kg ha^{-1}) and medium available K (154.6 kg ha^{-1}). Treatments comprised 2 mungbean genotypes (Pusa Vishal and SML 668) in main-plots, 3 date of sowing (26 March, 2 April and 9 April, 2013) in sub plots and 4 seed rates (20, 25, 30 and 35 kg ha^{-1}) in sub-sub-plot. Sowing was done at 30 cm x 10 cm. RDF for NPKS (20:50:15:20 kg/ha) was applied as basal. Harvesting was done by picking at 63, 70 and 78 DAS. The normal sown both the genotypes *viz.,* Pusa Vishal and SML 668 significantly influenced growth (plant height, plants/m^2 & leaves/plant) and at 45 DAS & at harvest respectively. Pusa Vishal had shown maximum plant height (51.4 cm) & plants/m^2 (40.2), hence the Pusa Vishal has high in-built genetic potentialities. But for leaves/plant were higher in SML 668 genotypes than the Pusa Vishal. The different date of sowing *(*26 March, 1 April & 9 April) had shown significant affected growth parameters at 45 DAS & at harvest. Sowing at first April, 2013 had found maximum plant height (54.4 cm) and leaves/plant (30.0) for both the genotypes. Contrary, maximum plants/m^2 (45.7) was recorded at 26 March sown crop compared to crop sown on 1 & 9 April. The Response of genotypes at different seed rates *i.e*. 20, 25, 30 and 35 kg ha^{-1} had shown statistically significant effect at both the interval (45 DAS & at harvest) on all the traits under study *viz*., plant height, plants/m^2 & leaves/plant. The 20 kg ha^{-1} seed rate had shown significantly superior over all the seed rates (25, 30 and 35 kg ha^{-1}) for all the traits under study.

The different date of sowing and seed rate significantly enhanced yield attributes and seed yield for both the genotypes. Pusa Vishal had shown higher pods/plant (27.5), pod length (7.8 cm), seeds/pod (8.8), seed yield/plant (7.8 g) and seed yield (0.81t ha^{-1}) compared to SML 668. Among the different date of sowing, 26 March sown crop had recorded higher pods/plant (29.5), pod length (7.7 cm), number of seeds/pod (8.8), seed yield/plant (8.8 g) and seed yield (0.85 t ha^{-1}) as compared to 1 April & 9 April sown crop. Similarly, the traits like pods/plant (28.4), pod length (7.8 cm),number of seeds/pod (8.9) and seed yield/plant (7.9 g) and seed yield (0.82 t ha^{-1}) were recorded maximum at 25 kg ha^{-1} seed rate; hence this seed rate has superior over the other seed rates. Among the genotypes PusaVishal recorded significantly higher values of seed quality parameters *viz*. germination (95.3%), root length (17.5 cm), shoot length (25.5 cm), seedling length (43.0 cm), seedling dry weight (0.211 g) and vigour index I and II (4095.2 and 20.1) as compared to SML 668. Significant improvement in the seed quality parameters *viz.* germination (95.8 %), root length (17.7cm), shoot length (25.6 cm) seedling length (43.3 cm), seedling dry weight (0.213 g) and vigour index I and II (4145.3 and 20.4) were significantly higher 26 March sown crop as compared to crop sown on 1 April and 9 April. However, maximum shoot length (24.8 cm), seedling dry weight (0.208) and vigour index-II (19.7) was recorded at 20 kg ha^{-1} seed rate.

T1 : CMP-18 Integrated management of foliar diseases of Indian mustard [(*Brassica juncea*) Czern. and Coss.]

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Mustard crop is the most important group of *rabi*oil seed crops and contributes a major share to the vegetable fat economy of the country. Among the various causes of low productivity, diseases are most important ones. This crop suffers from a number of diseases among them downy mildew (*Peronospora brassicae*), Alternaria blight (*Alternariabrassicae*, *A. brassicicola*) and white rust (*Albugo candida*) are the most destructive diseases causing economical losses at different crop stages. Series of experiments were conducted during *rabi*, 2012-2013 and 2013-2014 at Student Instructional Farm of NDUAT, Kumarganj, Faizabad (U.P.). A management schedule was developed by integrating the varieties, their sowing dates and fungicidal applications through various modes. There were two varieties of Indian mustard (Varuna and NDR-8501) with their two dates of sowing that is 20 October and 10 November, seed treatment of apron and their foliar sprays with (Mancozeb, Quintal, Folicur and Nativo) chemicals were tested in split plot design. The observations were recorded regarding the incidence and severity of downy mildew, Alternaria blight and white rust. Mean lower severity of Alternaria blight was noted in third date of sowing and downy mildew severity decreased with delayed sowing while white rust decreased in early sowing. Cultivar NDR-8501 proved better in respect of lower diseases severity and higher yield as compared to Varuna. Among fungicides Quintal @ 0.2% was found most effective in reducing the downy mildew severity followed by Mancozeb @ 0.25%, andNativo @ 0.05% proved most effective in managing the Alternaria blight severity and increasing seed yield followed by Folicur @ 0.2% while spraying of Quintal @ 0.2% proving most effective against white rust. Maximum seed yield and benefit cost ratio was obtained with Nativo @ 0.05% followed by Folicur @ 0.2% and Quintal @ 0.2%, respectively. Minimum disease severity and maximum seed yield with higher benefit cost ratio was recorded with genotypes NDR-8501 sown on 20 October sprayed with Nativo @ 0.05% as compare to control which was also reflected through the observations on thousand seed weight.

T1 : CMP-19 Seed enhancement studies in hybrid rice (Oryza sativa L.)

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Hybrid rice technology is practically feasible and readily adoptable genetic option to increase the productivity by 15-20% witnessed under irrigated ecosystem. The availability of high quality hybrid rice seed at affordable rate remained the real challenge. The inception of Cytoplasmic Male sterility system exhibiting partial panicle exertion, thus the delicate husk with opened glumes and higher doses of GA_3 for synchronization of flowering are responsible for seed quality deterioration at faster rate compared to traditional rice. Storage of seed till the next sowing season is an essential segment of seed industry. The knowledge of seed storability help in avoiding huge financial losses happens due to seed deterioration ultimately fails to meet out the minimum quality requirements. Hence, the study was undertaken to know the storage potential of hybrid seed of NDRH-2 and parental lines, IR-58025A and IR-58025B stored in moisture pervious/impervious containers after coating of polymer and treatment with botanicals, bio-agents and fungicides. Studies revealed that the highest seed quality attributes of F_1 seeds of NDRH-2 and its parental lines can be maintained till the next sowing season by coating with polykote @ 4ml diluted in 5ml of water and fungicidal treatment of vitavax 200 @ 2g/kg seed. Bio-agent *Trichoderma viride*seed treatment alone exhibited significantly at par germination but failed to preserve the other quality traits.

T1 : CMP-20 Entomopathogenic Nematodes for Insect-Pest Management in India-Current Status and Future Needs

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The menace of pesticide use has resulted in a demand for organically produced agricultural products. In India, the North-Eastern states are leading the organic agricultural revolution. Sikkim was the first state to go completely organic, followed by Mizoram and Arunachal Pradesh. The organically produced farm products sell at 2 to 5 times of the regularly produced farm produce; therefore, adoption of organic agricultural practices has the potential of increasing the farmer's income manifold. Entomopathogenic nematodes (EPNs) are a special group of nematodes that parasitize insects and are used worldwide for insect-pest management in agriculture. In-spite of their effectiveness and suitability for organic agriculture, the practical use of EPNs has been limitedon the Indian farms. Three major constraints that limit the use of EPNs in India are [a]- lack of coherent EPN research in India, [b]- lack of awareness about EPNs amongst the farmers, and [c]- lack of suitable mass production technologies, which limit effective commercialization and availability of EPNs in the Indian markets. An appropriate agenda for the researchers working on EPNs at various agricultural universities/ research institutes should be isolation and characterization of EPNs from their local geographical areas, testing the efficacy of local isolates on the local insect pests, and start small scale in-vivo mass production of selected EPNs and conduct local demonstrations. This would popularize the use of EPNs amongst farmers, and push various companies into investing in EPN mass production and formulation. In addition, there is a need for EPN researchers to organize under a scientific network of labs for better coordination and furthering EPN research in India.

T1 : CMP-21 Strategies for doubling farmers' income by 2022 in West Bengal

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Farming is the most important enterprise in our country and farmers are an integral part of it.During the period of last 50 years from 1965 to 2015, since the adoption of green revolution, India's food production multiplied 3.7 times while the population multiplied by 2.55 times. The net result has been a 45% increase in per person food production, which has made India not only food self-sufficient, but also an exporting country. While the country achieved commendable position in food production, farming itself turned non-profitable overtime due to rising costs and uneconomical holdings. Farmers' income remains low in relation to income of those working in the non-farm sector. The low and highly fluctuating farm income is causing detrimental effect on the interest in farming community and is also forcing more and more cultivators, particularly young generation, to leave farming. Hence, the goal set to double farmers' income by 2022 is central to have a direct impact on almost half of the population for providing income security to the farmers, reducing agrarian distress and promoting farmer's welfare. The paradigm has changed from food security to income security of the farmers. Doubling real income of the farmers till 2022- 23 over the base year of 2015- 16, requires annual growth of 10.41 per cent in farmers' income. Doubling farmers' income by 2022 is quite challenging, but it is needed. Agriculture has been the way of life and continues to be the single most important livelihood of the rural masses in West Bengal. Agricultural land of the State is 56.82 lakh ha. The gross cropped area is 97.52 lakh ha, while the net cropped area is 52.96 lakh ha with a cropping intensity of 184 per cent. The State is rich in human resources with 70% of its population engaged in agriculture. There are 71.23 lakh farm families of whom 90 per cent of the cultivators being small and marginal farmers (less than 1 ha land holding). Large holdings (above 10 ha) are almost absent. The average size of land holding is only 0.77 ha. West Bengal is bestowed with diverse natural

resources and varied agro-climatic conditions which support cultivation of a wide range of crops. Rice is the state's principal food crop. West Bengal ranks first in area and production of rice in India contributing about 14% of total rice production in the country. West Bengal put a record of highest production of jute and vegetables in the country, while the state is second largest producer of potato with high yield (19.73 t/ha) next to Uttar Pradesh (22.8 t/ha). West Bengal contributes 3.04% and 1.5% of oilseeds and pulse production, respectively, in India. It is also the leading producer of pineapple, litchi, mango and loose flowers. Despite the impressive achievements, still the challenges are many, namely, need of quality seeds and planting materials, need of new plant genotypes for diversification, degradation of soil health, lack of farm mechanisation, crisis of cool storage facility, inadequate food processing facility, weak in commodity value-chain, retail chains and organized market systems and farmer producer companies. The phenomenon of climate change and aberrant weather conditions are also serious issues to be tackled with new innovations in crop improvement and production systems. To address the present agenda of doubling farmers' income by 2022, the whole programme may be undertaken focusing three broad strategies: Strategy I: Development initiatives including infrastructure, Strategy II: Technology generation and dissemination and Strategy III: Policies and reforms in agriculture. The strategies will highlight on production of quality planting material, soil heath and nutrient management, farm mechanization, good agricultural practices, reduction of cost of production, precision farming, crop diversification, utilization of rice fallow area, cultivation of high value crops, integrated farming system (IFS) approach, application of climate resilient agricultural practices, capacity building of the farmers, post harvest technologies, ICT based agri-extension and agriculture marketing system.

T1 : CMP-22 Sustainable management of gram pod borer and tobacco cutworm through nanoformulated, indigenous *Bacillus thuringiensis* strain

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The green gram is one of the major pulses cultivated in dryland or rainfed areas with a contribution of 5% share of total pulse production in India. Even though the production of green gram is increasing substantially in last 5 years 1.19 mMT during 2012-13 to 1.87 mMT during 2016-17, the insect pest infestation is also increasing concurrently. The growing menace of *Spodoptera litura* Fabricius and *Helicoverpa armigera* Hubner reduces the productivity of mungbean. Both pests are polyphagous and highly migratory hence they had developed resistance to organochlorine and organophosphorous group of insecticides. Biopesticides like *Bacillus thuringiensis* can help in managing these insects in a sustainable manner. *Bt* has multiple insecticidal proteins like well-known crystal proteins (cry) followed by Vegetative Insecticidal Proteins (vip), Cytotoxic Proteins (cyt), Secreted Insecticidal Protein (sip), enhancing like protein and beta exotoxin. Keeping this in view present study was carried out to isolate *Bt* from legume plant rhizosphere. Out of 12 Bt strains characterized and identified, Ak2. IIPR was selected based on its potency and a nanoformulation was made with 1 mM silver nitrate. For nanoformulation preparation flasks were incubated in shaker at 200 rpm for 72 hours under dark conditions. The efficacy of the nanoformulation is compared with conventional spore crystal mixture of same strain and also with the *Btserovar Kurstaki* z-52 strain. The nanoformulated Ak2.IIPR has given highest percent mortality on 10 days old larvae of *H. armigera* and *S. litura*. The present study lucidly depicts the potency of nano- formulated native *Bt* strain (Ak2.IIPR). This product will help in increasing the productivity of green gram by sustainable management of *H. armigera* and *S. litura*. Moreover the production cost of biopesticides is also lower compared to these synthetic insecticides. Hence, farmers can gain more profit by using the biopesticides.

T1 : CMP-23

Trend of growth analysis of pulse production in Uttar Pradesh

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Pulses occupy a prominent place in human nutrition particularly among the lower-income groups of people in developing countries like India.These grains are relatively inexpensive source of protein in developing countries where malnutrition is quite common. The protein content in pulse grain generally ranges from 20-25 per cent. Besides, protein, pulses are also good sources of dietary fibre, starch, minerals and vitamins. However; the production of pulses from decreasing arable land available for agriculture is far from the demand by burgeoning population. Uttar Pradesh is the second largest producer of pulses in the country accounting for about 8.26 percent in area and about 9.14 percentinproduction of theIndia. The study is based on the secondary data on area and production for the period of 2001-2015. The study is revealed that the annual compound growth rateof area and production during this periodwas found negative of area (-1.06 percent)and production both (-0.84per cent).While the growth of productivity of pulse was found to be positive (0.27 per cent). The analysisdemonstrated over all decreasing trend in area and production of pulsein Uttar Pradesh with marginal increase in productivity. The productivity needs to be enhanced considerably by horizontal scaling up of modern production technology and seed production distribution of superior cultivars in the required quantity. Where is need to diversify the basket of pulses by including short duration cowpeas both summer and rainy season.

T1 : CMP-24

Effect of organic and inorganic sources of nitrogen application on yield and quality parameters in wheat (*Triticumastivum L.)*

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The experiment was conducted at Agronomy Research Farm of Narendra Deva University of Agriculture and Technology, Faizabad (U.P.).The experiment consisted of 6 treatments, was laid out in Randomized Block Design (RBD) of Variety HD-2967 with four replications.The various parameters like plant height, dry matter accumulation, no. of shoot m^{-2}were increased significantly higher$T_6$with nitrogen use in 75% of recommended dose nitrogen though inorganic source + 25% of recommended dose of nitrogen through organic source (FYM). Application of nitrogen use in 75% of recommended dose nitrogen though inorganic source + 25% of recommended dose of nitrogen through organic source (FYM) increased all the yield contributing character significantly viz., no. of effective ear head, number of grain, test weight compression to other treatment. This might to be due to the fact that nitrogen application with combination of organic and inorganic source increased the root development which enhanced the absorption of nutrients from soil which resulted in better development of source capacity i.e. leaf area and its utilization towards yield contributing characters. T_6 has higher values of all these growth and yield contributing character.

T1 : CMP-25 Effect of Nutrient Management Practices on Yield and Nutrient Uptake of different Soybean Varieties

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A field experiment was conducted during *kharif* season of 2015 on silty clay loam soil at MPKV, Rahuri (MS). The results showed that, the variety KDS-344 recorded significantly the highest grain and stover yield of soybean. The grain yield of soybean was significantly higher by application of fertilizer dose of 125% GRDF + 0.5% Grade IInd foliar spray at 30 and 45 DAS than other treatments, however, it was found at par with 75% GRDF + 0.5 Grade IInd foliar spray at 30 and 45 DAS and 100% GRDF + 0.5% Grade IInd foliar spray at 30 and 45 DAS. Similarly, growth and yield attributes *viz.,* plant height (cm), number of branches, number root of nodules, number of pod plant^{-1} and weight of seeds plant^{-1} (g) were recorded maximum under 125% GRDF + 0.5 Grade IInd foliar spray at 30 and 45 DAS. Application of fertilizer dose to soybean 75% GRDF + 0.5% Grade IInd foliar spray at 30 and 45 DAS The total uptake of N, P and K in soybean was recorded significantly the higher by variety KDS-344. The total uptake of nitrogen and phosphorus were recorded significantly higher with application of 125% GRDF (62.5:93.75:00 N:P_2O_5:K_2O kg ha^{-1} + 6.25 tons FYM ha^{-1}) + 0.5% Grade IInd foliar spray at 30 and 45 DAS (kg ha^{-1}) than the rest of the treatments, however it was found at par with treatment of 75% GRDF + 0.5 Grade IInd foliar spray at 30 and 45 DAS and 100% GRDF + 0.5% Grade IInd foliar spray at 30 and 45 DAS. On the basis of experiment, It could be concluded that, the optimum yield, nutrient uptake and higher economic returns of soybean can be achieved by sowing variety KDS-344 fertilized with 75% GRDF (37.5:56.25:00 N, P_2O_5, K_2O kg ha^{-1} + 3.75 tons FYM ha^{-1}) + 0.5 % Grade IInd foliar spray of micronutrient at 30 and 45 DAS.

T1 : CMP-26 Income generating, available low cost technology for integrated fish farming in eastern U.P.

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Rural population comprises about more than three fourth of the total population of India. In addition of the animal protein in their diet, gainful employment and sustained income are their most important requirements. Their land holdings are small and modern production technology with high input requirement is no solution to their problem. These small and marginal farmers in addition to small land holding do have surplus family labour, a few cattle, a few pigs and a small flock of duck or poultry. A low cost integrated farming system based on the principles of productive utilization of farm waste and full utilization of available resources and man power will be very suitable for these farmers and they can easily be motivated to integrated fish farming.

Integrated fish farming includes fish with crops (paddy, sugarcane, and pulses), livestock, horticulture, sericulture, poultry etc. The wise integration of these farming systems promotes full utilization of land area and recycling of wastes and byproducts, minimizes the operational expenses in feed and fertilizer and maintains a balanced ecosystem.

T1 : CMP-27 Nutritional and malting quality parameter's of hulled and hull-less Barley germ plasm(*Hordeumvulgare*L*)*

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Barley contains high dietary fibre in the form of betaglucan,which helps in lowering plasma cholesterol level,reduce glycemic index and helps in minimizing risk of colon cancer.Barley is suitable for malting bescause of presence of cemented lumma and palea (hull).During the process of malting and brewing,the byproduct left after separation of worth are rich in protein, fibre, arabinoxylan and betaglucan which have an opportunity for cereal based baked and extracted products with acceptable sensory and nutritional characteristics the Present investigation entitled "Nutritional and Malting Quality Parameter's Hulled and Hull -Less Barley germpalsm" was carried out at Student Instructional farm of ND University of Agriculture and Technology KumarganjFaizabad. Fifteen germpalsm of Barley namely NDB- 1,2,3,943,1173,1487,1465,1557,1596,1520,1582,1587,1445,Jyoti and Azad were collected form Department of GPB of this University and used as experimental material. They were grown in RBD design with three replications. After harvesting the seeds of each germplasm were collected separately and used for the analysis of Protein, essential amino acids, carbohydrate, total sugar, total mineral and crude fibre content.

The protein content in Barley germplasm was recorded between 8.33-11.52 per cent and highest content was found in NDB – 2. The amino acids namely lysine (2.62-4.50g/16gN),methionine (1.64-2.04 g/16gN)and Tryptophan content (0.97-1.17 g/16gN)were observed highest in NDB – 2 germplasm. The carbohydrate content was found maximum in NDB – 1596 (72.53%)while total sugar content was obtained maximum in NDB – 1587 (4.80%). Total mineral (1.82-2.65%)and crude fibre (3.61-4.93%)were obtained maximum in NDB -2 (4.93%).On the basis of nutritional and malting quality parameter's germplasm NDB – 2 was found suitable for malting quality parameter's followed by NDB – 1173 and NDB – 1520.

T1 : CMP-28 Effect of sulphur nutrient and moisture regimes on economics of wheat (*Triticumaestivum* L.) varieties

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The field experiment was conducted at Agronomy Research Farm of Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad (U.P.) during *Rabi* season of 2013-14 and 2014-15.The experiment was carried out in split plot design with three replications. with 24 treatment combinations, comprised of four irrigation levels (a) I_1; 0.6 IW/CPE ratio (b) I_2; 0.8 IW/CPE ratio (c) I_3; 1.0 IW/CPE ratio and (c) I_4; 1.2 IW/CPE ratio with two varieties namely PBW 343 and PBW 502 and three sulphur levels (a) Control (b) 20 kg/ha (c) 40 kg/ha. The growth attributes plant hight, no of shoot m^2 and leaf area index was significantly superior 1.2 IW/CPE ratio with PBW 502 variety at all growth stages except 30 days after sowing.PBW-502 (V2) wheat cultivar recorded significantly higher yield of crop over PBW-343 (V1). Moisture regime 1.0 IW/CPE (I3) has been found most suitable for wheat production. The optimum dose of sulphur has been found as 20kg/ha (S2) for wheat production. Wheat cultivar, PBW-502 (V2) recorded the significantly high uptake of NPK andsulphur under 1.0 IW/CPE moisture regime (I3) with 20kg/sulphur dose kg/ha. (S2). Wheat cultivar PBW-502 (V2) accrued the maximum net return with B:C ratio of 2.65 and 2.47 under 1.0 IW/CPE moisture regime (I3) with 20kg/ ha. Sulphur dose (S2) during the year 2013-14 and 2014-15, respectively.

T1 : CMP-29 Effect of seed rate and nutrient supply system on productivity of late sown wheat (*Triticumaestivum* L.)

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The field experiment was conducted at Agronomy Research Farm of Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad (U.P.) during *Rabi* season of 2012-13.Twelve treatments comprised of four levels of fertilizers (50% RDF + 50% N through FYM, 75%RDF + 25% N through FYM, 100% RDF and 125% RDF) and three seed rates (100, 125 and 150 kg ha^{-1}) were tested in a randomized block design with three replications. The growth attributes*viz*; number of shoots, plant height, dry matter accumulation and yield attributing characters *viz*, number of grains $spike^{-1}$, number of spike m^2, length of spike, test weight, grain and straw yield, harvest index, nutrients uptake by crop was significantly increased 125 % RDF along with 150 kg seed rate which was at par with 100 kg RDF along with 125 kg seed rate and significantly higher over rest of the treatment as well as economics of various treatments were recorded. On the basis of results obtained, application of 125% RDF, nutrient supply system and 150 kg ha^{-1} seed rate found to be more suitable for higher yield of wheat variety Malviya 234.Wheat cultivar Malviya 234accrued the maximum net return with B:C ratio of 2.65 and 2.47 under 1.0 IW/CPE moisture regime (I3) with 20kg/ ha. Sulphur dose (S2) during the year 2013-14.

T1 : CMP-30 Role of chitin and its derivatives in agriculture to modify plant-microbia interaction and improve crop yields: An overview

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India produces large quantity of waste material from the sea food industry which is rich in chitin. These materials have vast potential to be used in the agriculture after their testing and development of chitin containing material. In recent advances, it is established the many mode of action and how chitin and its derivatives may enhance crop yield. Other than its direct role in plant nutrition and as a growth promoter, chitin derivatives product also play role in toxicity for crop pest and pathogens, induce crop defense mechanism and promote the growth of plant and increase the beneficial microorganism. Number of published studies showed that chitin -based derivatives enhance and implicate the activity of beneficial chitinolytic microbes. Several published studies showed that chitin -based derivatives increase and implicate the activity of beneficial chitinolytic beneficial microbes. This article reviews the evidence for thought that chitin and its derivatives and products can increase the crop yields and the current understanding of the modes of action and interactions with a focus on beneficial plant-microbe.

T1 : CMP-31 Role of improving soil health in doubling the income of sugarcane farmers' in India

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India has the distinction of being second largest sugarcane producing country of the world. In India, sugarcane is an important cash crop which contributes 10% of the total value of agricultural output and occupies only 2.57% of the total cropped area. Indian sugar industry having more than 760 sugar factories in operation is the second largest agro-based industry (next to cotton textile) located in rural areas. The industry is instrumental in generating sizeable employment in rural sector directly and through ancillary industries. Sugarcane provides livelihood to around 6

million cane growers. Sugarcane crop is significantly influenced by soil, climate and irrigation facilities. It is a historical anomaly that a crop, which is native of tropics, is being cultivated in sub-tropics from time immemorial. Although, the crop has a wide range of adaptability, its productivity and quality depends largely on the climatic conditions and weather fluctuations.

Sugarcane is extensively grown in alluvium, red sandy, red and yellow, medium black and coastal alluvium soils. There are two types of soil related problems for sugarcane cultivation such as soil salinity/ alkalinity and depletion in soil fertility. The problem of soil salinity and alkalinity can be corrected through soil amelioration techniques and the depleted soil fertility can be managed through integrated plant nutrient supply systems. Income of the sugarcane growers has not been increasing in the ratio of increasing cost due to several factors, therefore, it is of utmost importance to increase their income by various measures. Apart from it, raising of sugarcane by ratooning without adequate supplemental nutrient deteriorates the soil fertility status. The major soil/climatic factors responsible for sugarcane yield are organic matter content, cation exchange capacity (CEC) and soil reaction (pH) and mean annual minimum temperature. The studies conducted at ICAR-IISR, Lucknow reported that soils with clay content 25-40%, pH 6.5 to 9.5, organic carbon 0.4 to 0.7%, $CaCo_3$<5% base saturation of 40-100% and DTPA-extractable Zn 0.2 to 1.0 mg/kg, Mn 5 to 7 mg/kg are optimum range for higher sugarcane production. The study suggests a fair understanding of water, soil and climate related factors which is responsible for increasing sugarcane and sugar productivity which could be of immense help to the administrators, planners, research and development personnel in doubling the income of the sugarcane farmers of the country.

T1 : CMP-32

Quality characters and maturity assessment in sugarcane

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Sugarcane is a perishable commodity and must be processed into sugar quickly after it is harvested. Sugarcane grows in different weather and management conditions which directly affect crop maturation. Maturity of cane refers to rapid synthesis and storage of sucrose in stalks. It is related to crop age and quantum of sucrose content in juice. Cane sugar is manufactured by the leaves of sugarcane crop and its accumulation in stalks proceeds from the end of vegetative growth. The same has to be recovered through juice clarification to remove various non-sucrose substances. In addition to loss in sugar recovery, its adverse effect has been noticed in the sugar manufacturing process and sucrose quality. Efforts have been made to reduce loss in tonnage and sucrose using breeding methods. More than 45% of the total dry weight of stalk is sucrose which becomes 80% if the rind of the stalk is excluded whereas fresh weight of juice may contain 18-22% sucrose. The crushing of harvested cane should be done immediately for high recovery and juice quality may improve with the ripening of cane. The quantity and quality of juice is dependent on quality of soil, climatic conditions, sugarcane variety and method of cultivation. These conditions lead to the necessity of quantifying crop response to different stimuli for planning purposes. Forecast models for quality of raw material are important tools in sugarcane farming, especially the forecast curve of sucrose accumulation in shoots. The process of sucrose synthesis and their accumulation is mainly determined by the crop age and environmental conditions. After harvesting of cane, the process of sucrose is stopped but other metabolic activities remained vital inside the cane and require energy for their preparation. The required energy obtained from the breakdown of existing sucrose is responsible for deterioration caused by microbial infection. So, from above it can be conceded that for evolution of sugar improvement, the gap between cane harvesting and processing should not be more than twenty four hours.

T1 : CMP-33 Doubling farmer's income by increasing access to the quality seed potatoes

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Availability of quality planting material has always been a limitation in vegetatively propagated crops. Potato, largely being a vegetatively propagated crop, is subjected to large number of seed-borne diseases responsible for yield degeneration.The use of quality seed involves two aspects: whether seed of good quality and in large enough quantities can be supplied and whether growers are willing to use quality seed considering the cost—benefit ratio. Both aspects are related to market conditions. The only factor motivating growers to grow potatoes is competitive returns compared to other crops. If higher profits can be achieved, growers would be eager to get quality seed, and then seed producers could have a market for their product. Potato growing has become a major source of income to the farmers. Since the profits from increasing yield are higher by using quality seed, growers are willing to buy good quality seed. Higher profits from potato growing are encouraging growers to use quality seed. ICAR-CPRI produces ~ 3,187 metric tonnes of nucleus and breeder seed of 25 popular potato varieties; out of which 70% is through conventional system whereas, 30% through high-tech systems. As there is limited scope to increase quantity of breeder seed production at ICAR-CPRI farms due to limitation of farm land, possibilities are being explored with the help of SAUs/KVKs/Pvt. farmers to identify the new areas of seed production, multiplication of breeder seed into FS-I, FS-II and Certified Seed under MoU and to produce seed through hi-tech systems with the help of entrepreneurs/private companies. Incorporation of hi-tech seed production system coupled with advance virus detection techniques is the only way out in fulfilling the huge demand of quality seed potatoes in the country.

T1 : CMP-34 Studies on compatibility of insecticide and fungicide molecules against major pests and sheath blight in rice

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Two insecticides molecules Rynaxypyr (0.3 ml/l), Dinotefuran (0.4 ml/l) and two fungicides molecules Carbendazim + Mancozeb (2.0 ml/l) and Validamycin (2.5 ml/l) were tested alone as well as in combination with an untreated control against stem borer and sheath blight during the year 2014-15 and 2015-16 at Crop Research Station, Masodha. Results of two-year data revealed that Rynaxypyr followed by combination of Rynaxypyr + Validamycin also recorded lowest incidence of white ear in both the years (3.3 and 4.4 % in 2014) and (1.6 and 1.0 % in 2015) respectively. The grain yield was highest in Rynaxypyr + Validamycin (34.0 q/ha in 2014-15 and 34.08 q/ha in 2015-16) followed by Dinotefuran + Validamycin (32.50 q/ha in 2014 and 32.25 q/ha in 2015).

T1 : CMP-35 Integrated farming system approach for doubling the sugarcane farmer's income by 2022

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Farmers' income can be improved if/when productivity goes up, if/when the cost of production comes down, if/when we ensure agricultural commodities produced get a remunerative price through a transparent price discovery mechanism. Weakening of the traditional joint family concept combined with unchecked linear growth in human population lead indiscriminate fragmentation of land holdings.Small and fragmented land holdings do not allow a farmer to keep independent farm resources and other sophisticated machineries for various cultural operations. Further, most of the inputs have become costly and out of reach of these resource poor farmers which has resulted farming as an uneconomic and unsustainable enterprise. Sugarcane based Integrated Farming System may hold promise to mitigate such problems and may prove as resource management strategy to enhance the income and

sustained production of farm households while preserving resource base and maintaining a high level environmental quality.

Apart from sugarcane based intercropping systems, components of the farming systems viz dairy, duckery, poultry, horticulture, apiary, pisciculture and plantation crops viz;, banana, papaya etc. along with crops may increase net profit significantly. This in turn raises the socio-economic status of small and marginal resource constrained farmers and generates employment especially for rural women and youths. Integrated Farming System in Sugarcane Agribusiness is in real sense activity of partnership and collaborative linkages with different agro- based industries.The potential enterprises which are important in farming system in the way of making a significant impact of farm by generating adequate income and employment and providing livelihood security are Crop Production (Sequential cropping systems, intercropping systems). Other components of farming systems with sugarcane are Dairy farming, Goat and Sheep Rearing, Piggery, Poultry, Duck Rearing, Apiculture, Fishery, Sericulture, Mushroom Cultivation, Agroforestry, Biogas. Presently, researches on IISR Sugarcane based IFS model are under progress on Sugarcane based IFS Model.Components of IFS Model are

- Sugarcane(Sole)/Intercropping with cereals/pulses/oilseeds/ vegetables (0.6ha) : 60% area (Sugarcane based Crop Rotations/systems)
- Mushroom, vermicomposting, Beekeeping & land for house (0.1ha)
- Horticulture –Banana, Papaya (0.1 ha each)
- Dairy with one or two cows,
- Food/fodder/vegetable and other crops for household uses (0.1 ha)
- Karonda (*Carissa carandas*) as boundary plantation (0.1 ha)

T1 : CMP-36 Doublingthesugarcane farmers' income through crop diversification and integrated farming system models

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Globally, sugarcane is grown in diversified cropping systems under varying edaphic and climatic conditions. As a result, not only sugarcane production fluctuates over the years but also the cost per tonne of cane produced varies considerably. Indiscriminate break-up of land holdings due to weakening of the joint family combined with increase in human population isunder woes. Per capita availability of land in India has declined from 0.5 ha in the year 1950-51 to 0.15 ha in the year 2000-01. Sugarcane based Integrated Farming System may hold promise to mitigate such problems and may prove as resource management strategy to enhance the income and sustained production of farm households while preserving resource base and maintaining a high level environmental quality.

In view of changing market scenario, consumers' preferences and global competitions, new income generating opportunities need to be created through crop diversification in sugarcane **'Produce to Product Chain'**. This would help in increasing the land utilization efficiency, reducing the production cost, economizing the use of market purchased costly inputs and making plant-ratoon system sustainable. Several crops and varieties are identified for intercropping in autumn and spring planting sugarcane at IISR, Lucknow.

Apart from sugarcane based intercropping systems, components of the farming systems viz dairy, duckery, poultry, horticulture, apiary, pisciculture and plantation crops viz;, banana, papaya etc. along with crops may increase net profit of the farmers significantly. This in turn raises the socio-economic status of small and marginal resource constrained farmers and generates employment especially for rural women and youths, which help mitigate the goal of doubling the farmers' income. The findings of the research experiments conducted at IISR on Integrated Farming System clearly indicated that intercropping of potato in autumn and ladies finger in spring planted sugarcane along with the ancillary activity viz. bee- keeping holds promise in increasing thenet farm income.

Intercropping Systems in autumn sugarcane under practice are (1). Sugarcane + onion,(2). Sugarcane + Garlic,(3).Sugarcane+ Potato,(4).Sugarcane+ Lentil,(5).Sugarcane+ Mustard,(6). Sugarcane+ Cauliflower and (7).Sugarcane + Pea.Under the experimental results, yield of sugarcane under sole as well as in intercropping system varies from 90.3 to 92.2 t/ha. Among the different intercrops only Ladies finger was found compatible and produced about 6.0 q of produce with a profit of Rs 18564 from 0.06 ha area. Under autumn planted sugarcane crop vegetable pea and potato was intercropped. The net income from potato and pea was Rs. 12000 and Rs 7500 respectively. Bee-keeping enterprise yielded about 6.1 kg of the honey. Banana, Papaya and karouda plantation also can be done under integrated farming system programme. Over all it may be inferred that sugarcane based crop diversification and IFS models holds promis in doubling the farmer's income.

T1 : CMP-37 Integrated farming system: An effective approach for minimizing risk & doubling the farmers income

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Agriculture production in India has been stagnating and investment on agriculture is declining. It is faced with several constraints and degradation of natural resources, increasing biotic and abiotic stresses, energy supply and decreasing factor productivity. To safeguard food security to the growing populations and to maintain environmental quality without further deterioration, the available resources have to be effectively harnessed and effectively managed. Burhanpur district of Madhya Pradesh is one of the leading districts in the field of agriculture with total cultivated area nearly 1,17000 ha and cropping intensity is nearly 145%. Despite numbers of favorable factors, the district agriculture is not very encouraging especially when it comes to tribal area of the district where majority of the farmers is dependent on rainfed farming. Unable to meet livelihood from agriculture and a large number of small and marginal farmers from the district go to the urban areas within and outside the district for seasonal migration. As livelihoods became more difficult to sustain for the farming communities, borrowing to supplement livelihoods deficit is the norms to survive.

Keeping above factor in view, KrishiVigyan Kendra, Burhanpur with the support of ATMA started working on adoption of area specific IFS model from 2014-15 onwards through various extension activities and demonstration in order to minimize the risk and raising the farmers income per unit area. Besides above, the introduction of new crops and varieties is also one of the important interventions. The study revealed that integration of different enterprises like goatry, poultry with agriculture and technological intervention helps in raising the income and securing the livelihoods. It can be concluded that multiple livelihoods strategies would enhance the prospects of farm and non-farm employment through micro enterprises development.

T1 : CMP-38 Impact of C.S.R. Bio in cereals crops (Paddy and Wheat) in reclaimed sodic soil

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In reclaimed sodic soil the application of CSR bio @ 20% /ha (with 400/ha) increase seed yield by 10 to 15% microbes present. In C.S.R. Bio supported Nutrient Mobilization, availability and ion exchange. C.S.R. Bio also increases availability and mobility of phosphorus, potassium and Iron uptake. By the plant from the soil use of bio with FYM increases organic matter, CED and CN ratio in soil which ultimately resulted higher yield and net profit. It also supports succeeding crops, their growth and development. Extra Net return 13,000.00 thousand/ ha in paddy and Rs. 6000/ ha in wheat are sign of performance of C.S.R. Bio in reclaimed sodic soil.

Indiscriminate use of fertilizer and pesticide which a part from reducing the sustainability in production as well as, it concerned over Eco- system contamination with residual effect. Use of C.S.R. Bio will be beneficial it is cast effective and remunerate time in crop production. It also induces disease resistant and against soil born disease.

T1 : CMP-39 Doubling farmers' Incomes through different approaches

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Introduce skill-based based activities of farmer to raise the farm productivity of farmer through Seed replacement, IPNM, IWM, Diversification of farming Enhanced Irrigation facilities, Precision agriculture, Shift to high value commodities: horticulture, Dairy, Poultry, Fisheries, Bee keeping, Value addition etc. and to boost exports and generate high-productivity employments. Agricultural advances will include implementation of crop location strategies, conversion to crops with higher economic value or productivity per unit of water consumed, and adoption of alternate drought-tolerant crops. Public Private Partnerships need to be encouraged through promotion of rural advisory services especially in hi-tech agriculture etc. for the benefit of the farmers. Restructuring and strengthening of agricultural extension machinery has to be a judicious mix of extensive physical outreach of personnel, enhancement in quality through regular training, new methods of information dissemination, public- private partnership, use of information & communication Technology (ICT), Mass Media and convergence of extension – related efforts under various schemes and programmes at state and central levels.

T1 : CMP-40 Identification of resistant sources for *Alternaria* blight of pigeonpea (*Cajanus cajan* L. Millsp)

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Pigeonpea *(Cajanus cajan* L. Millsp) is the most important grain legume grown in India. The crop is affected at various stages of the crop. Among the biotic stress stresses, *Alternaria* blight, caused by *Alternaria tenussima* is one of the most important foliar diseases of pigeonpea. Management of this disease through chemicals pesticides is not feasible and it affects the human, animal and ultimate causes the environmental pollution. Hence, considering host plant resistance (HPR) is one of the most important tools in managing this disease and reducing the yield losses of pigeonpea caused by *Alternaria tenuissima.* One hundred six genotypes of pigeonpea were obtained from the Department of Genetics and Plant Breeding, N.D. University of Agriculture and Technology (Kumarganj), Faizabad (U.P.) and screened at University Research farm for their reaction to *Alternaria tenuissima* under natural and artificial inoculated conditions by spraying inoculums (15-20 conidia/microscopic field). The genotypes were screened by 1-9 scale disease rating scale.

Out of 106 genotypes, seven genotypes viz. Path 402 , Path 407,NDA14-4, NDA14-15, NDA-14-16, NDA-14-29 and NDA-14-36 were found resistant, 33 genotypes *viz.*, Path403,NDA-13-1,NDA-13-2 ,NDA7 11,NDA-3, NDA-2-SPS-1, NDA-2-SPS-2, NDA-14-1, NDA-14-2, NDA 146, NDA-14-8, NDA-14-9, NDA-14-17, NDA-14-18, NDA-14-19,NDA-14-23, NDA-14-24, NDA-14-26, NDA-14-27, NDA-14-28,NDA-14-30, NDA-14-31, NDA-14-34,NDA-14-35,NDA-14-37,NDA14-38, NDA-GC-2010-14, NDA-GC-2, NDA-GC-2010-21, IC525505, IC2288 , ICP7353 , Path-14 were found moderately resistant, 53 genotypes *viz.*, Path2, IC525446 , IC 525433, IC 525500, IC525494, IC525533, Path18, Path19, Path21, Path22 , Path23, Path40 , Path404, Path406, Path408, Path409 , Path413, Path145, NDA-2(ch), NDA-1(ch), NDA-1, NDA-94-2, NDA-14-3, NDA-14-5, NDA-14-7, NDA-14-10, NDA-14-11, NDA-14-12, NDA-14-13, NDA-14-14, NDA-14-20, NDA-14-21, NDA-14-22, NDA-14-25, NDA-14-32, NDA-14-33, NDA-14-39, NDAW-304 , NDAW-3 , Path8 , Path7 , Path5 , Path107 , Path15 , Path13, NDA-GC-2010-5 , NDA-GC-2010-81 , NDA-GC-2010-83 , IC525414 , IC525486 , ICP-88600-2 , ICP-3377 , IC525425 were found moderately susceptible and 13 genotypes *viz*., IC525403 , IC525520 , Path 20 , Path 24 , Path 411 , Path 412 , NDA-12-1, NDA-GC-2010-016, NDA-GC-2010-44, Path 16 , Path 10 , Path 9 , Path 3 were found susceptible to *Alternaria* blight. The most susceptible variety Bahar showed 100 percent blighting. Resistant lines can by exploited in resistant breeding programme.

T1 : CMP-41 Effect of Seed Priming on Seedling Vigour, Seedling Establishment and Crop Productivity of Vegetable Crops

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Poor establishment of any crops is mainly due to poor seedling emergence and seedling vigor. For which different seed treatment practices have been adopted in different crops.Seed priming is a useful technique for enhancing seed vigour and thereby, improving overall germination and seedling development in crop species.Seed priming is a pre sowing seed treatment that involves the controlled hydration level within seeds so that the metabolic activity necessary for germination can occur, but radical emergence is prevented. During this phase, different physiological activities occur within the seed at different moisture levels.Priming of seeds of different crops alleviates the adverse effects of salinity stress and enhance crop yield. The priming techniques improved growth and yield of all the crops although the hybrids showed variation in responses to different treatments. In almost all the cases, improvement in seedling vigour and agronomic traits specially yield with special reference to tomato and chilli was observed. *S*eed priming with KNO3 (0.2%) increases significantly germination, root and shoot length and seedling vigour in vegetable crops. Osmopriming of seeds with NaCl nullify the adverse effects of salt stress. In general, hydropriming and halopriming gave favourable response in respect of agronomic traits and yield in tomato, whereas priming treatments improved agronomic traits and earlier fruiting in chillies. Hydropriming-1 gave about 67% increase in yield as compared to control in chilli. Different priming treatments showed beneficial effects on cucumber such as plant height, number of leaves, early fruiting and number of fruits. In case of cabbage there are beneficial effects of some agronomic variables such as emergence percentage, plant height, number of leaves, and leaf length. In all the treatments mentioned above cabbage showed remarkably greater growth specially in hydropriming-I and halopriming compared to control.

T1 : CMP-42 Diversity of Seed-borne Mycoflora in Wheat under Sugarcane Based Cropping System

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Wheat-Sugarcane-Ratoon-Wheat cropping system has occupied about 18 per cent of the sugarcane area is in Bihar. This relay cropping, concomitants the seed-borne pathogenic mycoflora which plays a vital role as primary source of infection in the field diseases. In this context, a study was conducted to work out the diversity of seed-borne mycoflora in relation to different wheat varieties at Indian Institute of Sugarcane Research. Seeds of five varieties of wheat grown under Wheat-Sugarcane-Ratoon-Wheat cropping system were subjected to Standard Blotter Paper Method (ISTA 2013) for the isolation of seed-borne mycoflora. After incubation of seeds, fungi developed on each seed were examined and the results are as under. Among the different varieties tested, the variety Raj 3765 was found more tolerant for the per cent infection of seed that is 12.00% under pre-treated condition and 25.50 % under untreated condition with five fungi *viz., Alternaria triticina, Bipolaris sorokiniana, Fusarium graminearum, Aspergillusniger*and*Rhizopus species.* The variety HI 1537 was found more susceptible for the per cent infection in both pre-treated and untreated condition with twelve fungi *viz., Alternaria alternata, A. triticina, Bipolaris sorokiniana, Curvularia lunata, Fusarium moniliforme, F. Graminearum, Stemphyliumherhurum, Aspergillus niger, A. flavus, Rhizopus species, Mucor species and Penecilliumspecies*. Maximum of 100 % germination under pre-treated and 99 % germination under untreated condition were found the variety Raj 3765 where as minimum germination was observed in the variety PBW 343 (96 %) under untreated and in the variety HI 1537 (91 %) under pre

treated condition. In total, Standard Blotter Paper Method yielded a sum total of 12 mycoflora found associated with the seeds of wheat which were *Alternaria alternata, A. triticina, Bipolaris sorokiniana, Curvularia lunata, Fusarium moniliforme, F. Graminearum, Stemphyliumherhurum, Aspergillus niger, A. flavus, Rhizopus species, Mucor species and Penecilliumspecies*.

T1 : CMP-43

CoLk 09204 – A Promising Sugarcane Mid – Late Maturing Sugarcane Variety

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Variety is the pivot around which entire production system revolves. Therefore, success of any sugarcane production system largely depends in selection of an appropriate variety for the particular agro-climatic zone. New sugarcane varieties are continuously evolved for different growing conditions. Proper balance of early and mid-late sugarcane varieties is very important for better cane productivity, longer crushing period and sugar recovery. Replacement of old and deteriorated sugarcane varieties with new improved ones through the quality seed cane production programme is the need of the hour.

CoLk 09204 (Ikshu-3), a midlate clone, is the result of concerted efforts at breeding for high yielding and high sugar midlate maturing sugarcane varieties. It has an improved IISR variety 'CoLk 8102' as its female parent and 'CoJ 64', an extraordinary high sugar variety, as its male parent. It has been selected from the progeny of the bi-parental cross (CoLk 8102 x CoJ 64) and subsequently evaluated in clonal generations. 'CoLk 09204' was proposed and accepted as midlate maturing clone for multi-location testing in the North West Zone of the All India Coordinated Research Project on Sugarcane during 2009. 'CoLk 09204' has given excellent performance in the AICRP(S) Varietal Trials (averaged over 8-9 locations in the North West Zone) with Commercial Cane Sugar and cane yield of 9.30 and 82.8 t/ha, respectively. The clone has shown an improvement of 19.83 %, 13.11% and 9.96% for cane yield over the standard varieties CoS 8436, CoPant 97222 and CoS 767, respectively. It has shown an improvement of 11.51 %, 5.32 %, and 5.20 % for CCS yield over the standard varieties CoS 8436, CoS 767 and CoPant 97222, respectively._For sucrose% in juice at harvest (360 days), 'CoLk 09204' recorded an average value of 17.0 % for two plant and one ratoon crop across 8 locations in the North West Zone which is comparable and *on par* to the best adopted standard CoS 767 (17.1%)._This clone was also evaluated under U.P. State Zonal Varietal Trial over three years across 11 locations in Uttar Pradesh. Under these trials, 'CoLk 09204' recorded 11.98% pol in cane averaged over three plant and one ratoon crops which is numerically higher than CoS 767 (11.90%).

The additional strength of 'CoLk 09204' lies in its ratoonability. Its ratoon crop gave approximately 12.48%, 8.87% and 6.27% increase in cane yield over the standards CoS 8436, CoS 767 and CoPant 97222, respectively. Considering the fact that raoon crop constitute 50% of the total sugarcane acreage and is held responsible for poor cane productivity, a variety like 'CoLk 09204' will definitely help farmers in reaping higher cane productivity and production. With respect to resistance for red rot, 'CoLk 09204'recorded Resistant to Moderately Resistant' reaction against the two prevailing races *Cf* 08 and *Cf* 09. It recorded 'Less Susceptibility'(LS) reaction to major insect pests of the subtropical zone. The clone, 'CoLk 09204', is lodging tolerant and suitable for multiple ratooning with lush green top at maturity. This provides additional benefit in form of green fodder to the farmers.

T1 : CMP-44

Scope of entrepreneurial opportunities in livestock sector for doubling the farmers' income

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India has the distinction of being largest milk producing country since 1998 along with largest livestock population in the World. Milk production in India has increased from 17 million tonnes to 146.3 million tonnes during the period 1950-51 to 2014-15. The increase in milk production led to increased per capita availability of milk in the country from 130 gram per day during 1950-51 to 322 gram per day in 2014-15 which is significantly higher over the world average of 293.7 grams per day during 2013. Millions of rural families have adopted dairy farming as an important secondary source of income. This sector has been playing an important role in providing employment and income generating opportunities particularly for marginal and women farmers. Most of the milk is produced by animals reared by small, marginal farmers and landless labourers. About 15.46 million farmers have been brought under the ambit of 165835 village level dairy corporative societies up to March 2015.

The Government of India is making its sincere efforts for strengthening this sector through various Central sector Schemes like "National Programme for Bovine Breeding and Dairy Development", National Dairy Plan (Phase-I) and "Dairy Entrepreneurship Development Scheme". Four existing schemes i.e. Intensive Dairy Development Programme, Strengthening Infrastructure for Quality & Clean Milk Production, Assistant to Cooperatives and National Project for Cattle & Buffalo Breeding has been restructured and named as National Programme for Bovine Breeding and Dairy Development since inception of 12th Plan. The Govt. is trying its best to increase further milk production by productivity enhancement, strengthening and expanding village level infrastructure for milk procurement and providing greater access of the markets to the milk producers. The strategy involves improving genetic potential of livestock, producing required number of quality bulls, and superior quality frozen semen and adopting adequate bio-security measures etc. The scheme is implemented by NDDB through end implementing agencies like state Dairy Cooperative Federations/Unions/Milk Producers Companies. NDP-I would focus on 15 major milk producing States - Uttar Pradesh, Punjab, Haryana, Gujarat, Rajasthan, Madhya Pradesh, Bihar, West Bengal, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, Orissa and Kerala which account for over 90% of the India's milk production. Now the area of Operation of NDP-I has further been extended to three more states i.e. Jharkhand, Chhattisgarh and Uttarakhand.

As per the data published under 66th round of the Employment and Unemployment Situation by NSSO, the unemployment rate (number of person unemployed per 1000 persons in the labour force), according to usual status, was 16 in the rural areas against 34 in the urban areas. It was 16 for both males and females in the rural areas against 57 for urban females and 28 for urban males. The unemployment rate was much higher among the youth (15-29) as compared to that in the overall population. According to the usual status, unemployment rate among the youth was 5% each for male and female in rural areas against 8% for urban male and 14% for urban female. As livestock sector is the backbone of Indian agriculture, having enormous potential to increase present annual growth rate and immense scope for increasing its contribution to the national GDP for making livestock sector one of the most potential enterprise. The unemployed youths can go for dairy farming which not only provides ensured income but it can also be adopted by farmers, especially rural women as backyard livestock farming as a subsidiary business for providing the employment to the unemployed and increasing their income. The study also recommends that the Government of India should also provide subsidy to the animal sector and frame the policies for developing the interest of the farmers in the livestock sector. Support of technocrats is highly needed to train the rural youths so that they can apply the latest technical knowledge for developing proper enterprises in this sector. These measures will certainly be helpful in increasing the income of farmers.

T1 : CMP-45 Noble indices for degree of host plant resistance against Alternaria blight in rapeseed-mustard

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Experiments were conducted at Genetics and Plant Breeding Research Farm of N. D. University of Agriculture and Technology, Kumarganj, Faizabad (U.P.) to evaluate 15 promising genotypes of rapeseed-mustard against Alternaria blight caused by Alternaria brassicae (Berk) Sacc. and A. brassicicola (Schw) Wiltshire. It is the most destructive and major disease problem under eastern Uttar Pradesh condition causing both the quantitative and qualitative losses. The evaluation criteria for host resistance against the disease considered were the number and size of spot, number of conidia/spot on both the vegetative (leaf) and reproductive (pod) were regularly recorded at periodical intervals starting from the disease appearance till the physiological maturity of each and every genotypes. The indices which were considered for in built resistance were delayed appearance of visible symptoms, minimum number of spot and their size, number of conidia/spot as well as the minimum leaf defoliation. The disease appeared first in genotype T-9 (44 DAS) which was delayed in GSL-5 (53 DAS). The number of spot/10cm2, size, sporulation capacity in terms of conidia/spot varied invariably among the genotypes and significantly in some cases.

The delayed appearance of disease symptoms (52 and 53DAS), lower number of spot /10cm2 on leaf (3.07 and 3.65), pods (3.74 and 4.14), smallest spot size on leaf (3.54 and 3.05 cm), pods (1.22 and 1.27 cm), number of conidia/spot on leaf (1230 and 1630), pods (130 and 150) were visualised in genotype GSL-5 and Pusa Aditya, repetively indicating a certain pattern and may be considered as attributes of disease resistance. Further, this fact was strengthened with minimum leaf defoliation (32.03 and 35.55%), PDI on leaf (12.35 and 14.16), pods (7.73 and 7.93) and ultimately the AUDPC calculated on leaf (486.70 and 551.90) and pods (282.85 and 291.05). accordingly both the genotypes were grouped in moderately resistant (MR) category. The correlation coefficient (r) among parameters attributing to resistancy behaviour was also workouted proved helpful in drawing the conclusion. Because very limited source of durable resistance are available, it may be suggested to exploit the two genotypes i.e. GSL-5 and Pusa Aditya for breeding programme against Alternaria blight.

T1 : CMP-46 Farmers achieve Double Income by Intercropping with Sugarcane

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Past strategy for development of the agriculture sector in India has focused primarily on raising agricultural output and improving food security. The net result has been a 45 per cent increase in per person food production, which has made India not only food self-sufficient at aggregate level, but also a net food exporting country. It is obvious that the targeted year to double the current income of the farmers or income for the agricultural year 2015-16 is by agricultural year 2022-23, which is seven years away from the base year 2015-16. And, if anything is to be doubled by the year 2022-23, it will require an annual growth rate of 10.4 per cent.

Keeping above views KVK, Shahjahanpur conducted Frontline Demonstration on various intercropping with sugarcane and compare with alone cultivation of sugarcane in traditional way.

The results were observe that the number of family employment increase 419 man days to 475 man days, productivity of sugarcane increase 675 q/ha to 725 q/ha and additional profitability from different inter crop varies from 25000 to 75000 rupees/ha.

T1 : CMP-47 Effect of intercropping on net return in sugarcane crop

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KVK,Lakhimpur kheri in Uttar Pradesh conducted on farm trial to refine the effect of intercropping on net return in sugar cane during 2013-14.The intercropping system of planting of sugarcane at 90 cm spacing and seeding of moongbean had realised a net return of Rs.1.90 lakh per ha as compared to the sole cropping with net returns of Rs.1.79 lakh per ha(6.14% increase in net return per ha).However sole crop has the higher B:C ratio as compared to sugarcane+lobia combination. This is due to the higher cost of seed of lobia and marketing of lobia is difficult specially as a grain.

T1 : CMP-48 LESSER KNOWN INSECTICIDAL PLANTS

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Now-a-days, due to harmful side effects of synthetic chemical insecticides on our health and environment, the safer plant insecticides are in great demand. Some plants such as Lantanacamara, Tageteserecta, Vetiveriazezanioides, Curcuma longa, Nepetacataria, Chrysanthemum cinerariaefolium, etcare already well known for their insecticidal properties and being used as bio-insecticides in different parts of the world. However, there are plenty of other plants which have been reported by the researchers in their scientific studies tohave insecticidal properties, but they have not yet been popularized and commercialized. Some of such plants include Coleus amboinicus, Blumiabalsamifera, CeasalpiniapulcherimaL., Tithoniadiversifolia, Aristolochiatagala, Vitexnegundo(L.), Vitextrifolia(L.), Derris elliptica(Rosch.), GliricidiasepiumJacq., Chromolaenaodorata(L.),PremmanauseosaBlco. andPremmaodorataBlco., etc. Various parts and forms of these plants like essential oil and water and methanolic extract are highly effective in controlling insects. For example, TinosporarumphiiBoerlhas been found effective against Green LeafHopper and Brown Plant Hoppers; Piper nigrumagainstDiamond Back Moth larvae, adult house fly, cotton stainer, corn weevil and Black Army Worm; NilaparvatalugensStalagainstBrown Plant Hopper, Nephothettixsp.against Green Leaf Hopper.and PlutellaxylostellaL.against controlling Diamond Back Moth and Asian Corn Borer. In view of increasing pressure on bio-resources, it is necessary to widen the plant resource base and utilize the potential lesser known plant for their insecticidal properties. This paper presents an account of lesser known plants having insecticidal properties for popularizing their use in agriculture and other sectors.

KEY WORDS: Lesser known plant insecticides, Insecticidal properties, Insects, Essential oils, methanolic extract.

T1 : CMP-49 Botanical as fungitoxicants against Alternaria brassicae isolated from Indian mustard

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Experiment was carried out during 2014-2015 in the laboratory of Department of Plant Pathology, N. D. University of Agriculture & Technology, Narendra Nagar Kumarganj Faizabad-224229 (U.P.) to test the fungitoxic nature of botanicals easily available in the vicinity of the University Campus. Fifty four plants were tested against their efficacy at 5.0 and 10 per cent concentration of each botanical. More or less, all the botanicals showed fungitoxic activity inhibiting fungal growth significantly over the control. The maximum inhibition of mycelial growth (60.61and 72.20%) was recorded through Garlic bulb extract at 5 and 10% concentration, respectively followed by Eucalyptus (58.83 and 69.16%) and Ashok (55.27 and 68.19%). Aloe Vera which is of medicinal importance, a major component used in cosmetics which clears the fungal dermatological infections, did not show any fungitoxic effect against the test pathogen. Total twenty nine botanicals which were found having fungitoxic effects were again tested for their effect against the spore germination of the test pathogen. The same pattern of inhibitory effect of the botanicals strengthened and supported the fact. Accordingly, these botanicals may be exploited for their antifungal activity especially against Alternaria brassicae causing Alternaria blight disease in Indian mustard, a major disease of the crop reported for both qualitative and quantitative losses.

T1 : CMP-50 Eco-friendly Management of Fruit Fly (bactrocera Cucurbitae) in Bitter Gourd Crop

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The study was carried out by KVK, Sitapur to assess the integrated pest management strategy against fruit flies in bitter gourd during Kharif season, 2015 in three villages viz., Gandhauli, Ramnagar and Vijwamau. The experiment was laid out in randomized complete block design with three replication and two treatments including the control (Farmer's practice). IPM package (T2) includes collection and destruction of infested fruits during fruiting season and installation of Cue lure baited pheromone traps (Wooden blocks 5x5x1 cm soaked in ethanol, Cue lure and Malathion @ 6:4:1) during fruiting period @ 10 traps per hectare. The IPM package was found to be most effective for reducing the average fruit fly infestation (11.7%) with benefit- cost ratio of 3.69. Farmer's practice (T1) includes injudicious use of hazardous insecticides proved to be least effective with average fruit fly infestation (16.80%) with lowest benefit-cost ratio of 3.20.

Keywords: Fruit fly, bitter gourd, Cue lure, pheromone trap

T1 : CMP-51 Possibility to enhance the income of sugarcane farmers

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Sugarcane is grown in 123 countries on about 24 million hectare but the largest area occupied is in Brazil (10.44 million ha). In India sugarcane is grown on about 5.02 million ha with the average productivity (71 t/ha). Presently, Uttar Pradesh rank first in area (2.3 million ha) and sugar production (87 lakh ton) under Indian scenario with average productivity 72.37 t/ha. The sugar recovery of nation is about 10.5% and in U.P. sugar recovery is about 10.61%. This happened due to awareness of the farmers by adopting scientific recommendations and cultivating larger area of early maturing varieties. Certainly, there is still chance for more improvement in productivity, resource use efficiency, saving in cost of production, increase in cropping intensity, diversification towards high value crops, improvements in terms of trade for farmers or real price received by farmers etc. This will be helpful to enhance the productivity of cane and sugar and also the income of sugarcane based rural population. There is need to set the strong link between research, effective technology exchange and social dynamics in facilitating adoption of new technologies developed in laboratory to land which will be key source for enhancing income of the farmers. The implementation of the suggestions given in the paper shall undoubtedly help in boosting up the entire rural sugarcane based economic system. To boost the income of sugarcane farmer's operations viz., maintaining soil health, INM, IPM, IDM, better ratoon management, mechanization in cultivation and intercropping of pulses, oil seed and vegetable along with sugarcane has to be adopted.

T1 : CMP-52 Agribusiness potential of potato in Uttar Pradesh

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Potato is an important vegetable crop of the world and as a food crop, it ranks fourth in global importance after rice, wheat and corn. Potato production scaled an unprecedented height of 42.33 million tonnes with a yield of 22.7 t/ha. India occupies second place in terms of production after China. Uttar Pradesh has the distinction of being the largest potato producing state of the country with annual production of 13.58 million tonnes. However, the productivity of potato of Uttar Pradesh (24.4 MT/ha) is lower than West Bengal (33 MT/ha) and Punjab (25 MT/ha). Farrukhabad, Etawah, Mainpuri, Barabanki, Allahabad, Badaun, Moradabad, Agra, Aligarh, Mathura and Faizabad are major potato producing districts of Uttar Pradesh where it is harvested during November-December. Agra holds 7% of India's cold storage capacity-more than whole of Punjab or more than the combined cold storage capacity of Madhya Pradesh, Maharashtra and Karnataka, put together. As the entire potato production happens during cold weather, about 50% is stored in cold storages and consumed throughout the year.

Potatoes are mostly utilized mainly for table purposes in India. Small quantities of potato are being processed in unorganized sector. Since the early eighties, potato processing in organized sector was taken in a big way and the increasing popularity of processed products of potatoes like potato chips has led to considerable growth in potato processing industry. It is emerging as sunrise sector of Indian economy. In spite of producing 12.8% to global potato production, India's share in export of potato is quite meager at less than 1%. There is immense scope for export of potato from Uttar Pradesh. The potatoes of Uttar Pradesh are produced at low production cost due to short crop duration and cheap and family labour offers a competitive advantage in international market. Agri Export Zone for potato export has already been set up in Agra, Farrukhabad, Kannauj, Meerut, Aligarh and Baghpat. APEDA also provides financial assistance to exporters. Uttar Pradesh should grab this opportunity and boost potato export. Potato can be processed into a variety of products. Potato strips, potato dice, potato flakes and granules can also be prepared. Potato flour is another important product from potato which can be used in baking industry, baby foods and as

thickening and flavouring agent in soups and sauces. Potatoes can be processed into French fries, which is the most popular processed potato product in the world. Potato chips are consumed in large quantities throughout the world next to French fries as a most common and popular processed product of potato. Potatoes are also used as dehydrated products. Solar dehydration and sun drying of potatoes in the form of 2-3 mm thick slices, shreds and papads are very popular dehydrated potato products. Potatoes are also processed to produce dehydrated potato chips which can be reconstituted by sacking in warm water and used when fresh potatoes are not available in the market. Apart from it, potato is used to flakes-potato cooked or uncooked but frozen after steaming or boiling, potato processed frozen and potato preserved but not frozen and potato starch. Thus, there is enormous growth potential for potato processing industry in Uttar Pradesh in terms of income, employment and revenue generation. The paper suggests for creation of an independent Indian Potato Board for solving problems of high transportation cost, scarcity of cold storage capacity, severe shortage of electricity and absence of modern market place, non adoption of international marketing norms by exporters and formulation of long term potato export policy. Organized retail in potato would further open up scope for employment generation through a series of new economic opportunities like collection and distribution centre, grading, packaging, cold chains and transshipment. It will also spur self employment for local entrepreneurs through opening up of better and more franchising opportunities.

T1 : CMP-53

Assessment of Major Insect Pest of Rice in Sitapur District Uttar Pradesh

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A field survey was conducted to investigate the major insect/pest of rice in sitapur district of Uttar Pradesh during kharif 2017-18. An interaction was made on the basis of questionnaire with 20 farmers randomly selected from each block of sitapur district. Total 380 farmers were covered out of nineteen blocks of district sitapur on the major parameters viz. pest incidence, damage of the tillers, no. of pesticides applications, grain loss, increase on input cost, yield loss etc. The farmers were selected on age group of between 30 -50 years who are growing paddy from past 10 years. It was found that 46% farmers facing yellow stem borer (Scirpophaga incertulas) problem in rice as a major insect pest while 33% having major problem with termite (Odontotermes obesus) attack followed by 11% with gundhi bug (Leptocorisa acuta), 7% with Armyworm (Mythimna seprata), 5% facing problem with rice hispa (Dicladispa armigera), 4% with gall midge (Orseolia oryzae), 3% with leaf folders (Cnaphalocrocis medinalis), 2% with case worm (Nymphula depunctalis) and 1% with Brown plant hopper (Nilaparvata lugens).

Theme 2

Abstracts: Diversification to high value agriculture (HVA)

T2 : HVA -1

Etio-pathological studies of diseases of broiler birds in Faizabad and Sultanpur districts of Uttar Pradesh to enhance production

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A study was conducted *to record the incidence, morbidity and mortality of the diseases of broiler birds in Faizabad and Sultanpur districts of Uttar Pradesh to describe the clinical signs, gross and microscopic lesions in various organs particularly lung, liver, kidney and intestine in different diseases.*The naturally dead broiler birds from different private farms were collected for one year (May, 2016 to April, 2017). After postmortem examination, the grossly suspected samples (lung, liver, kidney, heart and intestine) were kept for further bacteriological examination and histopathological study. Samples were also collected from the ailing birds of the concerned farms.

For bacteriological study, the aseptically collected materials were inoculated in nutrient broth and streaked on Mac Conkey's agar and EMB (Eosin Methylene Blue) agar. The positive *E. coli* isolates gave pink coloured colonies on Mac Conkey's agar medium and "metallic sheen" on EMB agar. The isolated strains were identified on the basis of cultural, morphological and bio-chemical characteristics. The suspected salmonella isolates produced red colonies on brilliant green agar media. 276 (colibacillosis) and 55 (yolk sac infection) were found to be suggestive of *E. co*li giving typical large (2-3mm) lactose fermenting pink coloured colonies on Mac Conkey's agar plate. Seventy four (74) cases of salmonellosis were diagnosed in one of the farm selected for the present study on the basis of history, clinical signs, gross pathological lesions in the dead birds.

The present pathological investigation identified a number of maladies responsible for morbidity and mortality of broilers. The incidence of the diseases viz. infectious bursal disease, hydropericardium-hepatitis syndrome, yolk sac infection, Salmonellosis, Mycoplasma-colibacillosis Complex, Colibacillosis, gout, Aspergillosis and choline deficiency was found in the present study area. All the diseases / conditions were diagnosed on the basis of history, clinical signs, gross and histopathological lesions along with bacteriological investigation. The highest broiler proportionate mortality in the present investigation was recorded 75.65% due to Aspergillosis. This was followed by Salmonellosis (70.27%), Yolk sac infection (56.36%), Colibacillosis (54.71%), Mycoplasma-colibacillosis complex (54.54%), Infectious bursal disease (42.85%), Choline deficiency (42.85%), Hydropericardium hepatitis syndrome (41.43%) and Gout (41.26%). This finding indicated that the aspergillosis, colibacillosis, Mycoplasma-colibacillosis complex and Salmonellosis are the major problems in the poultry farms of Faizabad and Sultanpur districts, but morbidity and mortality varies from farm to farm depending upon the management practices. These infections if prevented by regular preventive treatment using antimicrobial agents along with improved sanitation, hygiene and better husbandry practice can benefit the farming community by better production and income generation.

T2 : HVA-2

Effect of a Phytogenic Mixture, as an Alternative of Antibiotic Growth Promoters, on the Performance of Broiler Chickens

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To assess the effect of a phytogenic mixture,as an alternative of antibiotic growth promoters (AGP), on the performance of broiler chickens two hundred fifty Vencobb-400Y strain day old broiler chicks were randomly divided

into five groups and kept eitheron basal diet without any supplement (NCON), basal diet + antibiotic (PCON), basal diet + 1% phytogenic mixture (LPH), basal diet + 2% phytogenic mixture (MPH) and basal diet + 3% phytogenic mixture (HPH) for 35 days. The*phytogenic mixture supplemented group's birds had higher body weight than the control group birds and the mean body weight of LPH, MPH and HPH was significantly (P<0.05)higher than NCON group.After* 35 days *of experimental period it was found that* the total feed intake of phytogenic supplemented birds were similar to NCON but higher to PCON birds. Among the phytogenic mixture supplemented birds, lowest feed intake was observed in MPH group. The phytogenic mixture supplemented birds performance index were significantly (P<0.05) better in comparison to NCON birds. The economic efficiency and relative economic efficiency data revealed that rearing of broilers on phytogenic mixture was more economical than NCON but less economical than the birds reared on conventional system of rearing i.e. on AGP. The results suggest that 2% phytogenic mixture was economical and had potential to use as an alternative of AGP in broiler rearing.

T2 : HVA-3

Enhancing the farmer's income in India through dairy business

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Dairy can play a major role in doubling the farmer's income. Dairy is a more equitable agri-occupation. 85% of the small and marginal farmers in India own 45% of the land, but own 75% of the bovine. For landless farmers, dairying is one of the best occupations. Dairy husbandry is a boon for small farmers, as a family with three cows or buffaloes can earn an annual income of Rs. 50,000 to 60,000, while conserving our precious native breeds. With stall-fed, high yielding animals, the dung availability will increase by 3 to 4 times, giving a boost to biogas and agricultural production.

Dairying and livestock form the backbone of agriculture and deserve adequate focus in order to effect a turnaround in the economic condition of our farmers. For this, the following innovative measures to enhance productivity and quality need to be explored and implemented. (1) Enhance the productivity of animal through feeding of probiotics, bypass fat, green fodder and hybrid napier etc.; (2) Evolving cold chain from cow to consumer; Supplying milk throughout the country's milk grid by using railway tankers; (3) Overall development of infrastructure by establishing modern processing facilities throughout the country; (4) Funding through NDDB should be increased; (5) Cashless payments; (6) Farmers should get minimum support price and in case of fall in prices, the government should arrange for purchase of milk and milk products; (7) An agency should be identified in each district to co-ordinate the implementation of the above programme; (8) Insurance should be paid to farmer in case of animal's death.

Now a day, there is a tremendous demand for value added milk and milk products. The farmers can gets more returns by production of value added milk thought dairy vaccination and feeding of supplemented mineral mixture and value addition of milk products such as *cheese, khoa, dahi* and *paneer* etc. In India, about 2% of milk is contributed in total milk production by other species. The utilization of milk of different species especially goat in production of value added milk products can also be a better alternative to raise income of our farmers.

T2 : HVA-4

Polynomial models in prediction of mango yield cv. Langra (*Mangifera indica* L.)

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The mango tree cultivation has a notable importance in subtropical regions and profitability depends on several factors such as yield, production cost or product price. The management of tree-orchard with scientific information boosts the orchard production and information may be generated through orchard-yield-modelling. The models may be polynomial models; Linear, Quadratic, Cubic, Quartic, etc. find many applications in estimation of orchard-yield. For developing a polynomial model on produce the parabolic curve fitting method was attempted on orchard produce collected over different years. The produce data on yield (kg/tree) of one hundred tree, twenty five years old for cv. Langra mango (*Mangifera indica* L.), tree spaced at 10 x 10 m at ICAR-Central Institute for Subtropical Horticulture, Lucknow, growing under uniform cultural conditions were sampled consecutively for five years (2007-11) for developing polynomial models.

The form of the polynomial models for yield/produce (Pt) at time 't' can be obtained by fitting a polynomial curve to the set of observations on yield & time and the times 't' are at equal intervals. The method is based on the fundamental theorem of algebra, viz., " One and only one polynomial model/curve of degree less than or equal to n passes through a given set of (n+1) distinct points." Since yield data on 100 tree collected over five years (2007-11) and years are at equidistant interval of one year therefore, polynomial of fourth degree on yield/produce will be represented as, $Pt= at^4 + bt^3 + ct^2 + dt + e$, where Pt: mango yield/produce at time t (= year-2009), a, b, c, d, e were five unknown constants/parameters to be determined from data.

The observations from data used in model $Pt= at^4 + bt^3 + ct^2 + dt + e$ and model provides five equations with the values on constants/parameters as 'a' =0.59, 'b' =17.95, 'c' =-7.59, 'd' =-58.62 and 'e' =73.61. The polynomial model in fourth degree (Quartic) with values of constants obtained as;

$$Pt= 0.59\,t^4 + 17.95\,t^3 - 7.59\,t^2 - 58.62\,t + 73.61$$

This polynomial model has satisfactory R^2 value and predicted the orchard yield with non-significant difference from the observed yield over different years at five percent level of significance. The information on model-predicted yield inspired to growers for adopting better management practices and enhancing orchard yield for better livelihood and economic status.

T2 : HVA-5

Vertical farming techniques: A boon for summer vegetables crops in plain conditions of India

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India is second largest vegetable producer in the world but still production and productivity is very low. This is primarily due to erratic climatic conditions. Consequently, even required 300g per capita per day vegetable is not available. High yielding hybrid varieties of vegetables and protected cultivation technologies have shown great potential in different climatic conditions. However, such findings are very scanty in plain conditions of India. Therefore, presentexperiment was conducted on with increase in urbanization, industrialization and nuclear families

the land holdings are decreasing day by day. But we can produce above 50% more marketable quality and 30% yield of produce by using vertical space technique, vegetables which have spreading growth habits like; cucumber, bottle gourd, bitter gourd, ridge gourd, Sponge gourd, pointed gourd, rounded gourd, beans and tomato can be grown by using vertical space cultivation technique. In traditional system the number of plants or seeds per unit area is reduced by 30-40% as these vegetables need more space to spread on ground due to which it is difficult to carry out all the cultural practices? The crop gets severely affected during rainy season when the whole crop is immersed in water and the crop is highly infected by diseases and the mortality rate is very high, therefore, the vertical space cultivation is the best technique to overcome these problems. Vertical space cultivation technique helps the farmers are harvest quality produce for longer durations per unit area by protecting the crop from all biotic and abiotic stresses. This technique is compulsory or mandatory under greenhouse vegetables. The farmers of urban, peri-urban and villages can utilize this technique to get higher returns per unit area from cucurbits, beans and tomato crops.

T2 : HVA-6 Papaya farming helps farmer excess profit

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Papaya originated in tropical America. Portuguese introduced papaya in India from Malacca during 1611. At present it is cultivated throughout the world in tropical and sub-tropical climate. It does not tolerate freezing temperature and frost. The papaya plant has short life, hence the area under cultivation varies greatly in different years. In India it is cultivated over an area of 97.7 thousand hectares with annual production of 3628.9 thousand MT. Papaya is eaten as fresh fruit. It is a rich source of vitamin A (2020 IU per 100 g) and sufficient vitamin C (40 mg/l00g). It also contains sufficient amount of Calcium and other minerals. Shri Hari Lal Jaiswal, farmer of Sidhi district of Madhya Pradesh started papaya cultivation variety Tiwan-786. The Taiwan-786 variety plant is a dwarf almost half the size of a normal papaya tree, which can grow to be 15 ft tall. So, there is less chances of crop damage because one does not need to pluck the fruits using a stick or a ladder. Taiwan-786 variety of papaya was 100 per cent fertile, which means fruits grow on every plant. Within a year he obtained a yield of 135.4t/ha with a net profit of Rs.650,000/ha.

T2 : HVA-7 Changes in milk quality on feeding embilica officinalis in cows having subclinical mastitis

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Embilica Officinalis or Indian gooseberry, Amla is a gift of nature to mankind. The Sanskrit name, Amlaki, translates as the Sustainer or The Fruit where the Goddess of Prosperity Resides. *Embilica Officinalis* is known to possess potent antibacterial activity against *Staphylococcus aureusEscherichia coli*, *Klebsiella pneumoniae*, *K. ozaenae*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *S. paratyphi*A, *S. paratyphi*B and *Serratia marcescens. It*is an excellent antioxidant and free radical scavenger. The anti-inflammatory properties of *E. officinalis are also establishedby numerous workers.*The potential biological property of Embilica Officinalis remainsuntapped in the animal health sector. The complete package of antibacterial, anti oxidant, anti inflammatory, free radical scavenging, hepato-protective properties in one wonder drug can thus be of immense use in the prevention and treatment of innumerable health disorders, mastitis being one of them. Fresh fruits of amla (Narendra Amla-10) were collected from the university. The total bacterial count (TBC) was carried out as per the standard method. Thirty two animals positive for subclinical mastitis were randomly divided into four different groups containing 8 animals each and supplemented with various doses of deseeded fresh amla. Maximum recovery was obtained in cows supplemented

amla @ 250gm PO OD for 15 days followed by cows supplemented amla @ 200gm PO OD for 15 days and cows supplemented amla @ 150gm PO OD for 15 days. Changes in mastitis markers before and after supplementation were also studied.

T2 : HVA-8 Strategical interventions for doubling income of the farmers engaged in livestock farming and fisheries by 2022 in West Bengal

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Animal husbandry and fisheries are the two pillars of the rural economy in West Bengal, where 90 per cent of the farmers are either small or marginal farmers. The state livestock and fisheries sectors contribute 3.89 % and 2.35% of the State Domestic Product (SDP), respectively. Both the sectors are playing a significant role in employment generation, poverty alleviation and socio-economic upliftment in rural areas of the State. Next to rice, fish is the staple diet of Bengal's population and therefore, fish production is one of the key areas. The State is one of the leading producers of fresh water fish contributing 16.12% of countries fish and the largest producer of fish seeds (38%) in the country. In national perspective, the State is ranked third in egg and meat production and eleventh in milk production. Notwithstanding, a huge demand-supply gap presently exits in the State. There is a strong consumption base with huge localized demand for dairy, poultry, meat and fish widening market opportunities. Under such prevailing situations, opportunities are ample to double income of the farmers' by 2022 in West Bengal. The strategies for doubling farmers' income by 2022 include on production of quality animal breeds and fish fingerling, adoption of improved and innovative animal husbandry practices, reduction of cost of production, availability of low cost, good quality feed, commercial ventures under poultry, dairy and fishery sectors, piggery, goat and backyard poultry farming as supplementary livelihood, improved vet care and services, integrated farming system approach, application of climate resilient animal husbandry practices, implementation of innovative technologies like cage and pen culture, diversification into fresh water prawn farming, ornamental fishery, production of value added animal and fish products, capacity building of the farmers, ICT based livestock farming and fishery extension, expansion of cooperative milk/ meat/ egg/ fish societies and marketing system and export market.

T2 : HVA-9 Impact of coverd v/s ambiant conditions on diseases incedencesin vegetable crops in Indian plains

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The natural resources particularly land and water is shrinking day by day due to increasing population, rapid urbanization and industrialization. Consequently, there has been increasing pressure on available land for agriculture crop production. Vegetables are rich source for nutritional security but availability is poor mainly due to low productivity, increasing incidences of insect vectors like whiteflies, aphids, thrips and jassids incidences which are responsible for viral diseases in vegetable production. For controlling these vectors, growers use insecticides and pesticides indiscriminately in vegetables crops. But this is not good sign for soil, human and environment health. Hence, an experiment was conducted at Research farm of Centre for Protected Cultivation Technology, IARI, New Delhi, during 2010 to 2012. Four vegetable crops i.e., Summer squash, Cucumber, Bittergourd and Okra were transplanted/seeded during last week of Januavery in both the years under open and protected conditions. White

color U.V. stabilized insect proof net (40 mesh) was used to cover all the sides to make greenhouse type net house design with the help of 2 cm thick round GI paipe in 200 m^2 area. During crop period using recomended scientific agronomical package of prectices and GAP protocol. It was observed that all selected experimental vegetable crops under net-house enhanced 15-20 days earlier floweirng, fruting and pecking were recorded as compared to open field condition. The fruits yield and net retun were found 50.50% more in net-house as comperd to open field. Net-house minimized 98.50% virus diseas incidence and saved 80.50% insectiside/pestiside chemicals as compared to open field condition in all crop in both the years as insect proof net covering prevented all kinds of insect entry as act of physical barrier. Thus net house can be used for minimizing the use of pesticides in vegetable cultivation for producing safe vegetables.

T2 : HVA-10 Doubling the farmers income: ISAP Bidar model

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India is the world's largest producer of milk and pulses, second largest producer of rice, wheat, fruits, vegetables and the overall third largest producer of food grains. Interestingly, despite all these achievements, farmers at large are still in gloom. Farming has increasingly become unviable due to fragmentation of land. In recent years, collectivization and market integration through Farmer Producer Organization (FPO) emerged as effective way out to address the above situation. Indian Society of Agribusiness Professionals (ISAP), which is not-for-profit Section 25 Company, has successfully implemented an Agriculture Extension Services (AES) program in North Karnataka. In this project, all the major components of seven pronged strategies to achieve doubling of farmers' income are religiously followed and results are quite encouraging. This project is popularly known as “ISAP Bidar model”. In this paper, we take “ISAP Bidar model” as a Case Study.

In ISAP Bidar model, ISAP has set-up seven FPOs. Under each company 1,000 members farmers were directly involved. An Agri-Village Resource Centre (AVRC) was also built for a cluster of 15–20 villages at six locations. In their respective regions, these AVRCs are now being sustainably run by FPOs. In line with 'SwasthDharraKhetHaraa' slogan of 'Soil Health Card Scheme', each AVRC renders services like soil testing to farmers. Farmers are educated and assisted through FPOs for their farm activities. They can source their input requirements of seeds, fertilizers, pesticides, etc., from these AVRCs. Farmers can purchase good quality saplings from plant nursery in AVRC. From CHSC units at AVRCs, farmers on custom hiring basis can borrow agriculture appliances like tractors, cultivator, harrow, seed-cum-fertilizer drills, combine harvester, etc. Each AVRC is also comprised of mini-pulse processing units that help farmers in increasing realization minimum by 40–50% for their produce. All 7 FPOs are federated under Karnataka Farmers Maha Society (KFMS). In 2016-17, KFMS has provided 238,000 quintals of red gram to the NAFED under Price Support Scheme. As suggested by Honorable PM that ancillary activities like poultry, bee-keeping, etc. promotion can increase income of the farmers. So, these components have been heavily promoted under the model as Integrated Farming System (IFS). Farmers under this project are encouraged to get engaged with IFS components, which served as instant source of income and reduce their dependence on conventional cropping patterns. This model has huge scope of scaling and replication.

T2 : HVA-11 Heterozygosity analysis in Udaipuri goat of Uttarakhand

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The present investigation was undertaken for genetic diversity analysis in Udaipuri goat found in Pauri Garhwal district of Uttarakhand using a set of twenty microsatellite markers. Blood samples were collected from 30 unrelated

animals from the breeding tract of Udaipuri goat. Extraction of DNA was done by Sambrook and Russel (2001) method followed by PCR amplification, PAGE, silver staining, sizing & scoring of gels and finally the analysis of population parameters using POPGEN (version 1.31) software. All the twenty microsatellite loci were amplified successfully and a total of 96 alleles were observed across all the loci. Average heterozygosity of all selected marker loci was calculated from the equation by Nei (1978). Heterozygosity is one of the most important measures of assessing the genetic diversity within a population. The observed heterozygosity was varied between 0.033 (ILSTS-30, OarJMP-29 and ETH-225) to 0.900 (ILSTS-087), while the expected ranged from 0.381 (OarJMP-29) to 0.831 (ILSTS-34) within the Udaipuri goat population. The average observed heterozygosity was 0.363 against the expected 0.682. The Nei's heterozygosity or genetic diversity varied from 0.375 (OarJMP29) to 0.817 (ILSTS-34) with an average of 0.671. In Udaipuri goat population, the observed heterozygosity was considerably less than the expected heterozygosity. Also the estimated value of the average observed heterozygosity showed a lower level of genetic diversity within the goat population indicating the population to be moderately variable.

T2 : HVA-12 Guinea Fowl as an Alternative to Chicken

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Guinea fowl is a bird of African origin still semi feral in nature having certain unique advantages over chicken and other poultry species which makes it ideal bird.There are great possibilities for integration with agriculture, horticulture, fisheries and other livestock rearing systems. The present paper is an overview of work done on Guinea fowl to popularize it as an alternative source of chicken. The experiment conducted so far on farm and at farmer's field on growth, production and reproduction parameter clearly revealed that the guinea fowl can be successfully and beneficially reared by the small and marginal farmers as subsidiary occupation to supplement family income especially when the profit margins from agriculture are shrinking and hence it can serve as alternative source of poultry in India.

T2 : HVA-13 Utilization of animal and plant based product for profitable venture in bee keeping

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The utilization of cow urine for disease pest management has been adopted and appraised in vedic and holy text books since ages. Cow urine and its plant based decoctions have been successfully utilized for disease and pest management in bee keeping. The cow urine applied @ (50-100 %) in bee colonies gave cent per cent recovery against European foul brood diseases of honey bee in 3-4 weeks interval, with comparable results in chemical (Terramycin) treated bee colonies. There was significant reduction in brood mite infestation (72.10%) in cow urine @ (100%), while followed by neem leaf powder @ 5g/hive (71.35%), jatropha leaf powder @ 5g/hive (69.47%) and (51.11%) in case of thymol @ 500mg/hive treated bee colonies. The utilization of smoke generated from cow dung cake gave 100% results in off season management of empty bee frames from notorious pest *Galleria mellonella* in semi air tight and air tight units. The application of cow urine and its plant based formulation also did not have any adverse impact on the growth parameters and foraging behavior of *Apismellifera*. The mustard crop treated with desi cow urine @ 20% showed maximum foraging rate of (24 flower/bee/min), while the maximum foraging speed was observed in Holstein cow

urine @ 20% as (5 sec/bee/flower). Thus the study conducted in Pantnagar suggested a novel thought of utilization of cow urine and cow urine based formulations to manage the diseases and pests in bee keeping without utilization of toxic chemicals and reducing the cost of production and increasing the farmer's income with high benefit to cost ratio.

T2 : HVA-14 Carcass characteristics of broiler chickens fed diet supplemented with neem leaf powder (NLP)

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The present study aimed at evaluating carcass characteristics of 200 unsexed Vencobcommercial broilers supplemented with neem leaf powder(NLP). The chicks were distributed to four treatment groups with 0,1g, 2g and 3g NLP per kg feed. The heart and liver weights exhibited no significant differences but the giblet weights showed significant ($p<0.05$) variances among the groups. The highest giblet weight (4.72%) was recorded in T_2 group. Spleen weight was also followed the same trend that of as giblet weight. However, the pancreas weight of T_0 and T_3 was significantly lower than those of T_1 and T_2. The dressed weight was recorded in the range of 80.64 to 86.09% and the highest in T_2 and lowest in the T_0 group of birds. The eviscerated weight of T_3 was significantly lower than that of other groups which did not differ significantly one another. The drawn weight of T_2 group (80.13%) was significantly higher than that of other three groups which did not vary significantly among themselves. Similarly, shank weight loss was also higher in T_2 group. The percentage yield of thigh portion of birds in T_2 was statistically similar to that of T_1 and T_0 but T_3. The drumstick weight of T_2 birds was significantly higher than that of other groups which did not vary significantly each other. The organoleptic properties of breast meat from all the groups indicated significant differences in the mean scores for different attributes. The meat appearance of T_1 group was significantly higher than T_0 and T_3 which did not differ statistically. It is concluded that lower inclusion levels of NLP in diets have significantly higher drawn weight without compromising other carcass characteristics in broilers.

T2 : HVA-15 High-tech horticulture techniques for doubling the farmer's income

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Due toclimate change growing population decreasing land holdings increasing pressure on natural resources and high demand of quality horticultural fresh produce we are forced to shift towards modern technologies of crop production like protected cultivation. Under the new era of WTO (World Trade Organization) high potential for enhancing the income of farmers opting for quality and offseason vegetable and cut flower cultivation under protected conditions. Production of vegetables and cut flower crops under protected conditions not only provides high water and nutrient use efficiency but it can also easily increase the productivity by 3-5 folds over open field cultivation of these crops under varied agro climatic conditions of the country. This technology has very good potential especially in urban and peri-urban areas adjoining to the major cities which is a fast growing market for fresh produce of the country. But protected cultivation technology requires very careful planning, maintenance and management about timing of production.Moreover, harvest should coincide with the shortage period of availability of vegetables and high market prices, choice of varieties adopted to off season environments and should able to produce higher and economical yields of high quality produce etc. Vegetable and cut flower farming in agri-entrepreneurial models targeting various

niche markets of the big cities of the country is regularlyinviting attention of the vegetable and flower growers for diversification from traditional ways of crop cultivation to such modern methods. Even the unemployed educated youths who are not attracted or interested in traditional agriculture are also showing good interest and can be further motivated forthis kind of modern agricultural technologies. Extensive training of youths to grow, process and market horticultural produce using protected cultivation technologies will create employment, income and more nutritive food supply for human health.The utilizablewater resources in India are not enough to irrigate the entire cultivable area and hence concerted efforts are needed to maximizeexisting water use which is of paramount importance. Drip Irrigation is an advanced method of irrigation to achieve considerable saving ofwater through high water use efficiency compared to surface irrigation methods where irrigation efficiency is low due to losses in the water distribution system and on the field. Research in drip irrigation conducted so far in India and abroad has shown that this method leads not only to appreciable saving of water but also results in achieving higher crop yields as compared to surface irrigation methods. Drip System is well suited for water scarcity areas and undulating topography where surface irrigation proves costly for land shaping and leveling. Thus, Indian farmers may likely be adopt polyhouse and drip irrigation to double their income.

T2 : HVA-16 Production of elite quality planting material: An essential requirement for enhancing the profitability of the orchards

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The production and supply of elite quality-planting material either seeds or grafts is a major concern due to rising demand from the farming community across the country. The inadequate availability/supply of quality planting material is the major constraint for realizing a sound horticulture industry in the country. Existing infrastructure could meet only 30-40% of the demand for production of quality planting material in this sector.The working on horticulture under planning has projected that there has been fourfold increase of demand for planting materials of horticultural crops. It is now well established that there is a need to increase area under fruit crops, in order to step up production of fruits. In view of growing importance of fruit crops, the demand for quality planting material has increased manifold throughout the country in the recent past. However, the bottleneck in the expansion of area under fruits is the non-availability of genuine and quality planting material in adequate quantity from nurseries. It is essential to put a vibrant and active system of recognition of nurseries in place to facilitate, promote and monitor production and trade of planting materials of perennial fruit crops, which are propagated vegetatively. Some of the main problems in ensuring production of quality planting materials are; absence of genetically uniform rootstocks, lack of variability for rootstocks, lack of information on rootstock-scion interactions, year round production through specialized structures, lack of tissue culture protocol for most, lack of vegetative propagation for seed propagated crops, There is a need to develop rootstock for high density planting in crops like mangoes. With multi-species and multi-varietal orchards becoming one of the components to orchard efficiency, production of quality planting material assumes greater importance. In several fruit crops, the influence of environment has made it imperative that genotypes need to be developed for different regions and same may be available to different stakeholders as earliest through advance multiplication techniques so that it should not wait for decades to research the end users. The present article deals with the above aspects in details.

T2 : HVA-17 Technological options for achieving doubling the farmer's income in north-eastern Himalayan region

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The North East Region (NER) of India comprises of 8 states, namely Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura, covering about 8.3% geographical area with approximately 4%

populations of the country. Out of the total 26.27 million ha geographical area of NER of India, around 77% is hills and senile plateau, while only 12% net area is under cultivation. Agriculture provides livelihood support to 70% of region's population. It produces only 1.5 % of country's food grain production and continues to be a net importer of food grains even for its own consumption.The central government has set seven point strategy for doubling the farmers income viz. focus on irrigation with large budgets, with the aim of "per drop, more crop"; Provision of quality seeds and nutrients based on soil health of each field; Large investments in warehousing and cold chains to prevent post-harvest crop losses; Promotion of value addition through food processing; Creation of a national farm market, removing distortions and e-platform across 585 stations; Introduction of a new crop insurance scheme to mitigate risks at affordable cost and Promotion of ancillary activities like poultry, beekeeping and fisheries. Farmers' income can be improved when productivity goes up, if the cost of production comes down, when we ensure agricultural commodities produced get a remunerative price through a transparent price discovery mechanism. It can also happen due to improved income from allied activities to agriculture and non-farm sector or even wage employment during the agricultural off season. In North Eastern Himalayan Region, there are certain focused areas where we may double the farmer's income. In agriculture sectors we may focused in Inclusion of short duration of pulses in Rice-fallow system under conservation agriculture; Replacement of traditional cultivars through introduction of high yielding cultivars; Diversification of Jhum mixed farming and degraded land through pulses in Agroforestry system; Promotion of secondary agriculture enterprises with main crop- eg. Inclusion of Bee keeping, mushroom cultivation, Vermicomposting, Azolla production etc.; Introduction of high value crops under vertical intensification of Agriculture, Agroforestry and Horticulture based system; Introduction of suitable Integrated farming system in various ecosystems; Minimize the Pre and Post harvesting losses from agriculture produce and Promotion of small scale food processing and packaging especially pulses (Dal Mill) at farmers level. There are plenty of scope in horticulture sector viz., Commercial nursery under protected condition – Fruits, vegetables, flowers; Commercial plantation integrated with processing/cold chain and packaging – Pineapple, Khasi mandarin, Kachai lemon, Acid lime, Banana, Kiwifruit, High value vegetables including exotic vegetables; Protected cultivation of high value crops integrated with processing/cold chain and packaging – High value vegetables, Flowers; Organic production – Turmeric, Ginger, Chilli, King chilli, Large cardamom; Food processing integrated with packaging – Local fruit crops; Horticulture based farming system; Mushroom integrated with spawn production, processing and packaging – Oyster and Shiitake and Bee keeping integrated with Honey processing and agro-forestry/suitable crops. Doubling the farmers' income needs funds at institutional level as well as at enterprise level, for which a robust institutional credit flow mechanism and marketing infrastructure is a must. We have to create a healthy credit environment and effective marketing channel by enhancing access to credit through technology in an equitable manner. Our resource-scarce farming community such as small and marginal farmers, tenant farmers, share croppers, etc, and farmers in east, centre and northeast regions deserve special attention.

T2 : HVA-18

Sustainable dairying: A key tool for rural women empowerment

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Women contribute 50-60% of labour in farm production in India. Women form the backbone of agriculture and they play a significant role in agriculture and animal husbandry development. Female agricultural labourers are among the poorest sections of Indian society.The dairying has been considered as a potential means of alleviating large scale unemployment, especially in rural areas. Women play a key role in animal,farm and home management. Successful dairy husbandry enterprise not only improves the socio-economic status of rural women, but also assures asustained and assured means of income to supplement their income from the main enterprise. The major activities involved in dairy farming include collectionof fodder/cultivation of fodder, grazing the animals, feeding & watering, cleaning the animals and shed, milking and marketing of milk. The operations areflexible and staggered depending upon the convenience of the family members and need not necessarily be attended foregoing wage employmentopportunities.Dairy business provides good opportunity for women to develop this activity as an

enterprise and ensures steady cash returns throughout the year. Thecrossbred cows which are valued at Rs.10,000 to Rs.15,000 are considered as mobile cash reserves which are often sold to meet urgent cash needs. Apartfrom providing employment and income, dairy farming has several other advantages. It is hightime for the feminization of dairy. The solution lays in the formation of village level women self help groups. Dairying hasenhanced the status of women. They can better cope with ups and downs of life.Dairying has enhanced family self respect, dignity, and has also upped the family'snutritional status. Above all, as dairy income levels increase, they are able to purchasemore assets like utensils, gas stove, fan, TV, bicycle/ motorbike, house etc. It is evident that rise in income from dairy has triggered a social development process.

T2 : HVA-19 Role of dairy farming in rural development

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Dairying is an important source of subsidiary income to small/marginal farmers and agricultural labourers. In addition to milk, the manure from animals provides a good source of organic matter for improving soil fertility and crop yields. Dairy farming has a great potential for alleviation of rural poverty and improvement of living standards of the rural masses. Dairy farming is complementary to crop production. Dairying has played a prominent role in strengthening India's rural economy. It has been recognized as an instrument to bring out socio-economic transformation. A symbiotic relationship exists between agriculture and dairy farming.Dairy animalsplay a pivotal role in the livelihoods of the poor people especially those who are poornot only in assets and but are also basically unskilled. On the other hand, the ruralpoor have no option but to take up dairy farming as a main occupation as it is theonly enterprise which could provide regular income (Milk money), and serve as asset(Moving bank). The gobar gas from the dung is used as fuel for domestic purposes as also for running engines for drawing water from well. The surplus fodder and agricultural by-products are gainfully utilized for feeding the animals. Almost all draught power for farm operations and transportation is supplied by bullocks. Since agriculture is mostly seasonal, there is a possibility of finding employment throughout the year for many persons through dairy farming. Thus, dairy also provides employment throughout the year. The main beneficiaries of dairy programmes are small/marginal farmers and landless labourers.

T2 : HVA-20 Eco-friendly management of important fungal foliar and tuber borne diseases of potato (*Solanum tuberosum* L.)

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Potato (*Solanum tuberosum* L.) is one of the most important vegetable crop growing in the world, belongs to family *Solanaceae*. This crop suffers from a large number of diseases among them early blight (*Alternaria solani*), late blight (*Phytophthora infestans*), black scurf (*Rhizoctonia solani*) and common scab (*Streptomyces scabies*) are the most destructive diseases causing economical losses at different crop stages. To find out suitable eco-friendly treatment against foliar and tuber borne diseases of potato, an experiment was conducted in 2011-2012 at Main Experiment Station, Department of Vegetable Science, Narendra Deva University of Agriculture & Technology, Kumarganj, Faizabad (U.P.). There was one varieties of potato (Kufri Pukhraj) treated with seven treatments *viz.* T_1 (Control), T_2 (Tuber treatment with *Trichoderma viride* @ 8 g/kg at planting), T_3 (Tuber treatment with *Bacillus subtilis* @ 0.25 per cent at planting), T_4 (Tuber treatment with spray of Boric acid @ 3 per cent before storage), T_5 [Bio-fumigation (mustard was sown at least one month before potato planting and used as green manure)], T_6 (Bleaching powder @ 12 kg/ha with (NPK) fertilizer at the time of planting) and T_7 (Gypsum application @ 200 kg/ha at the time of planting). The data were collected on appearance of foliar and tuber borne diseases along with yield attributes. The minimum

diseases intensity of early blight (*A. solani*) was recorded with T_2 followed by T_3, T_4, T_6, T_7 and T_5 as compared to T_1, in case of late blight (*P. infestans*) disease T_2 represented minimum disease intensity followed by T_4, T_5, T_3, T_6 and T_7 as compared to T_1. On the other hand, T_2 proved better in respect of lower per cent tuber infection of black scurf (*R. solani*) followed by rest of the treatments while, minimum percent tuber infection of common scab (*S. scabies*) was recorded in T_4. Maximum tuber yield was obtained in T_2 followed by T_4, T_7, T_6, T_3 and T_5 as compared to T_1. In over all treatments we concluded that T_2 was a most effective treatment for fungal foliar and tuber borne diseases of potato and also increasing the yield but T_4 was better treatment for managing the bacterial disease such as common scab (*S. scabies*).

T2 : HVA-21 Effect of probiotic, prebiotic and synbiotic on haematological performance of cross bred calves

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A study was conducted at IDF, GBPUAT, Pantnagar to evaluate the effect of probiotic, prebiotic and synbiotic on haematological performance of cross bred calves. Twenty four crossbred calves with average age of fifteen days were divided into 4 groups of 6 calves each. The calves were assigned to different dietary treatments viz. T0- basal diet (control), T1 (probiotic group) - basal diet + Lactobacillus acidophilus @ 1 g/calf/day (2 x 1010 cfu/ g), T2 (prebiotic group)- basal diet + Mannan oligosaccharide (MOS) @ 4 g per calf/day and T3 (synbiotic group) basal diet + Lactobacillus acidophilus @ 0.5 gm (2 x 1010 cfu/ g) + 2 g MOS per calf/day respectively for a period of 90 days. Significant weight gain was observed in probiotic and synbiotic group. The results showed that there was a significant increase in leucocyte count in T1, T2, and T3 on 90th day of experiment. Haemoglobin content was significantly higher from 30 days till completion of experimental study in T1, T2 and T3 groups than control group. T1, T2 and T3 supplemented groups showed significantly higher values of Packed Cell Volume on 60th and 90th days as compared to control group. Significantly higher values of Mean corpuscular haemoglobin concentration were observed in T1, T2 and T3 group at 30th day than control group. The treatment groups T2 and T3 showed significant increase in lymphocyte count on 90th day than control group (T0). Neutrophil count showed no significant difference except at 90th day where T1, T2 and T3 showed significant difference from control group. It may therefore be concluded that supplementation of probiotic, prebiotic and synbiotic is advantageous in improving leucocyte count, haemoglobin content, and packed cell volume in crossbred calves.

T2 : HVA-22 Incidence and haemato-biochemical study of gout in broiler birds of Faizabad and Sultanpur district of Eastern U.P.

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A study was conducted to record the incidence of gout in broiler birds in organized and unorganized farms ofSultanpur and Faizabad districts in Eastern U.P., to record the haemato-biochemical changes in gout affected birds and also to confirm the diagnosis of gout depending on history, clinical signs, necropsy and histopathological changes in gout affected birds. For this study, broiler birds affected with gout were screened in 12 different private and commercial

broiler flocks located in Faizabad and Sultanpur districts of Eastern Uttar Pradesh for one year starting from June, 2015 to May 2016. Out of 23906 broiler birds examined, 1714 were clinically found to be naturally affected with gout, the incidence and mortality of gout being 7.17% and 4.37% respectively. The highest prevalence of this disease was recorded during colder months (833, 9.68% in October toDecember; 439, 7.06% in January to March) followed by summer (384, 5.40%) and lowest in rainy season (58, 2.92%). Of the susceptible age of first three weeks, the incidence was more during second week (9.96%), followed by first (7.63%) and third week (6.01%) of age. Out of the 12 flocks which were screened for gout 10 flocks were of cob breed (83.34%), one flock of Hubbard (8.33%) and one of Kasila breed (8.33%).The birds affected with gout had a significant ($P=0.01$) increase in serum uric acid (34.42 ± 1.10). The levels of serum creatinine were significantly ($P>0.01$) increased (2.14 ± 0.02). There were no significant change in serum calcium and phosphorus. The mean values of TLC and PCV of the affected birds were significantly ($P>0.01$) high. TEC and Hb were also significantly ($P>0.05$) higher than control. The increased leukocytes was mainly contributed to the absolute increase of lymphocytes ($P<0.01$).

T2 : HVA-23 Status of methicillin resistant staphyloccus aureus in buffaloes mastitis of eastern plain zone of uttar pradesh having subclinical mastitis

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The present study was conducted to isolate and characterize *S. aureus* from the cases of subclinical mastitis and to study the antibiogram in special reference to methicillin resistance (MRSA) in buffaloes of eastern plain zone of Uttar Pradesh, India. A total of 200 milk samples were collected from the buffaloes of Sultanpur and Faizabad district of U.P., and processed for isolation of *Staphylococcus aureus*. *S. aureus* was successfully isolated from 140 milk samples using Mannitol Salt Agar. On antibiogram mapping it was found that, the most effective antibiotic against *S. aureus* in this region in subclinical mastitis was Ofloxacin followed by Tetracycline, Methicilline and Gentamicin. Out of 140 isolates none of the *S. aureus* isolates from mastitic milk were 100% sensitive to any antibiotic. Highest 133 isolates (95%) were resistant to Cefotaxime. 120 isolates (85.72%) were resistant to Ampicillin. 113 isolates (80.72%) were resistant to Ceftazidime-Tazobactam , 27 isolates (18.58%) showed resistance against Gentamicin and Methicillin. 33 isolates (23.58%)showed resistance against Cloxacillin followed by Tetracycline where 20 isolates (14.28%) showed only resistance. Multi Drug Resistance was observed in 100% Buffaloes of eastern plain zone for atleast 2 drugs. In the present study, out of 140 isolates of *S. aureus* from mastitic milk, 27 (19.28%) isolates were found resistant to methicillin. All the 27 isolates from the mastitic milk, that appeared resistant to methicillin in disc diffusion method also showed positive result with Oxacillin Ezy MIC Strip(0.016-256 mcg/ml).

T2 : HVA-24 Intra-vaginal progesterone impregnated sponge: a cost effective therapeutic management of anestrus in buffalo's heifers

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Effective therapeutic management of anestrus animals involves the use of progesterone, but its use is limited in the rural area due to involvement of higher treatment cost. The self-made intra vaginal progesterone impregnated sponge minimizes the cost for the therapeutic management of anestrus animals. The cost of self- made progesterone impregnated sponge was calculated to be about Rs. 150/- only which is much lower than commercially available

intravaginal progesterone insert i.e. CIDR and Triu-B. The self-made intra vaginal progesterone impregnated sponge was prepared using 5 cm thick polythene foam cut in cylindrical shape, 6.cm diameter and a thread was tied to it for ease of removal. The sponges were sterilized in an autoclave and they were impregnated with micronized natural progesterone @ 1000mg per sponge. The source of micronized natural progesterone was capsule Susten 200mg (Sun Pharmaceutical Industries Ltd). The self-made intra vaginal progesterone impregnated sponge was tested for its effectiveness in 12 anestrus buffalo's heifers at farmer's doorstep in Jammu region. The sponges were placed in the vagina with help of PVC pipe speculum and were retained for 7 days. At the time of withdrawal of sponges, heifers were given injection Clostenol-2 ml (Cloprostenol-Synthetic Prostaglandin). Animals were observed for behavioral estrus symptom. Artificial Insemination was performed on detection of estrus using AM-PM rule. The estrus induction response was 100% in treated animals. A total conception rate of66.67% (8/12) after second artificial insemination was observed. It was concluded that the self-made intra vaginal progesterone impregnated sponge is a cost effective treatment and may be used for effective therapeutic management of anestrus in buffaloes' heifer.

T2 : HVA-25 Effect of integrated nutrient management on physico-chemical composition of cape gooseberry (*Physalis peruviana L.*)

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The present investigation was conducted at Research Farm of Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (U.P.),to study the effect of organic FYM integrated with urea and *Azotobactor*on physico-chemical composition of cape gooseberry.The data indicates that 25% of N through FYM +75% of N through inorganic fertilizer (T10) was found to be best as compared to other treatments which significantly increased the physico-chemical attributes of cape gooseberry.Chemical attributes *viz*. TSS (12.92 & 12.97 °B), Acidity (8.56 & 8.65 per cent) and Ascorbic acid(Vitamin-C) were found to be maximum with the application of *Azotobactor*+ 75% of N through FYM + 25% of N through inorganic fertilizer(Urea) (T9) which were at par with the treatment comprising 50% of N through FYM + 50% of N through inorganic fertilizers + *Azotobactor*.

T2 : HVA-26 Effect of season of flushing on flowering shoots in litchi

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The age of the vegetative flush, or the degree of dormancy, appears to have a strong influence on the subsequent shoot development of litchi. A dormant period of several months prior to the flowering period appears essential for the production of good panicle, whereas vegetative flushing just prior to floral induction results in poor or no initiation and often vegetative shoots. An experiment was conducted at BAU, Sabour during 216-17 to study the effect of season of flushing on the percent of shoots that flowered with respect to four commercial cultivars viz; Deshi,Purbi, Bedana and Kasba. A perusal study of data on season of flushing and percent shoots flowered revealed that mid season flush produced the maximum percent shoots that flowered as compared to early season of flushing, while percent shoots that flowered was almost nil in case of late season of flushing. The early season of flushing resulted into 42% shoots flowered in case of Purbi followed by Deshi i.e., 39.2%. Among the four cultivars mid season flush of Deshi had the

highest percentage of shoots that flowered i.e. 78% followed by Purbi (71%), while the lowest was found in cv. Bedana (32%).

T2 : HVA-27 Bee keeping for increasing income

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Beekeeping is an agro-based activity which is being undertaken by farmers/landless labours in rural area as an integrated farming practice. Beekeeping supplements income & employment generation and nutritional intake of rural population. Though the honeybees are best known for the honey they produce, their economic role in nature is to pollinate hundreds and thousands of flowering plants and assure setting of seed or fruit. Honeybees have been offering services to the society through ensured pollination in cross-pollinated crops as well as by providing honey and a variety of beehive products. Honey Bees have vital role in sustaining plants bio-diversity resulting in environmental stability. Beekeeping is one of the thrust areas and flagship programmes of Ministry of Agriculture & Farmers Welfare. Beekeeping industry is source of livelihood for rural poors/tribals/forest based population. Unemployed youth can start this business with minimal funds (Rs. 1.00 to 2.00 lakhs). Bee keeping utilises the natural resources like nectar and pollen which otherwise go waste, encourages ecological awareness, helps increase national income, helps in rural development and promotes small village industry, encourages biodiversity and will definitely help in doubling farmer's income by complimenting in the agriculture.

T2 : HVA-28 Breeding strategies for improving the cattle productivity for increasing the farmer income generation

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Uttar Pradesh is the most densely populated state in the country which has over 200 million inhabitants. The State economy is largely constituted by the agriculture as majorityare engaged in agriculture and allied animal husbandry activities. It is the leading state which has the highest contribution of 26.39 million tonnes (16.97%) to the national annual production of 155.50 million tonnes.It contributes 4.24 million tonnes of Indigenous cow milk which is the highest among all the Indian States. However, the State has not fully exploited the milk production potential of the large cattle population as they contribute only 25% of the total milk production of the state against the national average of 48%. Thus, the State possess ample opportunities for increasing the milk production potential of the cattle population constituted by the non-descript (35%), exotic and its crossbred (18%), Sahiwal and Hariana breeds with their graded population which constitute the majority of indigenous population. The breeding strategy for improving the cattle production includes, the Identification and multiplication of elite female germplasm, establishment of Bull mother farms for major breeds in the breeding tracts to produce sufficient number of bulls Increasing the AI coverage and use of quality semen for insemination, upgrading the non-descript cattle with famous indigenous breeds for increased milk production, Pedigree based selection of male calves to develop the young bulls for breeding, establishment of progeny testing networks and genetic improvement through supply of proven bull semen in indigenous breeds, Incentives should be provided for farmers to keep elite females and selling male calves to semen banks etc. The managemental strategies also include utilization of locally available agricultural by-products and crop residues to meet dry matter requirement of cattle, scientific feeding of balanced concentrate feed by regular inclusion of mineral mixture etc. Training of the farmers for production of value added products, channelizing the sale of milk

and milk products through societies will help to ensure the better return for their product which will increase the income from cattle farming.

T2 : HVA-29 Evaluation of different type of greenhouse designs on quality production and economics of high-value vegetable crops in plains condition

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Protected structures act as physical barrier and play a key role to minimize the biotic and a biotic stress to the crops. Experiments were conducted on year round production of cucumber (var. *Ishatis, Kian,Hilten*), Tomato (var. *G.S. 600*) and Capsicum (var. Swarana, Bambi) under three different type of greenhouse designs *i.e.* ***1****. Double Door Multy Span Naturally ventilated* type (all side height ventilation and roof ventilation), ***2.****Double Door Multy Span fan-pad/semi controlled* type (side ventilation and roof ventilated) and ***3.****Double Door* Quonsent type Insect Proof Net-house (complete covering by IP net) during August to May in the year of 2010–2012 at the CPCT farm, IARI, New Delhi. All type structures of greenhouse designing are installed under 1000 m^2area with the help of GI Pipes and covered by 200 micron thick U.V. stabilized transparent polythene and 40-50 mess size insect proof net. The experiments were laid out under Randomized Block Design (RBD). The Hi-value vegetable crops *i.e* cucumber, capsicum and tomato were transplanted during August month of the year. During the experiments we have used standardized and recommended agronomical package of practices with drip irrigation/fertigation for crop cultivation. Three successive cucumber crops were grown during the period of study (August-Nov.-Feb-May). The better growth, fruit setting, maturity, picking, higher marketable quality, fruits yield (12.50kg, 11.50kg, 13.70kg/m^2) and minimum percentage (10.75%) incidences of disease and pest were found significantly better under *Double Door Multy Span fan-pad* type as compare to others type polyhouses. This greenhouse temperature was maintained 4 to 5 degree centigrade higher (in day and night) during winter season which exhibited early fruit setting and harvesting as compared to all other design of polyhouses. The optimum temperature maintained in different greenhouses was 4–6 $^{\circ}C$ higher than the ambient temperature. The electric consumption was not required for energy conserving in any greenhouse, hence cultivation cost of all vegetable crops was relatively high as compared to naturally ventilated greenhouse.

The cost of cultivation of cucumber, capsicum and tomato varied from Rs.52.75 to Rs. 55.50/m^2 in *all* types of greenhouse design. The maximum net returns (Rs.102.5, 150.50, 70.50/m^2) and cost: benefit ratio (1: 4.20, 1:3.50 and 1:2.50) was obtained for cucumber, capsicum and tomato respectively in *Double Door Multy Span fan-pad greenhouse*. Considering the cost of cultivation, production of cucumber, capsicum and tomato are economically feasible to farmers using 1000m^2 size *Double Door Multy Span* naturally ventilated greenhouses and IP Net-house for plain condition.

T2 : HVA-30 Effect of herbal heat inducer with supplementation of mineral mixture on post calving anoestrus, milk production & it's composition in lactating buffaloes

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The domestic water buffalo (*Bubalus bubalis*) has an important role in the agricultural economy of many developing countries in Asia, providing milk, meat and draught power. Although the buffalo can adapt to harsh environments and live on poor quality forage, but reproductive efficiency is often compromised by such conditions, resulting in late sexual maturity, long postpartum anoestrus, poor expression of oestrus, poor conception rates and long calving intervals. However, in many farming systems prolonged postpartum anoestrus is a major problem, because poor nutrition, body condition, and stress due to harsh climates and improper management. Synchronization of time or induction of oestrus can be done using the same regimens as applied in cattle, using various combinations of prostaglandins, progesterone releasing devices, GnRH and eCG, but success rate observed during the periods of marginal breeding activity or seasonal anoestrus. The research based on this problem in riverine buffaloes in area specific at Unnao district level was conducted. In this research, 30 buffaloes divided into 3 groups(10 buffaloes in each group), in which T_1 was fed by farmers practices (Use of mustard cake, wheat straw and some green fodder), T_2 was fed by farmers practices with supplementation of mineral mixture and Bendofen as used Dewormer (50 g/day for 30 days with Bendofen 3 gm tablet orally) and T_3 was fed T_1+T_2 with herbal heat inducer (Estrona forte @1 cap BID for 10 days). The results were revealed that the numbers of animal showed estrous behavior and numbers of animals declared pregnant were in group T_3 (9 and 7) followed by groups T_2 (6 and 5) and T_1 (3 and 1), respectively. The percentage of fertility rate was 70, 50 and 10 % in groups T_3, T_2 and T_1, respectively. The Milk yield, Fat percent and Total solids percent were significantly ($P<0.05$) higher in group T_3 (7.006, 6.10 and 14.62) followed by groups T_2 (5.924, 5.98 and 14.32) and T_1 (4.854, 5.44 and 13.27), respectively. The Solid not fat percent was no-significant but numerically higher in group T_3 (8.51) followed by groups T_2 (8.34) and T_1 (7.82). Based on these observations, mineral mixture with herbal heat inducer (T_3) was found significantly superior as compared to other groups (T_2 and T_1).

T2 : HVA-31

Dragon Fruit: Wonder crop for rocky barren lands and water scarce semi-arid areas

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The impact of climate and human interference on land use pattern and land degradation has drawn worldwide attention. As proportions of productive lands are gradually declining with anthropogenic interventions, it is axiomatic that the food security for ever increasing population will be met from under/un-utilized harsh/waste landforms by using through adaptation and mitigation interventions. The Deccan region of India contributes a large portion to these types of landforms where rain, high temperature and edaphic constraints exist. Generally, from crop adaptation and production management point, these harsh landforms are more suited for horticultural crops as compared to field crops. Hence, there is an urgent need to identify crops, species and genotypes that can grow in these harsh agro-ecologies. Moreover, the urban consumers are now nutritionally aware and are willing to try natural products for their ever increasing ailments, of course diabetes, cardio-vascular and other stress related diseases being the most common. While choosing the crop and species for introduction, facts related to its adaptation, shelf-life, consumer acceptability must be on priority so as to contribute in the economic development of the debt ridden farming community of drought prone and degraded land areas. Dragon fruit (*Hylocereusspp*) is one such commercially lucrative plant with amazing health benefitting qualities along with better shelf-life, but has so far failed to draw much attention of growers in India. Therefore complete production technology or package of practices has been developed at ICAR-NIASM, Baramati for this fruit to exploit its potential yield and making its cultivable amongst the farmers with full support.

Dragon fruit (*Hylocerusundatus*) has been introduced as a new crop to adopt in low rainfall zone for rocky barren land and shallow basaltic murrum and gaining rapid popularity amongst farmers. Botanically, 3 species of dragon fruit viz., Red skin with white pulp (*Hylocereusundatus*), Red skin with red pulp (*Hylocereuspolyrhizus*) and Yellow skin with white pulp (*Hylocereusmegalanthus*) are available. We have initiated the cultivation of white fleshed dragon fruit (*Hylocereusundatus*) at our ICAR-NIASM experimental research farm in almost an acre. The package of practices has been standardised for rocky barren land in semi-arid regions of Maharashtra for this crop considering various steps in development. Keeping in view the general lack of its production technology and awareness in other areas,

some of the guidelines are provided here for establishing orchards of dragon fruit.Dragon fruit is propagated either by seeds or by vegetative means by using cuttings. The later is more popular due to its easiness in multiplication. The plants prefer full sunlight; hence open areas are most suitable for planting. The recommended spacing of 3.0m x 3.0m provides adequate air circulation and where as in low fertile dryland areas denser plant population is recommended (2.5m x 2.5m spacing) to compensate the yield reduction per unit area. As the dragon fruit is a climbing cacti and epiphytic, the vine needs concrete, wooden posts or wall columns for support. Immature stem must be tied to that column for aerial roots to develop and bound to the column. For this the post of 100-150 mm diameter, 2 m height are buried 40 cm in the ground.Planting is usually done during rainy season followed by making proper ridges of 50 cm height to give support to the plants. Once the vine reaches the trellies, free branching is allowed till then only the outer leader vine is to be allowed to grow which is known as structural pruning. Pruned materials can be used as cuttings for propagation which gives additional revenue. As the bunch density increases, this may invite pest and disease problem. To avoid this, number of branches need to be brought down to 30-50 by trimming the unwanted branches which is termed as production training.Irrigation should be applied whenever there is a long dry spell. However, in general, the crop is subjected to dry period in the pre-bloom period to produce more flowers. As these types of lands are having very poor soil fertility therefore, 10-15 kg FYM and 100 g SSP/ plant are required initially at the time of planting. During the first two years, 250 g urea and 200 g P and K is applied to each plant per year in two splits at six month interval. Mature plants should be given 700 g N, 700 g P and 525 g K per plant per year which should be well distributed in six equal splits from June to November at monthly interval. Nutrients should be supplied both through basal as well as through drip system install at top of the pole to feed aerial roots.As the crop is of Cactacea family, it required extremely less amount of water during most critical water availability period i.e. March to June. From June onward flowering starts and continues till October. Plant need irrigation whenever there is a long dry spell. However, in general, the crop is subjected to water stress during the pre-bloom period i.e. April- May to produce more flowers. Drip irrigation system is used to maintain soil moisture. The irrigation requirement is 1000-1500 litre/pole/year. The harvesting time mostly falls between July-November which comes in 6-7 flushes. During initial fruit development period, the outer skin of immature fruit looks bright green in colour and gradually turns red with the ripening progress. An additional advantage of the crop is that depending upon the market demand, there is a scope for adjusting the harvesting time. For local market, fruit can be harvested three to four days after the skin colour changes from green to red/pink colour, while for far markets/export purpose it can be harvested a day after colour change. Dragon fruit starts fruiting from second year onward after planting while the potential average yield of 18-20 t/ ha can be expected from third year onwards with the recommended package and practices. The experiment on shelf life of dragon fruit was conducted at ICAR-NIASM, Baramati. It was observed from the initial results that the fruit can be stored upto 5-7 days at ambient room temperature, 10-12 days and 20-21 days in cold storage at temperature of 18 $^{\circ}$C and 8 $^{\circ}$C, respectively. Dragon fruit can be taken as a money-spinning business with an initial investment of Rs 6.0-7.5 lakhs per ha.With higher retail price of the fruit i.e. Rs 150-250/kg and demand of saplings from nearby farmers for establishing their new orchards, the economic return of this fruit crop are quite remunerative.As the crop doesn't require intensive management, farmers are generating income of Rs 3-4 lakhs per year per ha during second and third year and Rs. 6-7 lakhs from 4th year onwards. Besides, farmers are also getting good return immediately one year after plantation through selling of pruned plant parts as saplings and from second year onwards through selling fruits as well as saplings. As this fruit crop is having great potential for adaptation under adverse conditions with limited inputs, the scope for expansion and adoption of this crop in degraded land areas is enormous. This crop will not only bring large unutilized area of degraded lands of Deccan region under use but also improve the socio-economic status of farmers. Once established as commercial crop on large scale, it has a thriving potential for exports also.

T2 : HVA-32 Study on Critically Endangered Raphanus Species of Jaunpur (U.P.), India.

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Raphanus sativus is native of western India. It is annual , some time biennial herbs with Rosetted of by lyrate with short term . A particular variety of Raphanus sativus known as Jaunpuri or Newar cultivated in certain belt of Jaunpur

city showed better growth in termed of length , girth and weight at certain period of growth cycle . However , this was not conspicuous 3-4 km away from the city . The paper throws light on critically Endangered species of Raphanus which is being described as new species viz. *Raphanus Jaunpurensis*.

T2 : HVA-33

Performance of New Sunnhemp Genotypes Under Different Fertilizer Management Schedule

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Crotalaria juncea L.belongs to Fabaceae family widely distributed in the tropical and subtropical regions of India, Nepal, Sri Lanka and Southern Africa. It is an important source of natural fibre. The fibre has high cellulose content, low lignin and negligible ash. In India traditionally it is used for making ropes, twines, net, handmade paper, tat-patties and canvas (Tripathi *et al*. 2012). It is also suitable for manufacturing of high quality tissue paper, cigarette paper and paper for currency.It is one of the most outstanding green manure crops. In present day context of climate change, it holds high promise on account of its ability to fix atmospheric nitrogen, adding organic matter into the soil, suppressing weeds and controlling nematodes thereby reducing dependence of agriculture on chemical inputs. In recent past drastic reduction in acreage under sunnhemp grown for fibre purpose have been noticed due to poor yieldand other various reasons. Keeping these points in view the experiment was conducted at Sunnhemp Research Station (ICAR) Pratapgarh, U.P. during 2016-17 to assess the performance of new sunnhemp genotypes under different fertilizer management schedule. The experiment was laid out in randomized block design (factorial) with two factors. The 1st factor comprised of four varieties/genotypes and 2nd five levels of fertilizer, constituting 20 numbers of treatments. All the treatments were replicated thrice. The results obtained from the experiment revealed

Table 1: Performance of new sunnhemp genotypes under different fertilizer management schedule

Varieties/genotypes	Plant height (cm)	Basal diameter (mm)	Green weight (q/ha)	Fibre weight (q/ha)	Stick weight (q/ha)
Sanai-9	255.40	10.25	397.01	9.43	49.31
Sanai-10	254.16	10.17	395.20	9.30	48.14
Suin-053	252.52	10.08	390.72	9.19	46.97
SH-4	252.25	9.97	386.67	8.92	46.15
CD@5%	**NS**	**NS**	**NS**	**NS**	**NS**
Fertilizer NPK (Kg/ha)					
Control	240.13	9.40	343.87	8.22	38.35
20:40:20	250.88	10.04	379.07	9.14	46.34
20:40:40	256.45	10.30	400.93	9.44	49.20
20:60:40	259.17	10.40	416.27	9.51	51.43
20:60:60	261.28	10.45	421.87	9.74	52.89
CD@5%	**7.17**	**0.39**	**31.02**	**0.86**	**5.96**

that variations among different genotypes and varieties were non-significant with respect to yield attributes and yield of the crop. But the performance of new genotypes were found numerically better compared to cultivated varieties Suin-053 and SH-4(Table 1).Whereas, application of fertilizer significantly influenced the yield and yield attributesof the sunnhemp. The highest values of yield and yield attributes were noted under the effect of highest level of fertilizer schedule but the difference was found significant up to the fertilizer dose of 20:40:20 kg NPK/ha only.

T2 : HVA-34 Use of antimicrobials and its effect on food animals and human health

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Increasing antibiotic use is driving an increase in antibiotic resistance, in both humans and animals. Because resistant bacteria can be transmitted between humans and animals through contact, food products and the environment, the use of antibiotics in animals plays a role in human health. More antibiotics are used in agriculture than in humans, more often to promote growth or prevent disease than to treat sick animals. Reducing the amount of antibiotics used in agriculture and phasing out the nontherapeutic use of antibiotics in animals is possible without jeopardizing animal health and will contribute to reducing the burden of antibiotic-resistant infections. Resistant bacteria and antibiotic residues have been detected in living bovines, chickens, and fish in India as well as in related food products. In many cases, the same strains of resistant bacteria are found in animal, human, and environmental sources within the same community. Currently, few laws in India govern antibiotic use in food animals, and most pertain only to animal products for export. General Statutory Rule (GSR) 28(E) mandates a withdrawal period for use of antibiotics in food producing animals from the time of administration until the production of foodstuffs. GSR 588 (E) specifies that all drugs in the H1 category, including many antibiotics, require a prescription, and requires separate pharmacy documentation of those prescriptions that are subject to review. Statutory Order (SO) 722(E) restricts some antibiotic use in aquatic animals for export, and the Export Inspection Council monitors for antibiotic residues in eggs, honey, milk and poultry for export. Surveillance, incentives, education, and appropriate laws and regulation, along with the enforcement of current laws, have the potential to reduce antibiotic use in India, lowering the resistance burden in humans and animals.

T2 : HVA-35 Comparative study on nutritional composition of cultured and wild Indian butter catfish Ompok bimaculatus

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The present investigation was carried out to determine the nutritional composition of farmed and wild Indian butter catfish (pabda) of Tripura, India. The farmed pabda was collected from the farms of College of Fisheries, Tripura and wild pabda from the local Gomti River, Tripura. Proximate composition of monthly samples was analyzed. There was no significant differences ($p>0.05$) in moisture (75-76.5%), ash (1.06-1.26%), protein (15.02-16.38%) contents between the wild pabda and farmed pabda. Lipid content was high in farmed pabda (6.73-7.32%) than in wild pabda (5.35-7.26%). The macro and micro minerals content of farmed and wild pabda showed no significant difference ($p>0.05$). However, only significant difference ($p<0.05$) was observed in Mg concentration. In case of farmed pabda macro minerals concentration was found Na, 106.13mg; Mg 12.53mg; Ca, 9.57mg; K, 117mg and P, 445.69mg, whereas in case wild pabda, it was found that the Na, 92.53; Mg 18.07mg; Ca,14.77 mg; K,113.06mg and P, 461.69mg. The concentration of micro minerals in farmed pabda was observed as Fe, 1.62 mg; Cu, 0.81 mg; Mn, 0.21 mg and Zn, 0.84 mg per 100 g of muscle, whereas in case wild, Fe, 1.94 mg; Cu, 0.81 mg; Mn, 0.12 mg and Zn, 0.84 mg per 100 g of muscle. The result shows that, farmed and wild pabda differ in their proximate composition, especially in lipids, and minerals concentration. The difference in both fishes bay be due to habitat changes. Though the fish is not commonly being cultured in Uttar Pradesh due unavailability of seed, it is advised to standardize culture and seed production technology according to geographic index of different places in order to exploit its full potential sustainably.

Keywords- Pabda, Ompok bimaculatus, Proximate composition, Tripura enforcement of current laws, have the

T2 : HVA-36

Timely Plantation of Banana is Helpful in Doubling The Income of Banana Growers

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Banana (Musa sp.) is the second most important fruit crop in India next to mango. Its year round availability, affordability, varietal range, taste, nutritive and medicinal value makes it the favourite fruit among all classes of people. It has also good export potential. Hi-tech cultivation of the crop is an economically viable enterprise leading to increase in productivity, improvement in produce quality and early crop maturity with the produce commanding premium price. A field experiment (On Farm Trial) was conducted by KVK, Sitapur to evaluate the effects of time of plantation in banana crops against profitability in two selected villages viz; Akohra and Tedai khurd. Banana saplings were planted on three different times viz; 19th June, 15th July and 16th August, 2015. Planting time had significant influence on almost all parameters studied. Banana planted on 15th to 20th July had better agronomic traits contributing towards yield. The result shows that plantation between 15th to 20th July (T3) was found best treatment with highest benefit - cost ratio 2.87 followed by plantation between 15th to 20th June (T2) with 2.67 benefit – cost ratio. Plantation between 15th to 20th August (T4) and Farmers Practice - Plantation between 1st to 20th September (T1) were found very poor with very low benefit-cost ratio 1 .35 and1.05 respectively.

Keywords: Banana crop, Time of plantation, Benefit - cost ratio

T2 : HVA-37

Application of Paclobutrazol In Mango Orchad For Increasing The Income Of Mango Growers

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A field experiment (On Farm Trial) was conducted by KVK, Sitapur to evaluate the effects of Paclubutrazol to control irregular bearing in Mango cv: Dashahari. The plants were identified in prior fruiting season in 3 selected villages. The recommended quantity of Paclobutrazol was diluted in clean water of 10 lt. and applied in a furrow 15 cm. deep, about 5 feet away from the trunk on 25th September. After application of the paclobutrazol the soil was filled up. The soil moisture was maintained up to one month after application of paclobutrazol and application of nitrogenous fertilizer before and after one month of application was also avoided. Trial was conducted on 5 plants for each treatment. Profuse flowering and fruiting was observed in treated plants. The result shows that the treatment comprises Soil application of Paclobutrazol (3.2ml/mt. canopy diameter) (T2) was found best treatment with highest yield (143.50q/ha), net return (1,03,100.00) and benefit - cost ratio 3.55. Farmers practice (no treatment of paclobutrazol) (T1) was found very poor treatment with lowest yield (34.40q/ha), net return (12,200.00) and benefit-cost ratio 1 .55.

Keywords: mango, paclobutrazol, soil drenching, panicle emergence

Theme 3-7

Abstracts: Conservation agriculture, Technological applications for rainfed and dry land agriculture, Organic farming, Value addition and Secondary agriculture for increasing farmers' income

T3 : CA-1 Performance of green gram (*Vigna radiata* (L.)) to moisture conservation practice and potash levels

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A field experiment was carried out during Zaid season of 2014-15 and 2015-16 at farmer's field of Village Kallarpur Gurjar, Rampur Maniharan, Saharanpur, UP, India to evaluate the Performance of Green gram (*Vigna radiata* (L.) to moisture conservation practice and potash levels under rainfed conditions.There were twelve treatment combinations which are evaluated by using split plot design with three replications. The moisture conservation practices viz., flat bed, between row sub-soiling, ridges and furrow and broad bed and furrow constituted the main plot while potash levels i.e. 0, 20 and 40 kg K_2O ha^{-1} comprised the sub plot treatments. Significantly higher Grain yields (9.05 q ha^{-1}) and straw yields (18.70 q ha^{-1}) were achieved under broad bed and furrow, being statistically at par with treatments between-row sub-soiling and ridges and furrow over flat bed. Significantly higher protein content was recorded under broad bed and furrow, being statistically at par with treatments between row sub-soiling and ridges and furrow. Potash fertilization @ 20 and 40 kg K_2O ha^{-1} being statistically equivalent proved superior to control in terms of grain yields, on an average increased by 19.6 and 10.4%. In case of straw yield treatment K_1 (20 K_2O kg ha^{-1}) recorded significantly higher straw yield over treatment K_0. Significantly higher content and uptake of nutrients (N, P and K) were registered with broad bed and furrow and between row sub-soiling over flat bed. The maximum net realization of 19603 Rs. ha^{-1} and 16223 Rs. ha^{-1} was obtained with broad bed and furrow and between rows sub-soiling respectively, whereas, flat bed realized the lowest net realization (12967 Rs. ha^{-1}). It seems quite logical to conclude that higher production and net realization from green gram can be secured by adopting broad bed and furrow or between rows sub-soiling and fertilizing the crop with 20 kg K_2O ha^{-1} besides the recommended dose of N and P on sandy loam soil of Saharanpur.

T3 : CA-2 Evaluation of Different Coloured Shade-Net Protected Covered and Open Field Cultivation for Leafy Vegetables during Peak Summer Season in Plains

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India is second largest vegetable producer in the world but still production and productivity is very low. This is primarily due to erratic climatic conditions. Consequently, even required 300g per capita per day vegetable is not available. High yielding hybrid varieties of vegetables and protected cultivation technologies have shown great

potential in different climatic conditions. However, such findings are very scanty in plain conditions of India. Protected structures act as physical barrier and play a key role to minimize biotic and a biotic stress to the crop. Therefore, presentexperiment was conducted on Protective structures are used against biotic and a-biotic stress which is enhances production and productivity per unit area through control microclimate in side of plants.Walk- in-tunnels with 50% U.V. Stabilized and shading intensity were fabricated with Quonset type design of GI pipes have beeninstalled in 100m^2 area with different colour*i.e* Red, Black, white and green shade nets cover on separate tunnel (size 4mW x 2mCH x 25mL) at the CPCT, IARI, New Delhi. The roof and one side of the Shade-net were covered but the front and back side was kept open. The sowing of seeds was done on 25 March 2012 with row to row spacing 15x15 cm in double row along with the drip line. Recommended package practices were used with NPK fertilizer dose @ 150:100:100 provide ½ as basal and ½ fertigation system. The results showed that shade nets with 50% solar intensity can decrease the temperature up to 1-2 $^{\circ}$C and increased 10-20% relative humidity during summer season. This type of shade-net structure protects the crop completely from intense solar radiations, warm winds, harmful UV rays and hot air. It also provides cooling effect to the crop as compared to hot conditions during summer season. After the harvesting of the crop, it was observed that the red colour shade-net promoted earliness, quality yield and economics of Spinach per unit area as compared to other coloured shade-nets. However, green colour shade-net promoted more quality yield and economics in coriander as compared to other shade-nets.

T3 : CA-3 Comparative studies onprotected v/s open field condition on insect-pestincidences and quality produced percentage in high-value horticultural crops

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Protected structures act as physical barrier and play a key role to minimize biotic and a biotic stress to the crop. India is second largest vegetable producer in the world but still production and productivity is very low. This is primarily due to erratic climatic conditions. Consequently, even required 300g per capita per day vegetable is not available. However, such findings are very scanty in plain conditions of India. Therefore, presentexperiment was conducted on Protective structures are used against biotic and a-biotic stress which is enhances production and productivity per unit area through control microclimate in side of plants.An experiment comprised of three crops like Tomato (Gs-600), Capsicum (CW) and Strawberry (Chandler variety) on insect-pest incidence under open field and polyhouse conditions were conducted at CPCT, IARI, New Delhi, during 2012 to 2013. The result revealed that the minimum incidence of insect-pest, plant mortality from affected insect vectors and spraying of insecticide were observed under polyhouse condition as compared to open field condition. However, un-marketable (insect affected) fruits were almost nil under polyhouse condition as well as to open field condition. The marketable fruits (free from insect-pest) production (kg/plant) and net income (Rs./plant) found maximum under polyhouse compared to open field condition in all crops during all seasons. The yield and economic loss was found very high under open field crops in respect of polyhouse cultivation respectively in all season. It was conducted that cultivation of highly insect-pest susceptible vegetable and fruits crops inside polyhouse is beneficial. Cultivation under polyhouse was thus observed to be a better technique forIPM.

T3 : CA-4 Effect of poly-tunnel technology on zucchini production during early cumoff-season in the Indian plains

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Poly-tunnels are miniature form of temporary or shifting greenhouses to protect the plants from rains,winds,low temperature (cold),frostand other vagaries. These are used to extend the growing season of summer squash to obtain marketing advantage of their off-season and early produce. With the use of low tunnels summer squash can be grown very early in the spring or summer season. Therefore, an experiment was carried out to study the effect of Plastic low tunnels on summer squash varieties with respect to quality, yield and net return at CPCT Farm, IARI, New Delhi during 2013-2014. The summer squash varieties *viz*., Australian Green (long green), Zucchini (long yellow), Chand (round) and DS- 8 (round) were transplanted on 3rd week of November with single row plant to plant spacing of 60 x 60cm along with pressurized drip line in both the years. All scientific recommended packages of practices were followed during the cropping period. After transplanting the summer squash the low tunnels were installed over the rows then immediately individual beds were covered with 20-30 micron transparent film. The plastic low tunnels provided the help to plants inside the tunnel by warming the soil and advancing the crop by 30 to 40 days than the normal season. Between long and yellow fruited varieties Zucchini was found best in terms of quality and average yield (56.20t/ ha) and fetched very high net return (Rs 2.8 Lac/ ha) and between round fruited varieties Chand was found best in terms of quality and average yield (41.50t/ ha) and fetched very high net return (Rs 2.1 Lac/ ha) during off and early season and can be grown successfully by using the plastic low tunnel technology. This technology is highly suitable and profitable for the farmers living in northern plains of India.

T3 : CA-5

Sustaining sugarcane productivity- Conservation agriculture is the way forward

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Sugarcane fits well into the predominant rice-wheat cropping system of the Indo-Gangetic plains. In UP, the major sugarcane based cropping systems is Rice-wheat/mustard-sugarcane plant-first ratoon -wheat (RWS) system. Majority of the crops in the sugarcane based cropping systems are exhaustive in terms of nutrients, delay planting of sugarcane and the place for pulses and green manure crops for improving soil productivity is very less in the system. However, sustainability of this cropping system is at risk due to the deterioration of soil health, mounting pressure on natural resources and emerging challenges of climate change. Conservation Agriculture (CA) involving zero- or minimum-tillage, crop diversification and crop residue management (CRM) to avoid straw burning should assist in achieving sustainable productivity and allow farmers to reduce nutrient and water inputs, and reduce risk due to climate change. High yields of the irrigated RWS system have resulted in production of huge quantities of crop residues (CRs). Burning of rice straw is common in north-western parts of India causing nutrient losses, and serious air quality problems affecting human health and safety. Mulch is a good option with residue management of previous crop in wheat, sugarcane and sugarcane ratoon, especially with no tillage. Mulch can increase yield, water use efficiency, and profitability, while decreasing weed pressure, chemical fertilizers. Long-term studies of the residue recycling have indicated improvements in physical, chemical and biological health of soil. Since CRs contain significant quantities of plant nutrients; their continuous application will have positive effect on fertilizer management in RWS system. Adoption of zero tillage resulted in high crop yield, lower production cost and saving in water and energy. Recent developments in machineries (zero till seed cum ferti- drill, happy seeder and sugarcane cutter cum planter) allowing zero-till sowing/planting of crops in the RWS system with residue of previous crop as surface mulch, while maintaining yield, reduces tillage costs and may beneficial for advancement in sowing/planting all crops of the system.

There is need to develop resource conservation technologies and machineries which may capable to increase the productivity of RWS system, its profitability and sustainability to meet future food and sugar demand of India. In countries like Brazil and Thailand sugarcane is being grown in accordance with the CA technologies on sizeable area of land, however, in India, there is more research need to develop agro-techniques under CA which can effectively conserve the physicochemical and biological properties of soil, reduce/zero tillage, CRs management,

conserve the natural resources, reduce the cost of cultivation, inclusion of legumes in RWS system and maintain the sustainability of sugarcane production system.

T3 : CA-6 Comparative studies on indeterminate cherry-tomato with plastic mulch under different protected structures in plain conditions of India

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Protective structures are used against biotic and a-biotic stress which enhances production and productivity per unit area through control of microclimate in side of plants.Virus free quality production of Cherry tomato hybrids is very difficult in open condition during pre and post winter season in India. High yielding hybrid varieties of vegetables and protected cultivation technologies have shown great potential in different climatic conditions. However, such findings are very scanty in plain conditions of India. Therefore, we evaluated naturally ventilated polyhouse, Force ventilated polyhouse and Insect Proof net house for production of indeterminate cherry tomato (Var.PusaCherry-1) in year 2013-2014. Twenty five days old seedlings were transplanted during 1st week of August, 2013 under different protected structures i.e. naturally ventilated polyhouse, Fan-pad polyhouse and Insect proof net house on raised beds along with plastics mulching and drip fertigation system. Result revealed that the IP-net house with the combination of plastics mulch exhibited higher tomato fruits yield as compared to without mulch under NV and FP polyhouse (Tablie-3). The IP-net-house received maximum sun shine (85%) harvesting during winter and continued to receive fresh air and provided more ventilation (90%) and protects against virus. Due to higher production, the IP-net-house was found more feasible and economically viable for the plains farmers as compared to others.

T3 : CA-7 Doubling FARMERS income through protected cultivation of rose in Burhanpur district of M.P. – A success story

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India is endowed with diverse agro- Climatic conditions, Which help to grow all kind of horticulture crops, almost throughout the years, in one part of the country or the other, but the quality of produce under open field conditions, particularly in case of high-value flowers & vegetables are not suitable for international as well as standard domestic markets. In recent years, changing climate is expected to be harsher and detrimental on crop production. A breakthrough in production technology that integrates market driven quality parameters with the production system, besides ensuring a vertical growth in productivity is required. One such technology is "Protected Cultivation" or generally called greenhouse technology. Naturally ventilated poly houses coupled with drip irrigation & fertigation can be effectively used to mitigate the ill effects of climate and force the quality production of high valued flowers & vegetables out of the season for the realisation of better market prices.

Keeping above in mind, a farmer of village SirsaundaDistt., Burhanpur motivated for Rose Cultivation under ploy house with the support of state govt. subsidy schemes in the year 2015 under the technical supervision & guidance of KrishiVigyan Kendra, Burhanpur. Four-month-old budded plants of top secret variety were used as seed material. Planting is done in the raised bed with paired row system in zig- zag fashion by giving the spacing of 40-45 cm Row to Row and 20-25 cm plant to plant. The data on economic parameters reveals that Rs. 5,93,700/ per 1000 sqm was earned from Rose Captivation under ploy house while Rs. 64,650/ per hectare through different Crop cultivation under open field condition. The B:C ratio was 5.94 in Rose cultivation whereas it was 2.78 under open field condition.

The finding indicated that a proper approach is required to convert maximum area under protected cultivation of high values flowers and vegetables in order to increase the income of farmers as well as state / national productivity.

T3 : CA-8 Role of resource conservation technology (Zero Til seed dril) in district- Sultanpur

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In U.P. about 60% area under wheat comes after paddy although it is not scientific approach but vast area coverage under this crop rotation needs attention and technology application. Impact of Use of Zero till seed drill in wheat sowing has paramount importancein placement of seed and fertilizer, saving of 10 to 15 days time. Low weed incidence and energy and labour saving. Due to RCT Paddy-Wheat crop rotation results as higher yield and net return.In district- Sultanpur 3 to 8% canal command area as well as low lying area covered under wheat sowing which are about 280 ha. Thus, it in throughout desirable to use Zero till seed drill in wheat sowing to advance sowing by 10 to 15 days and yield was also increased by 4 to 6/ha (10 to 15%). The average yield of wheat was recorded 55.56 q./ha. The total income was Rs. 62,000.00 to 65,000-00/ha where as net income was Rs. 35,000.00 to Rs. 37,000.000/ha. Thus it is concluded that the Zero till seed drill in wheat is very useful & need extension of technology as large scale in the district for popularisation.

T3 : CA-9 Aerobic rice: An approach for addressing low crop yield and water productivity issues in rice

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Flood-irrigated rice uses two to three times more water than other cereal crops such as wheat and maize. One way to reduce water demand is to replace conventional puddled transplanted rice with direct dry seeded aerobic rice. At present, the area of direct seeded rice in India is 7.2 million hectare that accounts for 26% of the total area under rice in South Asia. In Asia, "upland rice" is already grown aerobically with minimal inputs in the upland environment, but mostly as a low-yielding subsistence crop to give stable yields under the adverse environmental conditions of the uplands (Lafitte et al., 2002). Researchers are developing a simple but profound solution that requires less water to grow rice. This includes aerobic rice, alternate wetting-and-drying (Bouman and Tuong, 2001; Belder et al., 2004), continuous soil saturation (Borell et al., 1997), and direct (dry) seeding (Tabbal et al., 2002). These techniques involve irrigation applied to bring the soil water content in the root zone up to field capacity after it has reached a certain lower threshold level, such as halfway between field capacity and wilting point (Doorenbos and Pruit, 1984). Yield decline up to 15-20 % has been recorded under aerobic condition as compared to conventional method at various locations (Peng et al. 2006). Harvest index in these systems are also low which might be due to the reason that, aerobic system enhances root development to the deeper soil layers and also the root shoot ratio (Bañoc et al. 2000), thus, creating competition between root and shoot for photosynthates within the plant leading to low yields (Singh et al., 2012).

The shift from flooded soils to aerobic soils also causes changes in nutrient availability which plays an important role on nutrient uptake by crops. Attention should be given to nitrogen (N), zinc (Zn) and iron (Fe) availability and their uptake by aerobic rice. Therefore, to increase the nutrient uptake, approach of application of nutrient in an integrated

manner should be practised. Some new approaches should be explored to increase water economy without compromising on yield. It is hypothesized that bio-regulators and agrochemicals have potential to promote development of efficient root system architecture and thus can enhance tolerance to depleting soil moisture. The seed treatment as well as foliar application of bio-regulators and agrochemicals can facilitate this process when rice is grown aerobically through positive impact on physiological processes leading to growth and development. This aligns with concept of Low External Input and Sustainable Agriculture (LEISA) which is gaining significant interest among scientific community. LEISA is based upon the options which are ecologically sound, economically feasible, and culturally acceptable. This is generally achieved through the exogenous application of low concentration of chemicals termed as "Plant Bio-Regulators (PBRs)". Their successful implementation is dependent upon the interaction between scientists and farmers so that the knowledge accrued from plant responses toward different environmental factors at molecular, cellular and whole plant level can be utilized to develop an effective PBR. Exposure of plants to water stress leads to serious physiological and biochemical dysfunctions including reduction in turgor, growth, photosynthetic rate, stomatal conductance and damages of cellular components (Janda et al., 2007). Salicylic acid (SA) has significant role in controlling abiotic stresses including drought and salinity stress. Its utility however depends on various factors like concentration of SA applied, mode of application and the stage of plant growth. At low concentrations SA has been found to alleviate abiotic stress and at higher concentrations it induces oxidative stress (Vicente and Plasencia, 2011; Miura and Tada, 2014). Higher tolerance to drought stress was also observed in the plants raised from the grains soaked in aqueous solution of acetyl salicylic acid (Hamada, 1998; Hamada and Al-Hakimi, 2001).These probable combinations of suitable genotype and use of bioregulators/agro-chemicals will help in making aerobic rice cultivation ecofriendly and profitable for farmers.

T4 : RDA-1

Evaluation of bio-mulching in organic ginger production and income generation under rain-fed conditions

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Protective structures are used against biotic and a-biotic stress which enhances production and productivity per unit area through control of microclimate in side of plants. Field experiments were conducted during 2007-10 at various farmer's field of Dzongu valley of North Sikkim district of Sikkim to identify locally available different forest plant suitable for leaf material for using as bio-mulching under rain-fed condition as farmers practices for the main objectives: to identify best leaves for control moisture loss, optimized temperature, soil erosion, weeds and disease incidences, increased germination, quality yield and economy in organic ginger (*Zingiberofficinale*Rosc.) local cv. *Bhaisey*. Green leaves of *Artemisia vulgaris*, *Schimawallichii*, *Eupatorium odoratum*, *Alnusnepalensis* and mixed leaveswere used traditionally as bio-mulches in organic ginger seeding in field. The longest rhizome size (7.25 cm), no. of rhizome fingers/plant (39.23), more ginger yield (208.54 q/ha), B:C ratio (1:1.80), lowest incidence of diseases (16.10%) , recorded significantly maximum soil moisture conservation (44.75%) and optimum soil temperature (24.80°C) were recorded significantly under the *Schimawallichii*fresh leaves for bio-mulching as compared to all other bio-mulching material in organic ginger production and economic under rain-fed condition of NE hills. The leaves of S*chimawallichii*used as bio-mulch in organic ginger increased in yield (60%) and net return (134.50%) as compared to without mulching (control).

T4 : RDA-2

Evaluation of recombinant inbreed lines (RIL) population of upland rice under stress and non stress conditions for grain yield and drought tolerance

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Drought is a major abiotic stress that limits rice productivity in rainfed and upland ecosystems (Bimpong *et al*., 2011) and worldwide, drought reduces yield by 15–50 % depending on the stress intensity and crop growth period at which the stress occurs in rice (Srividhya*et al*., 2011).Under stress, days to 50% flowering (DTF) advanced by one week to one fortnight, average plant height reduced by 12.9%-29.5%, panicle numbers drastically reduced to 41.6%-65.4%, yield of inbred lines decreased from 17.34% -86.04% at an average of 44.86%than non stress condition. Similarly it was found that biomass; harvest index, filled grains/panicle, total grains/panicle, fertility % etc are reduced under stress condition in comparison to non stress condition. Variation of drought susceptibility index (DSI) in the inbred lines ranges from -1.081 to 2.116. Drought tolerance index (DRI) for inbred lines rice varies from 0.04 to 2.80 with average of 1.02. Significant variations observed in the population for different agronomical characters and derived indices will facilitate selection of derived lines with drought tolerance.

T4 : RDA-3

Study the extent of participation and empowerment of rural women in mushroom cultivation in rianfed condition of Jharkhand

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The novel experiments was undertaken among 70 on-campus trainees and 70 off-campus trainees spread among three purposely selected villages under two blocks under the domain of KVK, Koderma, Jharkhand which falls under rainfed condition. Farmwomen remains engaged in rice cultivation, after rice they have much spare time, which is wasted. KVK Kodermawas surveyed and it was decided to introduce mushroom cultivation.After three years of initiation of this intervention, this study was done. The 20 on-campus trainees and 20 off-campus trainees were selected randomly from each selected villages for the purpose of this study. Two variables namely, extent of participation and impact of KVKs in empowering rural women has been operationalized as the degree to which rural women participate in various activities in mushroom cultivation. The respondents were interviewed personally by a well-structured interview schedule. The findings on the extent of participation are given under the overall participation and activity wise participation. The salient findings of the study are, majority (68.42 %) of the respondent had medium level of overall participation, followed by high (16.82 %) and low (13.70 %) level of overall participation. Attending group meeting (2.15), operating commercial ventures (1.70) and attending village development work (2.10) are the major activities in Mushroom cultivation, economic activities and social developmental activities, respectively. It was also found that majority of the respondents (73.30%) had increased their knowledge level after going through these training courses, 44.25% of the respondents had improved their skill, 38.60

% of the respondents became fully independent. The study also revealed that rural women became socially, economically, psychologically empowered and had the power of taking decisions.

T4 : RDA-4 Studies on parthenocarpic cucumbers with and without plastic mulch under naturally ventilated polyhouse

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India is second largest vegetable producer in the world but still production and productivity is very low. High yielding hybrid varieties of vegetables and protected cultivation technologies have shown great potential in different climatic conditions. However, such findings are very scanty in plain conditions of India. Protected structures act as physical barrier and play a key role to minimize biotic and a biotic stress to the crop. Therefore, presentexperiment was conducted on protective structures against biotic and a-biotic stress which enhances production and productivity per unit area through control of microclimate in side of plants. Three varieties of parthenocarpic cucumber viz; Kian, Satis, and Hilton were evaluated under naturally ventilated greenhouse equipped with low pressure drip irrigation cum fertigation system during August to December 2012. The crop was transplanted on August 7, 2012. Out of three varieties of parthenocarpic cucumber, variety Kian took minimum period for First harvesting (33 days) after transplanting and produced highest fruit yield (2.15 kg/ Plant and 75.80 q/1000 m^2) and maximum cost benefit ratio (1:2.20) as compared to other three varieties. 25-30 micron silver/black plastic mulch on rig bed along with drip was used during transplanting time at the 30x30 cm spacing. The plastics mulching enhanced 40.50% more fruits yield of cucumber as compared to without mulching under polyhouse condition.

T4 : RDA-5 Influence of different level of drip irrigation and plastic mulching on yield, quality and economics of broccoli crop under tarai region of Uttarakhand

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A field study was carried out at Vegetable Research Centre of G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand during *rabi* season of the year 2012-2013 to standardize the drip irrigation levels and plastics mulching on growth, maturity, yield, water-use efficiency and economics of broccoli. Seven irrigation levels based on pan evaporation (E_{pan}) from a USWB Class-A open pan*i.e.* 100%, 80% and 60 % of PE replenishmentdaily as well as alternate day along with surface irrigation were tested under two levels of mulching *viz.,* without mulch (open surface)and UV stabilised 50 micron thick black plastic mulch in a Two Factorial Randomized Block Design replicated thrice. All growth characters as well as yield and yield attributes were found significantly higher with 100 % PE replenishment daily under plastic mulch. The highest water use efficiency (WUE) of 13.92 q ha^{-1} cm^{-1} was observed with 60 % PE replenishment daily through drip under plastics mulch and lowest (6.02 q ha^{-1} cm^{-1}) with traditional practices *i.e.* surface irrigation under without mulched (open surface) condition. Highest gross return (Rs.300795ha^{-1}), net return (Rs.214969ha^{-1}) and benefit cost: ratio of1: 3.50 was obtained in100 % PE replenishment daily with the combination of black plastic mulching.

T4 : RDA-6

Effect of crop establishment methods and weed management practices on weed management and rice yield of direct seeded rice (DSR)

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Rice is a principal source of food for more than half of the world population, and more than 90% of rice worldwide is grown and consumed in Asia. A change in establishment method from manual transplanting of rice seedlings to direct seeded rice (DSR) has occurred in some countries as growers respond to increased costs or decreased availability of labor or water. However, weeds are a major constraint to DSR production because of the absence of the size differential between the crop and the weeds and the suppressive effect of standing water on weed growth at crop establishment. A study was conducted during the kharif season of2015 and 2016 at the Agronomy Research Farm of NDUAT, Kumarganj, Faizabad (U.P.) to evaluate the performance of three rice establishment methods and eight weed control treatments on weed management, and rice yield. These approaches may include rice establishment methods (Main Plot); Dry Seeding; Seeding through Drum Seeder (Wet); Broadcasting (Wet) and Weed management Practices (Sub Plot); Bispyribac-Na @ 25g/ha at 25DAS; Pendimethaline @100g/ha at 0-2DAS**fb** Bispyribac-Na@25g/ha at 25DAS; Oxadiargyl @100g/ha 0-2DAS**fb** Bispyribac-Na@25g/ha at 25DAS; Pretilachlore @ 750g/ha at 0-2DAS**fb** Almix @ 4 g/ha at 25DAS; Pyrazosulfuran @ 20 g/ha at 0-2DAS**fb** ethoxysulfuran @18.75 g/ha at 25DAS; Manual Weeding; Weed free; weedy. Grass weeds were higher in dry-seeded rice(DSR) as compared to drum seeding and broadcasting. The highest total weed density(235.5–256 plants m^{-2}) and total weed biomass (310–501 g m^{-2}) were recorded in DSR while the lowest (129–156 plants m^{-2} and 95–387 g m^{-2}) in puddled condition. A weedy check and manual weeding (15 and 25 DAS) were maintained for comparison. Oxadiargyl**fb** Bispyribac sodium suppressed both weed density (80%) and dry weight (85%) over control that was highest among all herbicides. Higher rice grain yield and maximum marginal rate of return was also associated with this herbicide in all rice establishment methods. Despite of its effectiveness against weeds and scoring higher rice yields, manual weeding was uneconomical primarily due to higher costs involved. Post emergence application of bispyribac sodium appeared to be aviable strategy for weed control in direct seeded rice with higher economic returns.In both seasons, herbicide efficacy was better inDSR and wet-seeded rice. DSR produced the maximum rice grain yields. The weed-free plotsand herbicide treatments produced 84–62.4% and 59–52.4% higher rice grain yield, respectively, than theweedy plots in 2015, and a similar trend was observed in 2016.intraction between crop establishment methods and weed management practices was nonsignificant during both years.

T4 : RDA-7

Influencing technologies: To improve efficiency of water use

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The competition for existing freshwater supplies will require a paradigmatic shift from maximizing productivity per unit of land area to maximizing productivity per unit of water consumed. This shift will, in turn, demand broad systems approaches that physically and biologically optimize irrigation relative to water delivery and application schemes, rainfall, critical growth stages, soil fertility, location, and weather. Water can be conserved at a watershed or regional level for other uses only if evaporation, transpiration, or both are reduced and unrecoverable losses to

unusable sinks are minimized (e.g., salty groundwater or oceans). Agricultural advances will include implementation of crop location strategies, conversion to crops with higher economic value or productivity per unit of water consumed, and adoption of alternate drought-tolerant crops. Emerging computerized GPS-based precision irrigation technologies for self-propelled sprinklers and micro irrigation systems will enable growers to apply water and agrochemicals more precisely and site specifically to match soil and plant status and needs as provided by wireless sensor networks. Agriculturalists will need to exercise flexibility in managing the rate, frequency, and duration of water supplies to successfully allocate limited water and other inputs to crops. The most effective means to conserve water appears to be through carefully managed deficit irrigation strategies that are supported by advanced irrigation system and flexible, state-of-the-art water delivery systems. Non agricultural water users will need to exercise patience as tools reflecting the paradigmatic shift are actualized. Both groups will need to cooperate and compromise as they practice more conservative approaches to freshwater consumption.

T4 : RDA-8

Advances in Rain-fed Lowland Area of Eastern Uttar Pradesh

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Rainfed low land rice including deep water of which 92% is distributed in eastern India (Assam, Bihar, West Rice crop is grown in monsoon ridden low land situation under constant threat of inundation and submergence. Bengal, eastern Uttar Pradesh and other northern states. Excessive water in deep water areas results in partial or complete submergence of the plant. In eastern India,a sizeable area is under rainfed lowland situation.Flood is the overflowing of water from water bodies like lake or river. Excess rainfall is also a part of climatic change which leads to flood and destroys the ecosystem. Rice environments in India are extremely diverse with more than 44.5 million hectares of rice area of the total 2.3 million hectares of flood prone rice area in eastern India. Eastern Uttar Pradesh alone has 0.39 million hectares. These areas are located in depressed basins and low-lying areas adjacent to rivers in different eastern districts of the state which are subjected to various types of uncontrolled flooding every year. The most important limiting factor for rice production in such areas are unpredictable drought, submergence, flash flooding, low resource base of farmers, stem-borer infestation and unavailability of appropriate crop management technologies. Erratic rainfall leads to drought during vegetative period, but later on crop may be damaged by submergence due to high rainfall. Damage due to flash flood is quite high.

Rice-farming in these fragile areas are complex, diverse, risk-prone and more vulnerable than the other rain-fed ecosystem, hence its yield is low and unstable. Based on the variations in flooding pattern and water-regime, flood-prone areas are grouped into 4 eco-systems viz. deep, semi-deep, flash flood prone and off-season deep stagnant (boro). Major factors determining adaptations of such rice include survival strategies (submergence tolerance for flash flood, elongation ability for stagnant deep and cold tolerance for boro rice), soil types, plant statures, maturity time, photo period sensitivity and farmers' preference and requirements. Research efforts resulted in release of Jalmagna, Chakiya-59 and Madhukar in the late 60's following pure line selection. During last decade, three improved varieties viz. Jalnidhi for floating ecology, cross breeds Jalpriya for semi-deep water and BarhAvarodhi for flash flooded areas were released. The new entry NDGR 201 was released by CVRC for rsemi-deep water situation of Uttar Pradesh & Bihar in 2013.

The yield potential of the deep water rice could be improved by introducing an appropriate plant type. With increased tolerance of submergence, yields of flash-flooded areas could be increased.

T5 : OF-1

Agricultural utilization of MSW vermicompost: appraisal of potential effect on *Abelmoschusesculentus* L.

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Introduction of "Green Revolution" has resulted in enhanced use of inorganic fertilizers for raising the agricultural production. Though it has increased the agricultural production, its rampant use poses threat to soil health and agricultural productivity. Furthermore, rapid pace of urbanization and population growth has led to burgeoning amount of solid waste that needs to be managed in a sustainable way without harming the environment. In view of the above agricultural utilization of organic fraction of municipal solid waste (MSW) through vermicomposting provides an alternative and promising option for the management of two-fold problems at a time viz. ensuring agricultural sustainability and waste management. In the present study, effect of earthworm processed MSW was seen on biochemical, physiological and yield responses of *Abelmoschusesculentus* L. Plants were grown on different amendment rates of municipal solid waste vermicompost (MSWVC). A pot experiment was conducted by mixing MSWVC at 0, 20, 40, 60, 80 and 100% rate to the agricultural soil. The results showed a significant increase in photosynthesis rate and stomatal conductance of plants grown at different MSWVC rates (excluding higher doses). Total chlorophyll, carotenoid and protein contents also increased except higher doses of MSWVC. Likewise, proline, peroxidase and lipid peroxidation increased with increasing level of MSWVC. The study suggests that MSWVC could be used as organic amendment in soil depicted by good yield and anti-oxidative response of lady finger plants at different amendments of MSWVC.

T5 : OF-2 Organic Agriculture: Its Relevance to Indian Agriculture

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The green revolution technologies promoting higher use of synthetic agrochemicals such as fertilizers and pesticides with adoption of nutrient -responsive, high yielding varieties of crops, have boosted the production and productivity of crops. However, this increase in productivity has slowed down and in few cases; there are indications of reduction in growth of productivity. Priorities in agricultural research are gradually sifting attention from individual crop performance to a total factor productivity with keeping in view on product quality and environment safety in sustainable manner. Environmental and health problems associated with agriculture have been noticed, but it is only recently that the scale of the costs have attracted the attention of planner and scientists.

In India, only 35 % of total cultivable area is covered with fertilizers where irrigation facilities are available and in the remaining 65% of the arable land, which is mainly rainfed, negligible amount of fertilizers are being used. Farmers in the area often use organic manure as source of nutrients that are readily available either in their own farm or in their locality. The hilly region of India provides considerable scope and opportunity for organic farming due to least utilization of chemical inputs. Millions hectare of such land is available in the hilly region of India, which can be exploited for organic production. With the sizable acreage under naturally organic cultivation, India has tremendous potential to grow crops organically and emerge as a major supplier of organic products in the worlds organic markets. In large areas of country, where less amount of chemicals are used and have low productivity, could be exploited as potential areas for organic agriculture. Application of organic manures and residue incorporation is the only option to improve the soil organic carbon for sustenance of soil quality and future agricultural productivity. The replacement of external inputs by farm derived inputs which create to reduction in input costs under organic agriculture. The acreage in organic agriculture in developing countries is growing because it places more reliance on the natural

and human resources available, low financial inputs and provide quality food materials while conserving the environment. The government, private sector, producer associations and other stakeholders each have a necessary role to play in creating awareness, promoting and facilitating marketing of organic produce. Technical advice on how these processes function in other places and the roles of the different players would be very helpful. Under above circumstances, full potential of organic farming can be harnessed and country's commitment on food self sufficiency and other economic activity can be sustained with environments benefits.

T5 : OF-3

Prospects of Organic Farming in India

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Organic Farming has emerged as global interest with significant benefits on social, economic and envrionmental issues. It has shown the positive effects on climate change mitigation by enhancing the soil carbon sequestration. Similarly, it is also considered ecosystem-friendly because of its emphasis on minimum tillage and reduced use of pesticides, herbicides and synthetic fertilizers. Organic farming is thought of as the best alternative to avoid the ill effects of conventional chemical farming. Furthermore, organic farming reduces the vulnerability of the farmers to climate change and variability by comprising highly diverse farming systems and thus, increases the diversity of income sources and the flexibility to cope with adverse effects of climate change and variability, such as changed rainfall patterns. This leads to higher economic and ecological stability through optimized ecological balance and risk-spreading and by low-risk farming strategy with reduced input costs and, therefore, lower risks with partial or total crop failure due to extreme weather events or changed conditions in the wake of climate change and variability.

By its nature, organic agriculture (OA) is an adaptation strategy that can be targeted at improving the livelihoods of rural populations and those parts of societies that are especially vulnerable to the adverse effects of climate change and variability. Very rough estimates for the global mitigation potential of OA amount to 3.5–4.8 Gt CO2 from carbon sequestration (around 55–80 per cent of total global greenhouse gas emissions from agriculture) and a reduction of N2O by two-thirds (Niggli et al. 2009). An organic production system is thus mainly designed to:

- ❖ Enhance biological diversity within the whole system;
- ❖ Increase biological activity in soil;
- ❖ Maintain long-term soil fertility;
- ❖ Recycle wastes of plant and animal origin in order to return nutrients to the land, thus minimizing the use of non-renewable resources;
- ❖ Rely on renewable resources in locally organized agricultural systems;
- ❖ Pomote the healthy use of soil, water and air as well as minimize all forms of pollution there to that may result from agricultural practices; and
- ❖ Handle agricultural products with emphasis on careful processing methods in order to maintain the organic integrity and vital qualities of the product at all stages (Preface, Codex Guidelines).

Organic farming offers the most sustainable solution for developing the agricultural sector and provides food security with least negative impacts on the environment. Hence, promotion of organic farming identifying the niche crop and area based promotion for sound rural development, besides provides healthy food, more ecosystem services and creating more jobs opportunities. Similarly, a market driven organic agriculture policy has to be created that target the food securiry.

T5 : OF-4

Promoting Bio--control Measures In Agriculture For Life-care

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The introduction and indiscriminate use of synthetic pesticides in agriculture during and after Green Revolution has devastated effects on human and animal health causing a number of ailments and diseases. Interestingly, the very single purpose for which these dangerous pesticides were introduced and used is also seemingly defeated due to development of pesticides resistance in harmful insects and pests. The only effect which is dominating now-a-days is the multiple side effects on human health, soil, water, air, environment and ecology including beneficial flora and fauna. Their continuous indiscriminate use if not controlled, may prove curse for the global humanity. Use of safe bio-control measures including use of bio-pesticides in Integrated Pest and Disease Management model is the best and safest approach for its permanent safe solution. The use of bio-control measures including bio-pesticides in not a new discovery for Indian farmers- pre-green revolution it was a common practice-, the only need is to revive and re-adopt those practices for better life care of our future generations. The Ministry of Agriculture, Govt. of India through its Directorate of Plant Protection, Quarantine and Storage and Indian Council of Agricultural Research in association with other State Agriculture Universities has developed Integrated Pest and Diseases Models along with licensing for manufacturing of bio-pesticides. Lack of awareness about various aspects of bio-control measures including use of bio-pesticides is one of the importantimpediments in their speedy adoption and wide spread use. This paper is meant to create such awareness among the mass.

Key Words: Bio-control measures, Bio-pesticides, Integrated Disease Pest and Disease Management. Soil Health, Environmental Protection.

T5 : OF-5

Changes in different form of heavy metals during rotary drum composting of paper mill sludge

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The increased agricultural use of paper mill sludge compost is being qualified by its high heavy metal content.Toxicity of heavy metals does not depends on total concentration, but depends on bioavailable fraction. Chemical speciation is a very proficient tool for assessing bioavailability of heavy metals. Thus, this study was carried out to detect the variation in distribution in different fractions (Exchangeable, Carbonate, Reducible, Oxidizable and Residual) of Cd, Cu, Ni, Pb, Cr, Zn and Hg and also to assess the influence of physico chemical parameters on chemical speciation during rotary drum composting of paper mill sludge. Total concentration of all the metals increased during composting. . Residual fraction was the dominant fraction during speciation. An increase in residual fraction and decrease in exchangeable fraction was observed with the progress in composting. Most of the concentration of Pb and

Ni was found to be associated with residual fraction. Though the concentration of Cd, Cu is not very high, then also their bioavailable fraction was high. Bioavailable concentration of Zn was also found to be high. This study shows that addition of cow dung in appropriate quantity can influence the physico chemical parameters, which in turn decreases the bioavailable fraction (exchangeable and carbonate) of heavy metals during composting.

Keywords: Paper mill sludge, Rotary drum composting, heavy metals, Chemical Speciation.

T6 : VA-1

Enhanced saccharification of agricultural waste with immobilized cellulose and β-glucosidase for bioethanol production

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The depletion of the world's petroleum supply and environmental issues associated with crude oil usage has increased the demand for developing alternative, environmental friendly and non-petroleum dependent energy source. Agricultural waste has been considered as a potential sustainable feedstock for energy production. Bioconversion of renewable lignocellulosic biomass to biofuel and value added products are globally gaining significant prominence. Lignocellulose is a major structural component of agricultural waste and consists of cellulose, hemicelluloses and lignin. The effective utilization of all three components would play a significant role in the economic viability of cellulosic ethanol. Lignocellulosic biomass conversion process involve several steps viz. effective pretreatment, saccharification of pretreated biomass, fermentation of hexose and pentoses and downstream processing. The waste material must be first pretreated to convert the recalcitrant lignocelluloses structure to reactive cellulosic intermediates before enzymatic hydrolysis. World–wide, extensive research has explored the conversion of agricultural waste into fermentable sugars by various pretreatment technologies. In recent years, there has been a trend of using immobilized enzyme on magnetic nanoparticle for enhance stability, activity and reusability of enzymes. Since the high surface area: volume ratios of magnetic nanoparticles can effectively improve the enzymatic loading and catalytic efficiency of the immobilized enzyme. The magnetite- loaded enzymes are easy to recover by magnetic field, which may optimize operational cost and enhance the product's purity. In this work, we prepared the magnetic nanoparticles coated them with amino silane and immobilized them with cellulase and β-glucosidase via glutaraldehyde coupling reaction for enhanced saccharification of agricultural waste for bio-ethanaol production. Pretreatment of waste materials was carried out with ionic liquid (1-ethyl 3-methyl imidazolium acetate, EmimOAc) and ammonia and it was found that, there was enhanced saccharification in pretreated biomass in comparison to without pretreated biomass.

T6 : VA-2

Technological application of development of low cost odourless soya based paneer for sustainable development

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The present study was conducted to establish feasibility and acceptability of soya based paneer. Keeping in view the functionality and nutritional benefit of soya milk, soya milk based paneer was developed with the objective of improving quality and acceptability of soya Paneer. Three treatment viz. 15 (T1), 25 (T2) and 35 (T3) per cent addition

of cow milk along with *Cinnamomum zeylanicum&Syzygium aromaticum* (@ 0.5 percent) and control without incorporation of cow milk were studied. The result showed significant difference among treatments with respect to acceptability and nutritional value. It was found that the addition of cow milk at 30 per cent level along with *Cinnamomum zeylanicum&Syzygium aromaticum* has improved the nutritional & medicinal benefit and increase the acceptability of soya paneer. Similarly the cost of production was reduced by up to 60 percent that of milk paneer.

T6 : VA-3 Enhancing income and profitability by development of low cost soya based sweet dahi

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The present study was conducted to establish feasibility and acceptability of soya based misty dahi. Keeping in view the functionality and nutritional benefit of soya milk, soya milk based sweet dahi was developed with the objective of improving quality and acceptability of soya misty dahi. Three treatment viz. 20 (T1), 30 (T2) and 40 (T3) per cent addition of cow milk along with incorporation of lactose (@ 7 percent) and control without incorporation of cow milk were studied. The result showed significant difference among treatments with respect to acceptability and nutritional value. It was found that the addition of cow milk at 40 per cent level along with incorporation of lactose (7 percent) has improved the nutritional benefit and increase the acceptability of soya based misty dahi. Additionally the cost of production was less up to 55 percent of dahi manufactured from milk.

T6 : VA-4 Value addition of aonla for enhancing farmers income

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Value addition is a process of increasing the economic value and common appeal of a commodity. It is an alternative production and marketing strategy that requires a better understanding of the rapidly changing food industry and safety issues. The growth per annum in processed food would be about 10 per cent therefore the share of value added product should also increase considerably. Aonla or Indian goosebery is an indigenous fruit of Indian subcontinent. It is an underuttized fruit crop but is the richest shource of Vit C (0.9 to 13 per cent) of any naturally occurring substance in nature. It builds inmune system to fight against all kind of viruses like Hepatitis, AIDS, influenza and many others. This fruit is highly valued among medicines as it is acrid cooling, refrigerant, diuretic and laxative The fruit however have short fruiting season and is highly perishable in nature There is a glut during the fruiting season and have little acceptability in the raw form. Value addition to this fruit with simple technologies which the farmer adopt at their farm is the need of the hour. Many value added product could be prepared as aonla preserve, aonla pulp Aonla jam, Aonla candy, Aonla squash, aonla shred, aonla powder, osmotically dehydrated products, aonla jouice and health foods. An on farm trial was conducted by KVK,West-Champaran and value added products viz aonla juice and health food of aonla were prepared at local level Evalulation studies revealed a B:C ratio 5.32 for aonla juice and 3.08 for health food prepared from aonla at local level. Both these value added products have good acceptablity and profitability . The technology is also simple and acceptable to farm women. This sector however facing the problem of erratic and inadequate supply of quality raw material, inadequate infrastructure, lack of adequate training, lack of quality testing and certification laboratories. However employment potential in post harvest handling and value addition of fruit like aonla is high and can enhance farmers income considerably.

T6 : VA-5 Substitution of Maize by Bajra (Pennisetum typhoideum) in Broiler Ration

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An experiment was conducted to determine the feeding value of bajra substituting maize at 25%, 50%, 75% and 100% levels in broiler. Five experimental diets wee tested in broiler upto the age of eight weeks. The data indicated significant increased in body weight gain and feed consumption when maize was substituted by bajra. It was found that best result should be achieved by substituting maize by bajra at 75% level in broiler.

T6 : VA-6 Study on Innovative Value added Paper Mache Work for Doubling for interior enrichment

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An attempt has been through this study to know about the farm women preference for the creative innovative value addition paper mache work is order to incorporating the latest information regarding innovative paper mache art by using value addition technology. Total 15 innovative value addition paper mache were developed by incorporating various designing techniques using mould form. Among the total of 15 innovative design paper mache craft the five form of paper mache were preferred by the farm women. These form developed with the combination of different value addition techniques/ form i.e. plate, pencil stand, pen stand and flower vase etc.

Key word: Paper Mache, Farm women, Preference

T6 : VA-7 Processing Potato Cultivation And Storage: Avenue For Doubling Farmers' Income

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Potato is the fourth most important food crop after rice, wheat and maize and is a wholesome food. In India, potatoes have been utilized largely for consumption as fresh potatoes and the major part of potato harvest (approx. 68.5%) goes to domestic table consumption. Whereas, in the developed countries, table potato utilization is merely 31%, rest being frozen French fries (30%), chips and shoestrings (12%) and dehydrated products (12%). The processing of potatoes in India was not in vogue till 90's and with the openings of organized processing by multinationals and indigenous players, potato processing industry has grown manifolds. Presently, about 8% of potato production is being used by processing industry and the sector is still increasing at a rapid rate. Potatoes can be processed into a variety of products. Potato chips, French fries and dehydrated chips are the most popular processed potato products in the organized and unorganized sectors. The pattern of Indian potato industry suggests that the demand for potatoes for processing purpose is expected to rise rapidly over next 35 years for French fries (11.6% ACGR) followed by potato flakes/ powder (7.6%) and potato chips (4.5%). The demand for processing quality potato is expected to rise to 25 million t during the year 2050. Since processing varieties fetch very good prices in the market even for table consumption,

growing potatoes for processing could be an avenue to the potato growers for increasing their income. The table potato varieties are meant for consumption only and are not suitable for processing. Dry matter and reducing sugars are the two parameters that are of utmost importance to the potato processing industries and therefore, the varieties having high dry matter and low reducing sugars only are suitable for processing. ICAR-CPRI has developed six such varieties viz. KufriChipsona 1, 2, 3, 4, KufriHimsona and KufriFrysona, which have the above attributes of processing and are being utilized by the processing industries in the country for various purposes. Besides, to maintain the quality traits, particularly low reducing sugars, the Institute has also developed the Elevated Temperature Storage Technology, wherein potatoes are stored at 10-12C temperature with the use of an sprout suppressant CIPC. This technology is primarily meant for storing processing potatoes, but is becoming popular for table purpose storage also, since the potatoes stored using this do not become sweet in taste and fetch premium price in the market. By combining growing and storage of potatoes at elevated temperatures, farmers will have double advantage, one in getting premium price for processing varieties and another for maintained quality and therefore, high price of stored potatoes throughout the potato season, particularly when the market prices start increasing after mid-summers. So adoption of above varieties and technology may provide an avenue to the potato farmers' for doubling their income.

T6 : VA-8

Effect of Tillage And Weed Management Practices and Growth Productivity and Energy Analysis of Late- Sown Chickpea

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The field experiment was conducted at the Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.) during rabi seasons of 2013-14 and 2014-15 to study the tillage and weed management methods on growth, productivity and energy analysis of chickpea. The experiment was laid out in split-plot design with three replications. Main plot treatment consisted of five tillage practices viz., T1- Zero tillage, T2- Reduced tillage, T3- Conventional tillage, T4- Broadcasting and T5-Bed planting. There were four sub-plot treatments of weed management viz., W1- Pendimethalin PE @ 1 kgai./ha, W2-Pendimethalin + Imazethapyr (Vellor) @ 1 kg ai./ha PE, W3- Oxyfluorfen @ 100 gai./ha PE, and W4-Unweeded check. Chickpea var. JG14 was shown on 15 December in both the years in rows 30 cm. apart keeping a seed rate of 80 Kg./ha. The results revealed that bed planting and conventional tillage resulted in higher growth, yield and yield attributes of chickpea. Both these tillage practices resulted in higher energy output (59317 to 61263 MJ/ha), while lowest (48974 MJ/ha) in case of broadcasting method. Among the herbicidal method weed management, Pendimethalin + Imazethapyr recorded significantly higher growth, yield and yield-attributes of chickpea in addition to highest energy output (63335 MJ/ha), energy use efficiency (6.18) and energy productivity (0.13). The overall results allude that bed planting with use of Pendimethalin + Imazethapyr herbicide may be adopted to achieve maximum productivity of chickpea.

T6 : VA-9

Development and performance evaluation of deep rooted crop stalk uprooter

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A manually operated pull type stalk uprooter was developed at CIAE, Bhopal for uprooting stalk of shallow and deep

rooted crops having hardy stem like cotton, red gram, and weeds like Lantana Camara etc. which otherwise are very difficult to uproot manually. It consisted of a handle, fix jaw, adjustable jaw, soil bearing frame (body) and pins. The uprooter was designed for applying the uprooting force of 2000 N with the mechanical advantage of sixteen. Keeping ergonomic considerations in view, the handle length and weight of the uprooter were kept about 1600 mm and 4.5 kg, respectively. The jaws would accommodate the stalks having diameter upto 50 mm. The developed unit was evaluated for uprooting pigeon pea stalks at institute farm. The maximum uprooting force for pigeon pea stalks was 491N. Twelve selected male subjects were failed to uproot the stalks with bare hands. Moreover, the subjects had to bend forward more than 450 which made the posture uncomfortable and unsafe. The mean working heart rate during uprooting stalks with bare hands was reached to 160 beats min-1. While uprooting the stalks with the developed unit, the operator had to fix the stalks into the jaws and pull the handle backwards, which made the posture comfortable. The subjects were uprooted the stalks at the rate of 7 stalks min-1 with effective field capacity of 0.04 ha/h. The mean working heart rate, work pulse and cardiac cost during uprooting stalks with developed system were found to be 131 beats min-1, 49 beats min-1 and 8 beats stalk-1 respectively. The work load was found to be moderate.

Keywords: Stalk Uprooter, Force, Heart rate, Cardiac cost, Field capacity

T7 : SA-1

Nutritional garden for nutrition sensitive rural families

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Malnutrition is a serious health problem in some parts of India. It retards child growth, increases the risk and duration of illness, reduces work output, and slows social and mental development. Malnutrition among women of reproductive age increases the risk of mortality during labor and delivery and puts their newborn children at risk of long-term deficiencies. Improving nutritional status, including micronutrient status, can lead to increased productivity, increased child survival and growth, and reduced maternal morbidity and mortality. Diet diversification is arguably the most sustainable and affordable strategy to improve nutrition for the majority of the population - particularly the poor. For poor households, vegetables and fruits are often the only source of micronutrients in the family diet. Homestead production of fruits and vegetables provides the household with direct access to important nutrients that may not be readily available or within their economic reach. Therefore, kitchen gardening would be a good means to improve household food security with nutrition. Equally important, kitchen gardening has been shown to be a source of additional income, because the household can sell a portion of the garden's produce. Kitchen gardening is especially important in overcoming seasonal availability of foods and promoting household self-sufficiency.

The kitchen gardening is an imperative tool of our daily life. The 60 % women in the zone have learned the importance and adopted the practice of growing vegetables, fruits and spices which not only raised their economics but also proved beneficial to uproot the malnutrition as a remedy in such inflation scenario in the country.Kitchen garden provides an opportunity to farm women to engage themselves in work along with proper utilization of place, water and compost. As compared to their traditional practice of gardening they found 106 kg more vegetable through planned kitchen garden in a year. The availability of vegetable is increased by 186% at house hold level. With the availability of vegetable in the diet farm families can reduce problem of malnutrition. Technology was found acceptable and compatible with existing practice.

T7 : SA-2

Effect of various nutrient level and pruning methods on yield, quality and economics of capsicumhy brids under polyhouse and open field condition at high-altitudes

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Protective structures are used against biotic and abiotic stress which enhances production and productivity per unit area through control of microclimate in side of plants. Prevailing low temperature and frost injury during winter (off-season) are limiting factors for growing coloured capsicum. To make capsicum cultivation successful in winter, protected structures are a viable solution. Off-season capsicum cultivation is beneficial for Urban and peri-urban farmers of the country. Trials were conducted at hill research and extension center Lohaghat, Champawat, GBPUAT, Pantnagar, Uttarakhand during the 2007-2009 in the off-season at high altitude condition, Experiments were planned under two conditions i.e. greenhouse and open field conditions, with five plants nutrients doses i.e. N0= No apply nutrients (Control), N1=@ 100q/ha FYM+ 100+100+100kg/ha NPK + 1% mix micronutrient, N2= @ 200q/ha FYM + 150+150+150kg/ha NPK + 2% mix micronutrient , N3= @300q/ha FYM + 200+200+200 kg/ha NPK + 3% mix micronutrient, and N4= @ 400q/ha FYM+300+300+300 kg/ha NPK+ 4% mix micronutrient and four branch pruning method viz, ABCM (NP)=all branch cultivation method (No pruning/Control), SBCM (B1)= signal branch cultivation method, DBCM (B2)=dabble branch cultivation method , TBCM(B3) = triple branch cultivation method for capsicum cultivars (Bharat hybrid) at the transplanted on 50cm x 50cm spacing during the first week of March in each year according to treatment combination (60) with three replication. Soil was very poor, rocky and red type clay loam, having PH 6.5 -7.5 and poor nutrients status. The NPK + Micro nutrients combination was applied through water soluble 19:19:19 and multiplex mix micro nutrients with the help of Drip fertigation system. Four year pooled data were analyzed by RBD .The greenhouse technology was enhance 2-4time higher growth and development, fruit viz, A and B grade higher price fruits%, number of fruits, weight of fruits, yield kg/m2, grass income, net-income, BC ratio, initial cost of technology and minimum disease incidences% as compared to open field condition during all the years. The optimum dose of macro and micro nutrients combination @ 300q/ha FYM 200+2000+200kg/haNPK+3% mix micronutrient (N3) wasexhibited maximum growth and development, fruit siz, A and B grade higher price fruits%, number of fruits, weight of fruits, yield kg/m2, grass income, net-income, BC ratio, initial cost of cultivation and minimum blossom end root incidences% in fruits as compared to open field condition during all the years. The dose of mix micronutrients @ 3% was control or minimized incidences of blossom end rot in fruits as well as compared to control and N1 combination in both cultivation condition.The increasing branch pruning methods was produced maximum number of fruits and total fruits yield kg/m2, however, decreasing branch pruning method (B1) was increasing more plant height, A grade fruits%, individual fruits size and weight, minimum disease incidences, cost of cultivation as compared to others more branch pruning method in both condition. However, the double branch pruning cultivation method produced more A&B grade higher price fruits% and net return Rs./m2, as compared to others branch pruning methods in both conditions.

T7 : SA-3

Fruit plants nursery: A profitable business for the farmers

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India is blessed with a diversity of agro-climatic conditions prevailing in the different regions of the country. A wide range of climatic and edaphic conditions in the Indian sub-continent ensures that it is ideally suited to produce almost

all types of fruits. Commercial horticulture has been of recent origin though the traditional fruit cultivation has been going on for centuries. Emphasis has been shifting from agriculture to horticulture for increasing per unit returns. The liberalisation of economy has given an impetus to the Indian entrepreneurs for establishing export oriented horticulture.

Massive area expansion under improved varieties, replanting, planting in marginal and arid areas, etc. require a huge demand for quality planting material and a sound supporting infrastructure. At present, hardly 30 to 40% of the demand for planting material in different horticultural crops is being met by the existing infrastructure in public domain. Much of the dependence is on the private sources of which the majority of the units are not regulated or monitored in most of the states. Hence, farmers do not have access genuine diseased free and elite to certified planting material in different crops and as a result suffer with respect to production, productivity and quality of the produce. Most of the old existing nurseries lack modern infrastructure such as greenhouses, mist propagation unit, cold storage, mist irrigation systems, efficient nursery tools, implements and machineries and even facilities for soil sterilization, etc. Ignorance of the farmers, acute shortage of mother plants of improved varieties, and absence of quality testing and monitoring mechanisms make the situation complex.

There is immense need to motivate them and to increase their awareness about improved propagation technology. Horticulture may play great role for income generation and creation of employment opportunities to rural people, who are using traditional practices. In order to boost up the quality nursery stock production, there is a need to establish large number of small and medium scale nurseries of fruit crops.

T7 : SA-4

Performance of gynoecious cucumber varieties and planting distance on yield quality and economics during off-season production under polyhouse condition in plains

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India is second largest vegetable producer in the world but still production and productivity is very low. This is primarily due to erratic climatic conditions. Consequently, even required 300g per capita per day vegetable is not available. High yielding hybrid varieties of vegetables and protected cultivation technologies have shown great potential in different climatic conditions. However, such findings are very scanty in plain conditions of India. Protected structures act as physical barrier and play a key role to minimize biotic and a biotic stress to the crop. Therefore, present experiment was conducted onCucumber cultivation in northern India is hampered due to extremes of the temperature during September to March when crop cannot be grown using traditional methods in open field. To exploit this off-season period crop can be grown under protected conditions for better economic gain. The trials was conducted under naturally ventilated polyhouse, at Center for Protected Cultivation Technology (CPCT), IARI, New Delhi, during off-season (September – March) 2011 – 2014 with a view to identify suitable variety/hybrids with plant spacing. The experiment was carried out in randomized block design with three replication and 20 treatments combinations comprising 4 parthenocarpic cucumber varieties/hybrids and 5 spacing's. The four cucumber cultivar i.e.Isatis, Kian, Hilton, DaPC6 (IARI variety) and five spacing viz, 30cm x 30cm, 40cm x 40cm, 50cm x 50cm, 30cm x 50cm and 60cm x 60cm were used for conducting experiment. The Fertilizers was applied in the form of FYM @ 200q/ha and NPK @ 175, 60, 100 kg/ha, respectively.175kg/ha Nitrogen and remaining 50% P and K was applied in the form of water soluble fertilizer (20:20:20NPK and others) through Drip-fertigation system at 15 days interval after transplanting. The performance of three season's pooled data of parthenocarpic cucumber cultivar under different spacing were revealed that the Isatiscultivar showed significantly higher yield 15.50kg/m^2, fresh weight of fruit per plant 3.38kg, individual fruit weight 225.60g, fruit length 23.24cm, diameter 4.75cm, number of fruits per plant 15, the net return Rs. 261/m^2 and C:B ratio1: 2.28 among the all varieties in all season. However, *DaPC6* (IARI Variety) an OPV also found very good in performance related to yield and remained at par with *Kian* while better than the other hybrid Hilton. Considering the seed cost of hybrid v/s OPV, *DaPC6* could be a very good option for small and marginal farmers at affordable seed price. The spacing 30cm x 50cm and 50cm x 50cm showed significantly at par

with fruit yield (15.72 &15.66kg/ m^2). But the net income of Rs.249/ m^2 and B: C ratio 1:2.12 was recorded in 50cm x 50cm.The interaction of variety and spacing was recorded non-significant. It was concluded that higher yield and net return during off-season fresh cucumber fruits under naturally ventilated polyhouse conditions could be obtained by planting *Isatis* variety at optimal spacing of 50cm x 50cm.

T7 : SA-5 Enhancing farmers' incomes through entrepreneurship and farmers' innovations

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Agriculture being the engine of economic development of our nation needs to be supported with efficient marketing system, secondary agriculture, reduction of post harvest losses, diversification of agriculture towards high value crops and promotion of agri entrepreneurship in wake of shrinking resource base and rampant unemployment in rural areas. Average size of operational holdings as per different Agricultural Census of India is decreasing steadily over the years; it has come to 1.16 ha in the year 2010-11 from 2.8 ha of 1970-71. The farming situation gets precarious with steadily increasing population (1.23 millions in 2013) with an alarming unemployment rate. To mitigate the precarious situation, entrepreneurship has emerged as the central force of economic growth and development. Farming must move towards agribusiness management and development of entrepreneurial competencies among farmers is essential. Also the farmers' wisdom in the form of their innovations needs to be incorporated during the process of agripreneurship development. Agricultural productivity is believed to be enhanced by the incorporation of strategic entrepreneurship skills. Farmers may be trained to be entrepreneurial to manage agriculture not as a way of life but as an enterprise and trained cadre of youth having capabilities for agri entrepreneurial endeavours. Individual's motivation, aspirations and entrepreneurial competencies trigger agripreneurship development whereas adoption of best practices, dodging of inhibitive factors and facilitative socio economic factors play sequential role in reaching agripreneurial success (Singh *et al* 2014).

India has made impressive growth on food production front, commonly referred to as primary agriculture. However, the area of secondary agriculture and its derivatives inter-alia food processing and value addition has not been addressed adequately. Under traditional system, the post harvest losses are quite high i.e. 25-30 per cent is lost before reaching ultimate consumers (Sinha, 2010).The estimated losses are 5-15 per cent in non-perishable, 20-30 per cent in semi-perishable and 30-50 per cent in perishable. Post-harvest activities have assumed significant importance as an integral part of the food production system, which aim at promoting best practices for post-harvest handling and management along the entire food supply chain, focusing on a broad spectrum of operations and stakeholders in traditional and modern marketing systems.

The proposition of food processing and value addition stands to offer the advantages such as maintaining quality (appearance, texture, flavor, and nutritive value); protecting food safety; reducing post harvest losses; enhancing the self life and providing high quality and nutritive finished food products to the consumers. Another important issue is how to increase the income of the share of farmers in comparing rupee which is average 20-25 per cent at present. This issue may be addressed considerably through processing and value addition of cereals, fruits, vegetables, milk, fish, meat, poultry, flowers etc. The strategic approach for a dynamic and remunerative food processing and value addition system calls for developing adequate infrastructure including storage facilities; creating awareness; imparting knowledge and sharpening skills of farmers and other stakeholders about safety standards; improving capacity utilization; developing appropriate and specific technology for proper handling and grading, packaging etc; developing effective and trained human resources for technology dissemination; and implementing capacity building initiatives for farmers, farm women and rural youth; promoting group and collecting mechanism involving producer's societies, farmers interest groups & self help groups; and developing efficient market linkages etc.

Women play a significant role in agriculture, the world over. About 70% of the agricultural workers, 80% of food

producers, and 10% of those who process basic foodstuffs are women and they also undertake 60 to 90% of the rural marketing; thus making up more than two-third of the workforce in agricultural production (FAO, 1985).Women's average contribution in over all farm production is estimated at 55% to 66%. Traditionally women have been playing a great role in post harvest upkeep of the farm produce. It is essential to build capacities of women to take up these agri enterprises and become economically self sufficient besides increasing farm profitability. A study by ILO has found that new techniques in agriculture, particularly those involving commercialization, "often shift economic control, employment and profit from women to men". The diversion of income from women causes increased suffering for families because studies have found that, in general, income controlled by women benefits families more than income controlled by men.

The paper discusses findings of an action research study taken up where Agripreneurship development through multi-stakeholder partnership was attempted for setting up value addition agrienterprises. The paper discusses the strategy for building entrepreneurial competencies of farm women and mobilizing women for group action to take up food processing and value addition agriventures for maximising farm profits.

T7 : SA-6 Assessment of kitchen gardening for increasing income and nutritional security

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Malnutrition is a penetrating problem in India. Malnutrition is dominantly found in rural areas due to vegetable unavailability. It results in poor physical, mental growth and different diseases due to unavailability of vegetable throughout the year. In Uttar Pradesh, underweight prevalence in children(0-5 years) is 40%, percentage of women with low BMI is 25% and Anemia in women and girls (15-49 years) is 52% (National Family Health Survey-4, 2015-16). In rural area vegetables and fruits are only source of micronutrient in family diet. Vegetable and fruit produced at kitchen garden may offer direct access to rural people that may not easily available within their economic reach. Hence Kitchen Gardening is an important intervention to improve household nutritional security. Present study has conducted in Ghazipur district of Uttar Pradesh to assess the impact of kitchen gardening to improve nutritional security of households in rural area. There are many social benefits of Kitchen Gardening; better health, increased income, food security within family. The result reveals that kitchen gardening has played a significant role in livelihood plan for poor farmers in terms of increasing income and nutritional security.

T7 : SA-7 Doubling the Rose and Marigold Flower Harvester's Income by Using Ergo-Techno-Innovative-Devices

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This topic describes the rose and marigold flower harvester's income doubling by using Ergo-Techno-Innovative-Devices in villages of block Chaka in Allahabad city which developed during research. Based on pre-and post-research data which are collected during survey and presented here by table and graph in part of result and discussion. This topic explains the way to doubling the income of rose and marigold flower harvester's by commercial activity of collection and marketing of floriculture products are also a source of productive and qualitative employment to grades of people which support harvesters in doubling their income. The harvesting processes of these crops are very drudgery prone. India being an agricultural country, where majority

live in the rural areas, both men and women work very hard in the fields. The harvesting of rose comes under the severe drudgery prone activity (Ergonomic practices, 2003). Marigold and rose both are the annual flower plant. The harvesting of the Marigold flower is considered as the severe most drudgery prone activity (Ergonomic practices, 2003) where harvesters feel some skin problem and they found some cuts by thorns of rose flowers even there cloths were also torned that's why these devices were developed for their comfort. Both flowers rose and marigold are the main cash crops of Allahabad and by using Ergo-Techno-Innovative-Devices harvesters get more profitability in National /International market.

Keywords: Floriculture, buds, commercial, agro-climate, entrepreneurial, drudgery, rose, marigold, ERGO-TECHNO-INNOVATIVE-DEVICES

Theme 8-14

Abstracts : Climate smart system, Reducing cost of cultivation, Reduction in post-harvest losses, Role of ICT, Agricultural extension and role of KVKs, Role of private agencies and corporate sectors, and Policy issues

T8 : CSS-1

Effect of transplanting of seedling under SWI method

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Wheat (*Triticum aestivum* L.) is world's most widely cultivated food crop. Wheat contributes more calories (20%) and more protein to the world's diet than any other food crop.System of Wheat Intensification (SWI) which is based on the principles of System of Rice Intensification (SRI) is a new wheat cultivation technique which demands to maintain plant to plant distance at 20 cm and 20 cm between lines. This kind of sowing with proper plant density allows for sufficient aeration, moisture, sunlight and nutrient availability leading to proper root system development from the early stage of crop growth.System of Wheat Intensification (SWI) is one of the promising technologies to increase productivity which ultimately contributes to the household level food security of farmers. SWI uses only 25-30 kg of improved seed in one hectare. Twenty to twenty five cm spacing between rows, use of manure and organic seed treatment ensures higher yield. Sufficient spacing between the plants and sowing of two seed grains at one point facilitates desired moisture, aeration, nutrition and light to the crop roots. This helps faster growth of plants. Only 2-3 times irrigation and weeding through cono-weeder save time and expenses on labor. The present on farm trial on effect of transplanting of seedling under SWI methodwas conductedby Krishi Vigyan Kendra, Dhanbad at ten farmers field using RBD (Randomized Block Design)to test the feasibility of three technology namely Technological $Option_1$–Farmers Practices (Traditional sowing) Technological $Option_2$- SWI (Sowing of 2 seeds at the distance of 20 cm after seed treatment),Technological $Option_3$- Transplanting of 2 seedlings at 2 leaf stage under SWI at 20 cm. The parameter of judging the suitability was No. of effective tillers, Panicle length (cm), Grain yield (q/ha), Straw yield (q/ha), Gross return (Rs/ha), Net return (Rs/ha), Benefit Cost ratio. The transplanted wheat was found superior than sown under SWI significantly. The lowest was found under farmers practices. Therefore transplanting method of wheat under SWI is recommended for farmers of Dhanbad. Some constraints also reported during the experiment like raising of wheat seeding, seed treatment, line sowing at spacing of 20x20 cm, use of cono-weeder and frequent and light irrigation.

T8 : CSS-2 **Evaluation of different protected structures for off-season cucumber production and economics in plain condition of India**

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High yielding hybrid varieties of vegetables and protected cultivation technologies have shown great potential in different climatic conditions.Protected structures act as physical barrier and play a key role to minimize biotic and a biotic stress to the crop. India is second largest vegetable producer in the world but still production and productivity is very low. This is primarily due to erratic climatic conditions. Consequently, even required 300g per capita per day vegetable is not available. However, such findings are very scanty in plain conditions of India. Therefore,

presentexperiment was conducted on Off-season cucumber production is very difficult in open condition during winter season in India. Therefore, evaluated Naturally ventilated polyhouse, Fan-pad polyhouse and Insect Proof net house for production of parthenocarpic cucumber (Var.Ishatis and Kiyan) in year 2012. Seedlings (25 days old) of cucumbers were transplanted on 15 September 2012 under different kind of protected structure i.e Naturally ventilated polyhouse, Fan-pad polyhouse and Insect proof net house on raised beds along with drip fertigation system. Both varieties of cucumber were found free from insect-pest and disease In all protected structures during crop period up to December 2012. The variety Ishatis was enhancing average fruits yield (15.50kg/m2) as compared to Kiyan (14.15kg/ m2). However, inside of both design of polyhouse good crop growth, development, fruits setting (70.5%) and maximum quality fruits yield (18.50kg/m2) was observed as compared to insect-proof net house (11.50kg/m2) which could be because of control micro-climate (increased 3-4 0c average temperature) and abiotic stress in polyhouses, but not in insect proof net house (only increased 0.5-1 degree centigrade temperature almost similar to open). It was concluded that parthenocarpic cucumber Ishatis can be produced successfully under naturally ventilated polyhouse during off-season and this structure was economically feasible to farmers.

T8 : CSS-3 Assessing agronomic reuse of anaerobic digestate from municipal solid waste:Sustainable solution for reducing greenhouse gas emission

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Anaerobic digestion (AD) of organic fraction of municipal solid waste (MSW) is a promising alternative to landfilling for reducing Greenhouse GasEmission (GHG). Biogas-AD produced, represents a usefulsource of green energy, while its by-product (digestate) is a waste that needs to be safely disposal. Digestedmunicipal solid waste provides excellent opportunity for agricultural application.Utilization of anaerobic digestate and their impact on soil properties and crop are still uninvestigated. Therefore, apilot experimental setup to evaluate the utilization of anaerobic digestate generated by biogas reactor at the end of the anaerobic process of municipal solid waste was conducted. The aim of this study was to determine the effect of anaerobic digestate on soil properties and crop (*Spinach oleracea*) grown. Different amendments of slurry with control, 0%, 25%, 50%, 75%, 100% equivalent rates were applied to the pots. pH, EC, OC, NPK and exchangeable cations were evaluated along with total biomass, root length, shoot length and heavy metal contents of *Spinach* after 40 days. The study indicated that the nitrogen from the digestate was readily available and 25% application rate was found to be most suitable. This fact highlights the importance of a careful dosage of this soil amendment. It can be concluded that the use of slurry from the reactor had a positive effect on the nutrients availability. This has greatly reduced the environmental impact and dependency on fossil fuels for electricity generation. Therefore, agronomic reuse of digestate holds a promising future for sustainability of both environment and agriculture, with generation of energy as an additional benefit.

T8 : CSS-4 Doubling of farmers income through adoption and diffusion of micro-irrigation system

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A growing population and changing food consumption patterns are estimated to require a doubling of food production in the developing countries. This increase would need to come mainly from higher crop yields and greater crop

intensity given limited scope for agricultural land expansion. Expanding the use of efficient irrigation and agricultural water management technologies is a key part of the solution to increase yields in a sustainable manner. Investments in efficient irrigation can also lead to major improvements in the standards of living of small farmers who produce the majority of food in developing countries. With regards to Gujarat, the state government has taken initiative to form a special purpose vehicle like Gujarat Green Revolution Company limited and also provided adifferential subsidy to the farmers, which varies with respect to category and geographical location. In this regard, this paper aims to examine the role of institutional reforms and pro-farmer policy interventions in adoption and diffusion of micro-irrigation across the state in the recent years.

T8 : CSS-5 Comparative studies on differentcoloured shade-net cover on quantity, quality, colour and economy of organic leafy vegetable in summer season

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Protected cultivation is physical barrier of abiotic stress to the crops. Leafy vegetable production in northern India is hampered due to extremes of the temperature during summer season when crop cannot be grown using traditional methods in open field. To exploit this off-season period crop can be grown under protected conditions for better economic gain. The trials was conducted under shade-net covered structure at Center for Protected Cultivation Technology, IARI, New Delhi, during off-season (summer) 2011– 2012 with a view to identify suitable variety with plant spacing. We used 50percent cut-off sun intensity efficiency type two coloured shade nets- one was green and second was white shade-net, covered on GI make 100 m2 size hi-tunnel or half-moon type structure and apply four doses of organic compost i.e. D1=100kg, D2=200kg, D3=300kg, D4=400kg/100m2 area) are used for green Palak (all green) production were evaluated for colour effect on yield and economics. The green Palak leaf yield and net return were found higher per unit area under green colour shedding net with combination of organic compost doses was foundstatistically significant as compared to white colour shade net. The green shade net and combination of organic compost dose D3 were produced higher yield 0.85kg/m2 /crop and Rs.4.50/m2 net return and Rs.0.08C:B ratio as compared to white shading net with D3 organic compost doses. A green shedding net decreased 4°C monthly average air temperature and increased 13% average monthly RH as compared to open condition. The soil moisture and duration upto 20-30% were found maximum under green shading net as compared to whitecoloured shading net because fast evapotranspiration. Minimized number of irrigation, enhance irrigation frequency and wilting period were observed under green shade-net covered hi-tunnels. More over 10-15% difference of green Palak leaves production and microclimate creation of both shade-net coloured conditions. Thus,Palak production under green shade-net-covered cultivation was found more fusible and ruminative year round, especially in summer season.

T8 : CSS-6 Enhancing drought tolerance in wheat through seed biopriming with *Trichoderma harzianum* isolates

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Wheat (*Triticum aestivum*) crop is very sensitive to water deficit at any crop growth stage. Studies were conducted to investigate whether seed biopriming through some of the drought tolerant isolates of *Trichoderma harzianum* induces

drought tolerance in wheat variety DBW-17or not. Direct effect of seed colonization of wheat seed was apparently noticed, as promotion of root growth and an increase in water content, which probably manifested in a delay in many aspects of the drought response of wheat. Colonization of *Trichoderma* by seed biopriming delayed drought induced changes like stomatal conductance, net photosynthesis, chlorophyll content and greenness of plants. Findings clearly indicated that treating wheat seed with *T. harzianum* strains like SV-21, SV-28, SV-26, IRRI-1, SV-03 and SV-30, enhances speed of wheat seed germination as the seed treated with SV-21 germinated faster and more uniformly as compared to those which remained untreated. Also, seedling growth was quite faster due to all isolates with a maximum byisolate SV-21 .This isolate was best performer in stimulating germination and also increasing plant height of wheat at 21 days after sowing. Treated seeds germinated at 5 days after sowing whereas untreated (control) seeds could germinate at 7 days after showing. Similarly, shootlengthof wheat was found maximum due to above mentioned treatment *i.e*. SV-21. Value of shootlength due to biopriming with all isolates was 29.16, 28.33, 28.13, 27.33, 26.96 and 26.73 cm against 25.54 cm in untreated at 21 days age of plant.The impacts of these isolates have also been found effective in increasing root length. Biochemical analysis of plants has revealed that all the treatments significantly increased the chlorophyll content in the treated plants as compared to (control). Chlorophyll of wheat was found highest in SV-21.Value of chlorophyll content due to various isolates was39.03, 37.73, 35.8, 35.13, 35.03, and 31.06 against 22.56 in untreated at 21 days age of plant.

T8 : CSS-7 Role of surface covered cultivation in horticulture based farming system for improving socio-economic of hill womens: A case study

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India is second largest vegetable producer in the world but still production and productivity is very low. This is primarily due to erratic climatic conditions. Consequently, even required 300g per capita per day vegetable is not available. High yielding hybrid varieties of vegetables and protected cultivation technologies have shown great potential in different climatic conditions. However, such findings are very scanty in plain conditions of India. Therefore, presentexperiment was conducted on the farming in hills which suffers from scattered traced land, erratic climate, rainfed conditions. Majority of (75%) male migrate from hills to metro city in search of employment. Therefore, the hill farming is largely dependent on women. Women are also involved in other responsibilities, as a house wife, mother, farming and social activities, with all these commitments, women workers are very hard pressed which affect their health. Therefore, there is an urgent need for women friendly technologies which could save their time and energy. To alleviate the situation, we conducted 20 trials/FLDs on plastics mulch technology (UV stabilized 40-50 micron thick black colour) for off-season high value vegetable crops (Solanaceae, Cole group and Cucurbits) and compared with traditional farming system at different village level during 2006-2009 at Champawat district of Uttarakhand through Research and Extension Center (KVK), Lohaghat under the administrative control of GBPUA&T, Pantnagar. All GAP, INM, IPM protocols were used under study and it revealed that plastics mulch technology saved 90% time of labour spent on weeding, 25% fertilizer, 50% irrigation/water or moisture losses through evapo-transpiration, 50% soil fertility erosion, 50% expenditures, 60% crop mortality. This technology has enhanced 50% more qualitative yield and return per unit area per unit time as compared to traditional farming methods during all the years. Mulching technology also saved forest pruning ensuring environment security, risk of life hazard, time and money. Plastics mulch technology as compared to traditional farming save 50% time of women farmers which they can utilize in other activities. Mulching technology, a part of protected technology was found to be very cost effective (Rs.5/m^2), easy adoptable in field. This technology can play a key-role in organic mode of vegetable production, drudgery reduction, and livelihood security of women in hills. This is a proven technology especially for hills easy to adopt where limited resources of man power is available for agricultural operations and it gives a higher return in many of horticultural crops under small land holding for resource-poor woman farmer community.

T8 : CSS-8 Doublingfarmers income through protected cultivation of rose in Burhanpur district of M.P. – A success story

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India is endowed with diverse agro- Climatic conditions, Which help to grow all kind of horticulture crops, almost throughout the years, in one part of the country or the other, but the quality of produce under open field conditions, particularly in case of high-value flowers & vegetables are not suitable for international as well as standard domestic markets. In recent years, changing climate is expected to be harsher and detrimental on crop production. A breakthrough in production technology that integrates market driven quality parameters with the production system, besides ensuring a vertical growth in productivity is required. One such technology is "Protected Cultivation" or generally called greenhouse technology. Naturally ventilated poly houses coupled with drip irrigation & fertigation can be effectively used to mitigate the ill effects of climate and force the quality production of high valued flowers & vegetables out of the season for the realisation of better market prices.

Keeping above in mind, A farmer of village Sirsaunda Distt., Burhanpur motivated for Rose Cultivation under ploy house with the support of state govt. subsidy schemes in the year 2015 under the technical supervision & guidance of KrishiVigyan Kendra, Burhanpur. Four-month-old budded plants of top secret variety were used as seed material. Planting is done in the raised bed with paired row system in zig- zag fashion by giving the spacing of 40-45 cm Row to Row and 20-25 cm plant to plant. The data on economic parameters reveals that Rs. 5,93,700/ per 1000 sqm was earned from Rose Captivation under ploy house while Rs. 64,650/ per hectare through different Crop cultivation under open field condition. The B:C ratio was 5.94 in Rose cultivation whereas it was 2.78 under open field condition. The finding indicated that a proper approach is required to convert maximum area under protected cultivation of high values flowers and vegetables in order to increase the income of farmers as well as state / national productivity.

T8 : CSS-9 Duckweed- A potential source in aquaculture

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Duckweed (Spirodela) fed poly-culture have been found to induce higher growth rate in Indian major carps like *Labeo rohita* and *Cirrhinus mrigala* and exotic carp, *Cyprinus carpio* (Ansal et al., 2008; Ansal and Dhawan, 2009). Since Duckweed species are small floating aquatic plants belonging to the botanical family *Lemnaceae* family consists of five genera, *Lemna, Landoltia, Spirodela, Wolffia and Wolffiella*, among which about 40 species have been identified worldwide (Les et al. 2002). They grow very fast and their biomass get doubled in 2-3 days (Iqbal, 1999; Skillicorn et al., 1993) under ideal conditions yielding 20-30 tonnes (t) of dry matter from 1-ha of water area annually. On dry matter (DM) basis, the protein content of duckweeds varies from 15-45% (Fasakin, 1999) and has a better array of essential amino acids than other plant proteins and more closely resembles animal protein (Hillman and Culley, 1978; Iqbal, 1999). Among the different duckweed species, *Spirodela* is the largest,abundantly available and more promising in terms of nutritive value (Rusoff et al., 1980) and productivity (Iqbal,1999). The Duckweed would pave the way for economic, eco-friendly and environment conserving fertilization in aquaculture.

T8 : CSS-10 Strategy for improving farmer's income for sustainability

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Agriculture sector in India has focused primarily on raising agricultural output and improving food security which has made India not only food self-sufficient at aggregate level, but also a net food exporting country.ICAR and SAUs should develop models of farming system for different types of socioeconomic and bio physical settings combining all their technologies in a package with focus on farm income. This would involve combining technology and best practices covering production, protection and post-harvest value addition for each sub systems with other sub systems like crop sequences, crop mix, livestock, horticulture, forestry. Such shift requires interdisciplinary approach to develop on knowledge of all disciplines. Therefore, it is essential to mobilise States and UTs to own and achieve the goal of doubling farmers' income. If concerted and well-coordinated efforts are made by the Centre and all the States and UTs, the Country can achieve the goal of doubling farmers' income by the year 2022.If technology, input prices, wages and labour use could result in per unit cost savings then famers' income would rise at a much higher rate than the output. Therefore, doubling of farmers' income should not be viewed as same as doubling of farm output. The quantitative framework for doubling farmer's income has identified such as increase in productivity of crops, increase in production of livestock, improvement in efficiency of input use (cost saving),increase in crop intensity, diversification towards high value crops, improved price realization by farmers and shift of cultivators to non-farm jobs.Strategy for improving farmer's income the sources of growth in output and income can be put in four categories. i.e. Development initiatives including infrastructure, Technology, Policies and Institutional mechanisms.

T8 : CSS-11 Studies on Lettuce Production under Shade Net Covered Structure V/S Open Field Condition in Northern Plain of India

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Protective structures are used against biotic and a-biotic stress which is enhances production and productivity per unit area through control microclimate in side of plants. The shade net structure was fabricated by GI. Pipe and wire with covering black colour shade net of 30% shading intensity was evaluated for lettuce cultivation during December 2012 to March 2013. Lettuces crops *(var. Red Revolution, Yellow Bergamo, Ice-berg,)* were planted on dated 5.11.2012 on raised beds equipped with drip fertigation system in open and shad net structure at the spacing on 30x30cm. Leafy type lettuces varieties i.e. *Yellow Bergamo* was harvested started in 2nd week of January 2013 and heading type variety Ice-berg was started harvesting in 1st week of February 2013 in 30% shade net structure. However 7-10 days late started harvesting in open field condition. The crop period was observed 10 days more in shad-net condition as compared to open. The crop was goring continued up to last week of March 2013. Total period of lettuces harvesting was 70 days in shade net and 50 days in open. Total average yield of lettuce crop was recorded 1.8kg/m^2 red colour leafy variety *Red Revolution then* 2.20kg/m^2 in light golden green coloured leafy variety *Yellow Bergamo* and 2.5kg/ m^2, dark green heading type variety , *Ice-berg* But 1.40kg/m^2, 1.70kg/m^2 and 2.10 kg/^{2} in open condition. The lettuce mortality was found 15.5% in open and 5.5% in shade net. The edible quality and was observed better in shad-net structure respectively, under northern plains of India.

T9 : RCC-1

Harvesting and sowing with combine harvester in single pass: Opportunities and prospects

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Presently harvesting and sowing operations are performed separately with harvesters and sowing machines, respectively. Combining of these operations in single pass may provide new concept under conservation technologies (CT). The CT are being practised over 3 Mha in South Asia. Laser leveller, zero-till seed drill, paddy drum seeder, bed planter, rice transplanter, rotavator, straw reaper, happy seeder,etc are being used as efficient farm machines as resource conservation technologies (RCT). Combine harvester which performs three unit farm operations in single pass has wide potential for its further utilization under RCT. The combine harvesters were introduced at the advent of Green Revolution in India and their numbers grew from 800 in 1971-1972 to over 40,000 at present.This machine cuts crop with anchored stubbles and straw in heap over harvested crops. Farmers generally go for burning the residue prior to sowing of next crop. Mechanical options are commercially available for handling the residue which consumes extensive energy. An alternate method is thought to combine these two operations with commercially available combine harvester. With suitable engineering interventions, concept of add-on sowing attachment with straw distributor is conceptualised and discussed in the paper. This will help in increasing the farm profitability by reducing the cost of operations and environmental pollution.

T9 : RCC-2 Mechanization in mountain farming– the need of the hour

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The mountain ecosystem is covering 12 states of India i.e. Jammu and Kashmir, Himachal Pradesh, Uttaranchal, Sikkim, Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and West Bengal in which about 51 million people are inhabitant and mostly depend on agriculture and horticulture.The hill region has advantage and potential to grow different crops but the pressures emanating from natural resource constraints, increasing fragmentation of holdings, frequent climatic variations, rising input costs and post-harvest losses pose an enormous challenge to sustaining agricultural growth. In hills, agriculture and horticulture is cultivated in 12628 thousand ha with 29412 thousand metric tonne and 1536 thousand ha area with 11665 thousand metric tonne production in the year 2012-13, respectively. The cultivation of these crops is labour intensive and it needs timely operations for maximizing the production.

At present, majority of the farmers are using traditional tools and equipment for various field operations involving drudgery, high cost of operation, wastage of agricultural inputs and damage to crop produce. In such condition, farmers are not getting good return from their farm and leaving the farming in search of white collar jobs. There is a good prospect in various operations of farm where mechanization is possible to make the operation easier with minimum drudgery to the farming community. Some of the farmers are using the modern light weight technology for their farm but adoption is at very slow pace. The light weight power tiller/weeder is to be introduced as per the need of topography so that quality of work may be achieved particularly for terraced farming where vertical interval is high from one terrace to another. Adoption of suitable greenhouse technology for specific crop and location will help in large scale propagation of planting material. The major constraints in hill farming are non-availability and suitable improved equipment for precision and proper application of costly inputs. In the era of modernization, new initiatives with respect to modern farm engineering technology is the need of hour for further boosting the agriculture/ horticulture production especially to attract the young generationin hill farming.

T9 : RCC-3

Improved agricultural machinery for reducing cost of cultivation in Vidarbha region of Maharashtra

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The different farm machineries were developed in the Department of Farm Power and Machinery, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola in view to mechanize the farm operations to reduce the cost of cultivation. It includes Pigeon Pea Stem Cutter, the cutting efficiency of implement was recorded to be 81.25% and the cost of operation was reduced by 42.07 % when compared with manual harvesting. Rotary Sorghum Harvester (single row) was designed and developed for two stages harvesting of sorghum. The effective field capacity was found to be 0.134 ha/hr and cutting efficiency 96.95%. The net saving in cost of operation per hectare was found to be 23.72%. The developed Sesamum planter was tested and observed that the average uniformity of Sesamum seed placement was 79.60%. A bullock drawn seed drill covers around 0.20 to 0.25 ha area in one hour. Sugarcane set cum Forage Cutter facilitated the cutting of sugarcane sets and recorded cutting of 1985 sets for single eye bud and 1977 for double eye bud at 32 strokes per min. The output of Citrus Fruit Harvester used was noted as 15.6 kg/hr for lemon and 59 kg/hr for orange harvester. A manual Seedling Transplanter can be operated by men as well as women. This reduces drudgery during transplanting operation and saves time. The Power Operated Groundnut Decorticator developed for decorticating groundnut pods. The capacity utilization was noted as 63.88% and 63.60% at 12mm and 7mm clearance respectively. Lateral coiler helps to make the coils of laterals and takes only 3 to 4 minute to make the coil of lateral of 200 m length.The field efficiency of Broad Bed Furrow planter was observed to be 72.30%, 73.53% and 70.92% at the forward speed of 3.38 km/hr, 3.20 km/hr and 4.03 km/hr for Chickpea, Safflower and Onion crop respectively.

T9 : RCC-4

Gender-friendly farm equipment: a potential for reducing cost of cultivation

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Farm operations for different farm activities are being performed in the country with varying involvement levels of men and women workers. Various study indicated about passive level of involvement of farm women in most of the farm operations. Ergonomic studies pointed out the possible reasons for non-adoption or use of improved farm equipment by farm women. Total farm workers available as per Census 2011 are 261 million of which 37.1% are farm women. Estimates on farm workers showed 22.6% reduction of total farm workers by year 2050. Simultaneously, the percentage of farm women is estimated to increase from the present 37.1% to 60%. This farm worker population estimates indicate the need of active involvement of farm women in terms of use of improved farm machines/ equipment. This will not only help in improving the overall farm productivity but also help in reducing the cost of cultivation.

Based on ergonomics study, 15 to 22kJenergy expenditure was observed in operation of various manually operated farm equipment. The power requirement varied from 50 to 70W in operation of farm equipment. This clearly indicated the load exerted by human being while operating these manual operated farm equipment when power requirement exceeds over 30W by farm women. The energy expenditure can be reduced if major load is shared with auxiliary power source. The latest technologies are being utilised in many industries commercially. This technology in blend with solar capacitor and panel has vast potential in agricultural machines. An attempt has been made to ease the workload of workers in weeding operation. The area-covered per hour by battery-assisted four-wheel weeder is about

three times as compared to manual operated four-wheel weeder. Manually operated women friendly farm equipment namely seed treatment drum, fertilizer broadcaster, four-row paddy drum seeder,375W electric motor-cum-hand operated maize de-hsuker-sheller, sitting type groundnut decorticator and groundnut stripper are the gender-friendly farm equipment having many fold increase in output. These improved gender-friendly farm equipment will help in reducing cost of cultivation.

T9 : RCC-5 Production development of ciae prototypes for doubling farmer's income by enhancing the reach to advanced technology

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The majority of farm machines are produced in unorganized sector, which lack quality control. As a result of this, the machines available to farmers are subjected to frequent repair & maintenance and machine break down often takes place during peak seasons. This causes tremendous financial loss to the farmers. In order to get quality machine by manufacture it is imperative to develop effective production technologies for ease of manufacturing. Therefore, the principals of production development are to be applied to machine so that manufacturing errors are eliminated and thus reducing cost towards machine repair and ultimately breakdown.

ICAR- Central Institute of Agricultural Engineering, Bhopal has a well-established Prototype Production Centre for production development of prototypes exclusively used for batch production in the area of farm mechanization, food processing and value addition, energy gadgets for multi-location trials, pilot introduction and to meet the demand of users to limited extent. Various stakeholders like manufacturers and entrepreneurs are provided training on material selection, service life enhancement of fast wearing components, interchangeability (use of components for ease in fabrication) and various aspects of manufacturing like marking, measurement and tooling for capacity building and skill development. After getting training, they develop linkages with the institute for promoting institute technologies by making agreement with institute in the form of MOU and MOA. Project profile on setting up an enterprise for manufacturing of institute prototypes provides complete information about CAD drawing, material requirement, production process, cost estimation, economic analysis and suppliers of raw materials and standard parts, which attracts manufacturers/entrepreneurs towards starting the fabrication of institute prototypes. In last five years institute has supplied 20,576 prototypes costing about 323.28 lakhs. At present about thirty one manufacturers are manufacturing these machines through memorandum of agreement (MOA). All these machines are helpful in increasing the farmer's income by reducing the investment (improving the input use efficiency), increasing the productivity and reduction of drudgery in farm operation. The food processing and value addition reduces the post-harvest losses, value addition to the final product and additional income generation to the farmers.

T9 : RCC-6 Increasing farmers income through farm mechanization

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Farm mechanization is the application of engineering and technology in agricultural operations to do a job in a better way to improve productivity. Farm mechanization not just reduces labour and time but also reduces losses and cuts down production costs. Mechanization supports the optimal utilization of resources (e.g., land, labour, and water) and

expensive farm inputs (seeds, fertilizers, chemicals). Judicious use of time, labour and resources helpsto facilitate sustainable intensification (multi-cropping) and timely operation, which can providemore time to crops to mature, leading to increase in productivity. The use of machinery also helps in reducing losses, and drudgery. It has been estimated that the use of proper equipment can increase the productivity up to 30% and reduce cost of the cultivation by about 20%. It is estimated that farm mechanization saves about15-30% seeds and fertilizers, 20-30% time and labour and enhances 5-10% cropping intensity. All of these benefits will increase the farmers' income. There are various other benefits of farm mechanization such as it helps in conversion of uncultivable land to agricultural land through advanced tilling techniques, decrease workload on agricultural work force, increase safety in farm operations and encouraging youth to join farming to work and live in rural India.

Several studies suggest a direct correlation between farm mechanization and crop productivity. Food grain productivity in India has increased from 0.636 t/ha in 1965-66 to 2.111 t/ha in 2013-14, while farm power availability has increased from 0.32 kW/ha to 2.02 kW/ha during the same period. Farm power input has to be increased further to achieve higher food grain production and the composition of farm power from different sources to be properly balanced to meet its timely requirement for various farm operations.It is estimated that food grain productivity and farm power availability will increase to 3.96t/ha and 5.17 kW/ha by 2032-33.

T9 : RCC-7

Increasing farm profit of farmers of Changthang highlands through farm mechanization

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District Leh with an area of 45100 Sqs Kms makes it 2nd largest district in the country after Kutch (Gujrat) and is bounded by Pakistan occupied Kashmir in the west, China in the north and eastern part and Lahaul & Spiti of Himachal Pradesh in the south east. Changthang region of Leh district covers approximately half of the area of district i.e. 22000 Sqs Kms. Changthang highlands are characterized by heavy snowfall, low/negligible rainfall, dry, harsh winter, short growing season, harmful UV radiations, strong winds, sharp fluctuation in temperature, high altitudes (11800-15000ft AMSL-Inhabited villages). Crop season in Changthang highland is very short ranging from 2½ to 4 months. However, area under agriculture is very less due to adverse climatic condition. Major agriculture crop is barley, oats and field pea (local pea). Farmers also started cultivating Alfa-alfa-a perennial fodder grass. As working efficiency is less due to high altitude and low oxygen content, cost of cultivation for these crops become higher as compared to other parts of India. Increased time and higher labour charges for different operation increased the cost of cultivation thereby reducing net profit of the farmers. An initiative was taken under Tribal Sub Plan (TSP) programme by KVK/HPSRES, Nyoma with a view of increasing farm profit of local farmers by mechanized harvesting. Improved farm implements like Reaper cum Binder, Barley Harvester and Alfa alfa Harvester were introduced in the area after studying their feasibility. These implements not only saved the time in harvesting of barley, peas and oats but also money and labour. Reaper cum Binder harvested and bundled 0.2 ha barley in one hour only against manual harvesting and bundling by 3 labours days. Operational expenditure was 3 times less as compared to manual operation. Similarly, Barley Harvester took 1 hour for oats and barley harvesting in an area of 0.15 ha against 1.5 labour days for same area and operational expenditure was 2.14 times less as compared to manual operation. For alfa alfa harvest in 0.1 ha area, harvester took 1 hour against 1.5 days for same area and operational expenditure was 2.5 times less as compared to manual harvesting. Mechanized harvesting through Reaper cum Binder, Barley Harvester and Alfa-alfa Harvester could save Rs 5000/-, 2667/- and Rs. 4500/- for harvesting of one ha area. These interventions in harvesting increased the profit margin of the farmers of Changthang with increase in B:C ratio in barley, oat and alfa alfa by 6.20%, 2.87%, and 11.16%, respectively.

T9 : RCC-8 Mechanization in sugarcane production system: Cost saving technique

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Sugarcane and Sugar Sector is most important for Socio- economic development in rural areas of U.P. and India. With 5 million ha of area, 3.6% of total cropped area and 6% of agricultural GDP in Country provides livelihood to about 6 million cane families U.P. accounts 60% of total area and 37% of the total sugar production enhancement in income of cane growers through increasing sugar cane productivity and doubling the farmers income it is necessary to introduce diversification and mechanization in cane production system:-

Trench method of planting of sugarcane & use of modified weed management are playing significant role in reducing cost of cultivation & increasing net profit unit area. In traditional method of planting of sugarcane production of 600-650 q/ha, Income approx. Rs. 215000 – 217000 with C.B.R.- 1:2.73 where as in Trench method of planting sugarcane production of 800-850 q/ha, Income approx. Rs. 252000 – 283000 with C.B.R.- 1:4.18.

T9 : RCC-9 Evaluation of self propelled verticalconvey or reaper for rice

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The study was conducted on farmer's field using Reaper as mechanized harvesting of paddy for minimizing thecost of cultivation of paddy. A self-propelled vertical conveyor reaper (KAMCO Model KR120) was used for harvesting of paddy crop. The overall performance of the self-propelledvertical conveyor reaper was quite satisfactory. The actual field capacity of the power reaperwas found to be 0.28 ha/h with a field efficiency of 72% at an average operating speed of3.02 km/h. The fuel consumption was 0.82 l/h. the cost of cultivation of paddy crop could bereduced through mechanization of harvesting operations. Cost of mechanical harvesting was695Rs./ha compared to 2530 Rs./ha as in case of traditional method i.e., manual harvestingusing local sickle. The overall cost of harvesting was found to be decreased in case ofmechanized harvesting by self-propelled vertical conveyor reaper. Hence, the mechanicalharvesting would be feasible and economical compared to traditional method in terms oftime, labour requirement and money.

T10 : RPL-1 Effect of independent variables on knowledge extent of farmers about green gram (summer season) crop

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The present study was conducted in Malwan block of Fatehpur district by conducting personal interview with 100 respondents which were selected through random sampling technique. The data was collected personally by using pre-tested interview schedule. There were 67 percent respondents found in middle age group followed by 17% in

Young age group and observed to be literate (96%) while 04% respondents were found illiterate, (38%) respondents belonging to general caste followed by other backward caste 35% and scheduled caste 27%, 56 per cent residing in joint families while, 44% belong to single type of families. The maximum respondents (43%) were having medium farmers land holding and agriculture was observed as main occupations (75%) followed by services (22%). The 70 per cent respondents were found such who had family annual income Rs. 83001-220000. The majority of respondents (83%) were observed overall material possession in medium level (32 to 47 score) followed by high (12%) and low (05%) categories. A maximum number of respondents were found in medium level of scientific orientation (39%) while (31%) and (30%) respondents was found in the categories of low and high levels of scientific orientation, medium level of economic motivation and risk orientation with 47 per cent and 45 per cent respectively. Besides, among all 13 agricultural practices of green gram (summer season) cultivation, timely sowing (99%) were rank at 1st as far as knowledge possessed by the respondents were concerned. Out of 15 variables studied the variables i.e. knowledge about technological practices of green gram cultivation, annual income social participation and extension contact was found highly significant and positively correlated with extent of knowledge.

T10 : RPL-2 Need of safe grain storage for minimizing food grain losses and increasing farmer's income in India.

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Agriculture is an important sector of Indian economy, accounting for 14% of the nation's GDP, about 11% of its exports, about half of the population still relies on agriculture as its principal source of raw material for a large number of industries. Food grains undergo a series of operations such as harvesting, threshing, winnowing, bagging, transportation, storage and processing before they reach the consumer and there are appreciable losses in crop output at all these stages. The post harvest losses in India amount to12 to13 million metric tons of food grains each year,an amount that the World Bank stipulates could feed one- third of India's poor. The monetary value of these losses amounts more than Rs. 50,000 crores per year. In India, around 60-70% of food grains produced is stored at home level in Indigenous storage structures. These structures made of bamboo, straw, and other plant materials, allow free flow of air but causes insect infestation and damage by rodents. Grain storage capacity in India cannot meet the storage requirement for buffer and operational stocks, public distribution system and farm level storage. Storage is an important link in the entire procurement and distribution system of food grains, produced seasonally but consumed all the year around. Hence, storage facilities in India need to be strengthened by supplying them with much needed scientific storage and drying equipment. Setting up a community drying-cum-storage complex as suggested by Ojha (1984) has great potential,as it will help to reduce losses and to provide a better return for the grower. They will aid in enhancing India's ability to meet its food security objectives by increasing storage capacity, reducing losses,and increasing the efficiency of purchasing and distributing grains.

T10 : RPL-3 Constraints in adoption of vegetable production technology in Etawah district

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The present study was conducted in Etawah district of Uttar Pradesh. Out of eight blocks, one block namely Barhpura was purposely selected. In this block 5 villages were randomly selected from vegetables grower's villages. Thus the total numbers of 50 vegetables growers were selected for the study. Production of vegetables crop in Uttar Pradesh is 23575.61 (in '000 MT). It is mainly because poor knowledge as well as adoption of scientific technologies of vegetable cultivation. A wide gap exists between the yields obtained and the potential yields due to less adoption of vegetables production

technology. By adopting improved varieties and technologies, the production and productivity can be increased. Promotion of hybrid vegetable varieties or improved varieties is major input for increasing productivity as well as production. The major constraints that could be detected to vegetable production technology like lack of knowledge about improved variety, method of sowing (ridge and line), non availability of fund at time of sowing, seed rate and sowing time, lack of knowledge of IPM technologies, unavailability of improved seeds of vegetables, lack of irrigation facilities, non-remunerative price, lack of training of scientific vegetable production technology.

T10 : RPL-4

Impact of training on rural farm women through extension channel

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Tumba (*Colocynthis citrullus)* is a weed found in plenty with many common names including colocynth, bitter apple, bitter cucumber, desert gourd, is a desert plant. It resembles a common watermelon vine, but bears small, hard fruits with a bitter pulp. In India it is utilized as a part of conventional medication for hack, frosty and agonizing swellings and skin ejections, as an antipyretic. Tumba is an herbaceous weed with great therapeutic value. However, it is an under-utilized crop due to the bitterness it possesses, which makes it unacceptable for consumption. Thus, the present study was undertaken to standardize the processing technique to reduce its bitterness and motivate its utilization in the community. Dhapi Devi, while her agricultural practices found majority of weed tumba in his small piece of land. Once during OFF campus training of KVK, Scientists went to her place where it was found that Dhapi Devi has huge stock of tumba which she assembled for the purpose of animal feeding use during off season. Asking about how she uses to preserve it, she said she has nothing instead of spreading it in cold room and allow it to dry. The only care she can take is to have regular watch so that tumba doesn't get spoiled. She has no other option to raise tumba's shelf life. Team has decided to conduct an ON campus training at KVK. Here beneficiaries were taught about making pickle, churna and other value added products of tumba. Here was the problem that training cannot be conducted in one training programme removing bitterness of tumba itself takes time of fifteen to twenty days. So training was planned in two phases. During first training tumba will be prepared to make pickle out of it by removing its bitterness and during second training addition of spices to make pickle will be happening. As time flies, A sixty year old lady who had no choice rather than doing hard work in his small piece of land is now able to make earning in such amount that she with her family can have rich meal thrice a day. Dhapi devi stated her own enterprice to sale different value added products of tumba. She started her own shop name “yahan tumba ke achar milta hai” in her village. Although, initially she didn't get that fame and popularity but latter with passing years her products are that much famous that people from far places come to her for tumba pickles.

T11 : AE-1

Participation of rural women in decision making pattern on farm and household related activities

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In Indian Society, both husband and wife participate in different household activities. Their role are generally complementary not only in physical participation in farm, but also in the decision making process concerning major land use activities. Women play a pivotal and potentially benefiting role in all-round growth of resource poor farm families. But often they are neglected in decision making on farm and house hold matters which are mostly managed

by them. Participation in decision making process especially in economic activities is an indication of empowerment. The present study attempts to investigate the level of women economic empowerment in resource poor farm families by analysing their extent of participation in decision making on farm and house hold related economic activities. The study was conducted in Deoria district of Uttar Pradesh. Out of sixteen block three blocks i.e. Salempur, Bhatpar Rani and Bhatni were selected for this study. From each block four villages selected and from each villages ten resource poor farm families were selected randomly from nine villages, thus a total 90 couples (180 respondents) were selected for the purpose of the study. The study revealed that wives played a major role to jointly decide purchasing or hiring of land (41.11 - 42.22%), borrowing for agriculture (35.55 - 40.00%) and selling of produce (20.00 - 38.88%). Decisions for milking and processing of milk, utilization of dung and sale of milk and milk products were dominantly taken by wives (86.66%, 54.44% and 17.77% respectively), where purchase and sale of animals (37.77 - 40.00%), type and number of animals to be kept (30.00 - 37.77%) and adoption of new animal husbandry practices (28.88 - 33.33%). Household economic decisions on building new house, household purchasing, selected of occupation for children, Marriage of the children, education of children and financial activities were mainly taken jointly (36.66-41.11%, 34.44-35.55%, 33.33-34.44%, 24.44-32.33% and 24.44-30.00% respectively). The findings of the study indicate higher level of women economic empowerment in animal husbandry and household sectors.

T11 : AE-2

Krishi Vigyan Kendra (KVKs) as a Tool to Transforming Agriculture

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An agricultural invention-and-innovation continuum in all facets of agriculture and allied activities with its effective diffusion is key to sustainably increase the agricultural production and productivity with environment sustainability. With half of the workforce engaged in agricultural sector in India, the role of science and technology in agriculture is pertinent to not only ensure food security of the country, but also to provide farmers a competitive edge and to maintain affordability of the food items for the public at large. To realize their true potential, farmers must have access to the state-of-the-art technologies, necessary inputs and related information. In this context, the Government of India through Indian Council for Agricultural Research (ICAR) has established a large network of Krishi Vigyan Kendras (KVKs) across the country with an aim to conduct technology assessment and refinement, knowledge dissemination and provide critical input support for the farmers with a multidisciplinary approach.The efficacy of KVKs' services, assess them in terms of infrastructure and human resources, impact of new knowledge and practices on farmers' farming practices and the effect of new knowledge adoption by farmers on their incomes and quality of life. The KVKs are playing a proactive role in transferring new technology at field level with beneficial impacts. They have an edge in technology transfer over other service providers by virtue of their having better technical expertise and demonstration units. With the intervention by KVKs, the farmers have modified their agricultural patterns which were related to diversification of crops and changes in cropping pattern, seed planting technique, use of fertilizers and pesticides, changes in machinery used and in water use pattern.

The farmers have mechanized their farm operations; however, ownership of farm machinery and technology adoption increased with the size of holdings and education level of the farmers. It has been found that the technologies adopted resulted in higher productivity, enhanced incomes and reduction of drudgery. Enhanced incomes are spent in construction of house, better education and health for family and better inputs for agriculture; some improper use of enhanced income has also been observed, which needs to be guided more to channelize into better use.The KVKs can play an important role in transforming rural India. It came out that interventions of KVKs should target the family and not the individual farmer. KVKs should come out of 'inside the wheel' approach and should also cater to the needs of small and marginal farmers with innovative mind sets. A number of farmers are doing various innovations that should be taken a note of. There is also a need to follow bottom-up approach and researches done at field level should reach

the laboratories for validation. It is expected that in due course of time KVKs would play an increasingly important role in transforming agriculture, a key ingredient to transform India.

T11 : AE-3

Socio-Cultural and Economic Considerations in Increasing the Income of the Farmers with Special Reference to Sugarcane

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Farmers and their families are members of the social systems in which they live. In all societies there are accepted ways of doing things and these ways are directly related to the culture of the society. Farmers' attitudes and desires are influenced by their society's culture. An extension agent will be more effective if he or she understands the social and cultural background of the farmers with whom he works. He will then be better able to offer advice that fits in with the culture of the society, and he can use the structure and culture of the society to the benefit of his work. It is useful, therefore, to examine the main features of societies, cultures and rural economy that are relevant to extension work. Social factors like social structure, social stratification, groups, formal and informal leaders, social expectations, expected impacts of technologies in the social systems, counter measures to resolve the negative consequences of technologies, training to the farmers, positive attitude of the sugarcane development personnel, discharge of corporate social responsibilities by the sugar mills traditional means of communication, cultural factors *viz.,* ceremonies, festivals, beliefs, values, mores, taboos, further, economic factors such as farming systems, land tenure, inheritance, *common economic interest, price, payment of dues, timeliness of payment, correctness of sugarcane survey, promptness in delivery of supply slips, fairness in weighing and supply of inputs to the farmers are major factors must be taken into consideration while advocating the change in the social systems for increasing the income of the farmers.*

Key words: Social system, Socio-cultural-economic factors, income, farmers and sugarcane

T11 : AE-4

Front Line Demonstration of Early Cauliflower cv.*Sabour Agrim*in Western Uttar Pradesh

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Cauliflower (*Brassica oleracea*var. botrytis) belongs to family *Brassicaceae* and is popular for its white tender head or curd. Cauliflower is one of the most important winter vegetable of North India. It is consumed as a vegetable in curries, soups and pickles. Timing of curd initiation is a key determinant of yield and maturity which is totally influenced by date of transplanting. Country produces 8.57 mt of cauliflower per year from 4.34m ha area with an average productivity of about 19.8 mt/ha (NHB, 2014). The major cauliflower producing states are Bihar, Uttar Pradesh, Orissa, West Bengal, Assam, Haryana& Maharashtra. In the plains, it is available in the market from September to May. Vegetative growth parameters like plant height, number of leaves, whole plant weight, marketable curd weight and yield were influenced significantly by the type of varieties and date of planting. Sowing times depend on the varieties and the agro climatic conditions prevailing in a particular region. In North-Indian plains, early cauliflower is sown from May end to mid-July, mid-season varieties from July to August end and snowball types from September to October. Therefore, present investigation was laid out to evaluate the performance and adoption of early cauliflower cv.*Sabour Agrim* by farming community, demonstrated on different locations in Saharanpur district of Uttar Pradeshduring kharif season, 2015-16 and 2016-17 and compared with the farmer practice (cv. Dactor). The

results revealed that transplanting of early cauliflower cv. *Sabour Agrim*had a significant effect on growth and yield of cauliflower followed by maximum plant height (68.4 cm), the best marketable size of curd (472.9 g), maximum curd length (15.2 cm), diameter of curd (17.3 cm) and the maximum yield (208 q/ha) over local hybrid varieties. Cauliflower can be grown better at places which are cool, frost and litter free than other *Brassicaceae*. It is difficult to grow cauliflower as a spring crop because it tends to bolt during the condition of extreme heat. Farmers of Saharanpur district mainly grow hybrid varieties of cauliflower for good remuneration. They invest more money on seed due to which cost of cultivation become very high in comparison to return. With the adoption of early cauliflower variety farmers are getting high income over local varieties.

T11 : AE-5

Sugarcane based interventions to double farmers' income: Case study

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Sugarcane and sugar sector has been a most important agro-industrial sectorin India for socio-economic development in the rural areas of the country. With 5 M ha of area, sugarcane occupies about 2.57 per cent of total cropped area, contributes nearly 10 per cent of gross value of the agricultural GDP in the country, and provides livelihood to around 6 million cane growers. Can this sector contribute to double farmers' income keeping intact the economic prosperity of sugar industry? This is million dollar question to put before the sugar industry and all its stakeholders, as Govt. of India has ambitious target to double farmers' income by the year 2022. In this regard, how technological interventions can help to enhance farmers' income as well as sugar recovery was assessed and analyzed in public-private-farmer partnership (PPFP) mode under the present study.

During last 5 years cane development activities in partnership mode involving three partners i.e. Indian Institute of Sugarcane Research (public), Sugar Mill (private) and cane growers (farmer) was implemented in command area of a sugar mill with sole objective to enhance productivity and profitability of farmers and sugar mill. The IISR introduced technological interventions, sugar mill supported with financial outlay for development activities, agri- inputs, skilled field staff and farmers spared his land, labour and input resources in execution of collaborative programme of cane development in mill zone areas. Three technological interventions module i.e. seed cane production, ratoon cane production and intercropping in sugarcane was introduced in the farmers' fields.

The average yield of seed cane plots (intervention module I) was 104.83 t/ha, with net profit of ₹2,04,007 (if 100% cane supplied for crushing to mill) and ₹2,48,035 (70% supplied for seed purpose and 30% for crushing). This enhanced yield and profit was much higher than the average cane yield and net profit of 66 tha^{-1} and 1,01,400ha^{-1}, respectively in the region. In case of ratoon cane production (intervention module II) the average yield obtained in demo plots of ratoon promoter machine was 69.32 tha^{-1} and net profit was ₹1,31,000ha^{-1}, which is higher than the average yield (60.00 tha^{-1}) and net profit (1,04,000ha^{-1}) in ratoon crops under conventional method. Under intervention module III i.e. on intercropping in sugarcane net profit accrued with cane + inter crops ranges between ₹1,86,500 to ₹3,38,500 per ha where as it was only ₹1,42,000 in sole cane crop. The reduction in acreage under rejected varieties, increase in area under early varieties and most importantly increase in sugar recovery from 9.78 (2012-13) to 12.40 (2015-16) are tangiblebenefit of interventions. This helped sugar mill to earn addition income from more sugar production. The outcome clearly spelt that sugarcane based interventions can contribute considerably in achieving ambitious target to double farmers' income.

T11 : AE-6

Extension and Development Needs for doubling income of farmers in Sugarcane based cropping system in Central Uttar Pradesh

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The paper is based on the experiences gained while working in villages under IISR-DSCL Sugar mill public- private partnership programme for doubling the income of the farmers in Hardoi District of UP. Methodology adopted for gathering the information consisted of organization of one Sensetization Workshop cum Kissan Gosthi in each selected village followed by information gathering on collective wisdom of the village. The villages are located in sugarcane intensive tracts within the sugarmill cane command area. Hence, the extent of sugarcane cultivation is very high to the extent of 74.7% of net cultivated area (NCA) on an average. The cropping pattern followed is sugarcane based with sugarcane– ratoon as the major cropping sequence followed by rice-wheat, til-wheat in 2-5% area. The spring planted sugarcane is grown (33.70%), and the autumn planting is done to the extent of 10.97%. The average yield of spring planted sugarcane is 59 t/ha and that of autumn planted sugarcane is 70 t/ha. However, in autumn planted sugarcane, the yield levels to the extent of 150 t/ha have been achieved under trench planting. Trench method of sugarcane planting has gained popularity in the village, though the planting is done manually and the operations are yet to be mechanized. Inter-cropping in sugarcane is predominantly being followed in autumn crop with mustard crop, the crop being preferred to escape the menace of wild animals.

Analysis of extension and development needs of these villages that has the potential to increase the income of the farmers in the selected villages was carried out. It highlights that special attention for ratoon crop such as demonstration of ratoon management technology including use of machines needs to be given. Encouraging intercropping in sugarcane with suitable intercrops for autumn planted, spring planted and ratoon crop is the next important development need in the villages. For this, demonstration of the utility of automatic trencher cum sugarcane planter, sugarcane cum potato planter and raised bed seeder needs to be made on priority. The ancillary activities like dairying and goatry which has the potential to increase the income also need to be encouraged. The development of suitable literature in local language on all above aspects, and its distribution to the farmers at the beginning of the crop season will help in fast adoption of those package of practices which has the potential to ensure high income generation for the farmer.

T11 : AE-7

A study on the effectiveness of mass media and interpersonal communication sources as perceived by the farmers of J&K

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Communication plays a significant role in the development of modern agriculture. For doubling farmers' income it is necessary to disseminate fast and effectively new technologies to the farmers. This is only possible by effectively utilization of communication sources. A study was conducted on systematically randomly selected 120 farmers from the Samba district of J&K state to analyze the effectiveness of mass media and interpersonal communication sources as perceived by the farmers. The results revealed that among personal localite sources 91% expressed that progressive farmers were effective in dissemination of agricultural information. 100%, 88%, 91% and 95% reported that panchayat members, neighbours, relatives/friends/elders and group meeting respectively were effective in dissemination of agricultural information. Among personal cosmopolite sources 78%, 100%, 73%, 100%, 100% and

96% farmers reported that staff of department of agriculture, staff of agricultural universities, bank personnel, personnel of NGO, personnel of private company and private input dealers respectively were effective in transfer of agricultural information. Among personal cosmopolite channels 95%, 100%, 87%, 100%, 86%, 97% and 97% reported that method demonstration, farmer's training, result demonstration, field day, study tour, farm exhibition, kissan mela and campaign respectively were effective channels in dissemination of information. Among print media 96%, 85%, 100 and 92% farmers reported that newspaper, farm magazine, folders/leaflets and wall papers/banners/hoardings were effective in dissemination of agricultural information. In case of electronic media 100%, 100%, 85% and 92% of the respondents reported that mobile phone, internet, radio and television respectively were effective source of communication.

Keywords: Communication, utilization, effectiveness, personal localite, personal cosmopolite.

T11 : AE-8

Study of Economic dairy farming in Rural Area of Lucknow district

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The present study of Lucknow district indicate that all group and size dairy farms (small, medium and large) are profit making units per milch buffalo per year maximum net income Rs. 19030.00 was recorded in large size group and minimum net income Rs. 16233.60 observed in small size group. Were as per dairy per year net income Rs. 266420.00 was recorded in larger size group (Maximum) and Rs. 81165.00 in small size group (minimum) respectively. The overall average return per milch buffalo per size group per year was Rs. 17732.00 and per year per dairy net return Rs. 169663.00 respectively.

The Human labour employment was increased as per increase of dairy size groups ranging from 280 days (minimum) in small size dairy to 1095 days (maximum) in large size groups. The overall per dairy size farm average human labour days employment was 593 days having its labour wage Rs. 41510.00. There was cent percent use of family labour in small size group and the share of hired human labour in total human labour employment was 69% in large size group. The human labour was continuously employed for whole of the year. Thus conclusion may be drawn that in Rural area of Lucknow district if higher milch buffalo are reared with proper feeding and management then respective dairy size groups will not provide continued assured maximum net income but will also be employed human labour of that particular area for whole of the year at their doorsteps as well as helpful in solving the problems of urbanization in rural areas.

T11 : AE-9

Impact of KVKs Front Line Demonstration on Knowledge and Adoption of Paddy crop technologies in Jammu and Kathua districts of Jammu and Kashmir

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Frontline demonstration (FLD) is one of the most powerful tools for transfer of technology. Keeping in view of an effective extension approach of FLDs for dissemination of paddy technology, an impact assessment of FLDs conducted by Krishi Vigyan Kendras, located in Jammu and Kathua Districts of Jammu and Kashmir was assessed. The impact evaluation was based on the comparison of beneficiary and non-beneficiary respondents with reference to

difference in knowledge level of beneficiary and non-beneficiary farmers and extent of adoption of improved paddy production technologies by them. Based on random number sampling total sample of 80 respondents (40 beneficiaries and 40 non-beneficiaries) were interviewed using a structured interview schedule. In paddy majority (72.5%) of the respondents possessed high level of knowledge in case of beneficiaries while only 57.5% of respondents possessed high level knowledge in case of non-beneficiaries. The adoption of technologies both in case of beneficiaries and non-beneficiaries follow knowledge, though high percent of farmers were aware about different rice practices but the adoption was lower than the knowledge in both cases. A significant difference was found between beneficiaries and non-beneficiaries related to the adoption of recommended seed rate, seed treatment, use of DAP in nursery, fertilizer usage in main field & diseases management of rice and the results of linear regression showed that none of the selected variables had significant contribution with the adoption of various practices in paddy.

Keywords: Frontline demonstration, knowledge, adoption.

T11 : AE-10

Krishi Vigyan Kendra (KVK) - Tool for Capacity Building of Farmers

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The Ministry of Agriculture, Government of India through Indian Council for Agricultural Research has established a large network of Krishi Vigyan Kendras (KVKs) across the country covering nearly all the rural district with an aim to reduce the time lag between the generation of technology and its adoption to the farmers through various extension methodology in the interest of farming community and nation. (KVK) is a vocational institution, working as centred for capacity building for practicing farmers, farm women, rural youths and grass root level extension personnel of the district. The main aim of training is to develop skill and knowledge among the trainees to do better in their profession. KVKs are the only district level institution with a proven potentiality to build capacity on their multi dimensional requirements in a scientific and systemic approach. It also synthesize farmers capacity with technology viability. The capacity building of farmers and farmwomen by enhancing their knowledge and skill would bring about a socio economic change thus empowering them with opportunities for enhancing their income and raised their living of standard. The KVKs are playing a proactive role in transferring new technology at field level with beneficial impacts through imparting training. With KVKs' intervention, the farmers have modified their agricultural patterns which were related to diversification of crops, changes in cropping pattern, seeding/planting techniques, application of chemicals, mechanization, resource conservation, value addition, reduce post harvest losses, drudgery reduction, etc. Capacity building has been considered in the last decades an important element of farmers development, as helps institutions and communities to better use of resources, design and manage farm plan, which enhance productivity and profitability of farm ultimately increase farmers' income and improve living of standard of farmers.

Key word: KVK, skill, knowledge, trainees, vocational, capacity building, technology

T11 : AE-11

Farmers Field Schools –A Tool for Technology Dissemination

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Dissemination of appropriate agricultural technologies is key to increasing the productivity and incomes of farms while protecting the environment. In particular, agricultural extension programs based on the Farmer Field School

(FFS) approach that disseminate new science based knowledge and other information to farmers are being implemented in dissemination agricultural technologies. The farmer field school is a season long training of farmers involving participatory activities, hands on analysis and decisionmaking. FFS are participatory platforms for improving decision-making capacity and encouraging local innovation for sustainable agriculture. Farmers Field Schools have been created as learning centers of the farmers. These learning centers are being managed by the farmers. FFS offer community-based, non-formal education to groups of 25-30 farmers facing similar problem. It is a participatory learning process throughout a crop cycle. FFS fill gaps in local knowledge, conduct holistic research on agroecosystems and increase awareness and understanding of phenomena that are not obvious or easily observable. Their strength lies in increasing farmers' skills as managers of agroecosystems. FFS will work as forums where farmers can share their traditional Knowledge (ITKs), experiences and skills. Dissemination of location specific , farmers' friendly, cost - effective technologies on sodic reclamation, IPM, management of reclaimed sodic land, resource conservation technologies, Integrated Crop Management, protective vegetable cultivation, off season vegetable cultivation, vermicompost production etc . It also emphasizing on initiation of Income Generation Activities (IGAs) to enhance income base of FFS and its Master Trainers. For developing these FFS as Knowledge centers, Libraries/ e-chaupal have been promoted at the FFS Level.

T11 : AE-12 Study on Trichoderma Adoption and Challenges with the Farmers in Sitapur District Uttar Pradesh

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Trichoderma one of the best studied fungi with an efficient bio-control strains of the genus being developed as promising biological fungicides, and their weaponry for this function also includes secondary metabolites with potential applications as novel antibiotics. It multiplies and thrives as the host plant grows, providing season-long protection while sending messages through biochemical pathways to improve plant performance and yield. A study was carried out during *Kharif* 2017-18 at district, sitapur, Uttar Pradesh on adoption level of trichoderma at field level and challenges faced by the farmers. Data were collected from different agri-institution, departments working in sitapur about number of trained rural youth/ farmers and farm women on bio-pesticide and Integrated Pest Management. 100 Rural youth/ farmers and farm women were selected on random basis to interact about their experiences. During study, it was found that 85% of the beneficiaries were known about the importance of trichoderma for the growing nursery as well as the field application in soil with FYM before sowing but only 65% of them are using it, rest of the 35% says that they wish to use but due to timely and quality materials unavailability they are out from this pictures. It was also observed that 46% farmers are using farm yard manure (FYM), 11% farmers doing green manuring, 4% using vermin-compost, 3% using NADEP compost, 2 % farmers using Jeevamrit in their fields and no one using cow pit pat. The study reveals that, we have to motivate more and more no. of farmers for their soil health improvement and a good soil environment creation for the self multiplication of the trichoderma as well as for other beneficial soil micro-organism.

T11 : AE-13

Major Pest Problem of Groundnut in Sitapur District Uttar Pradesh

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There was a time when peanuts were cultivated on a large scale in sitapur district but over time peanuts area were declining day by day due to rigorous pest problem. Once again efforts are being made to increase the area of groundnut cultivation in sitapur by Krishi Vigyan Kendra-II, Sitapur with technical collaboration with ICAR-Directorate of Groundnut Research, Junagarh, Gujarat. Now Peanut has emerged as a new dimension with sugarcane, which has enough enthusiasm inside all the farmers. A field study was conducted to investigate the major pest problem of groundnut in sitapur district of Uttar Pradesh during kharif 2017-18. Four major groundnut cultivating blocks of sitapur district viz. Biswan, Laharpur, Reusa, Pisava were included during the field study. Five randomly farmers fields of five villages from each blocks were selected for the study. Total 100 farmers field were monitored throughout the crop season to observe the incidence of pest problems. Major parameters viz. pest incidence/ sq meter, damage of the leaves, damage of pods and grain, stem and root infestations, no. of pesticides applications and yield loss. It was recorded that out of 100 fields the insect/ pest incidence more than ETL level observed in 57 fields infested by white grub (Holotrichia spp.), 48 fields infested by Tobacco caterpillar (Spodoptera litura) and Gram pod borer (Helicoverpa armigera), 39 fields infested by termite (Odontotermes spp.) attack, 34 infested by Aphid (Aphis crassivora), Thrips (Scirtothrips dorsalis) and Jassids (Empoasca spp.), 11 infested by Groundnut Bruchid (Caryedon serratus and 6 infested by Leaf minor (Aproaerema modicella) attack,). The disease incidence out of 100 fields was found more due to Alternaria blight (Alternaria spp.) 28% followed by dry root rot (Rhizoctonia bataticola)12%, leaf spot (Cercospora arachidicola) 8% and Collar rot (Aspergillus spp.) 5% and peanut bud necrosis tospovirus disease (Peanut bud necrosis virus) 2% respectively.

T12 : PA-1

Trends of major vegetable brassica in India

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Vegetables are the most important component of a balanced diet. India is the second largest producer of vegetables in the world next only to China with an estimated production of about 168.3 million tonnes from an area of 9.54 million hectares at an average yield of 17.3 tonnes per hectare. India shares about 15 % of the world output of vegetables from about 2.8 % of cropped area in the country (NHB-2014). Varied agro-climatic conditions in India make it possible to grow a wide variety of vegetable crops round the year including vegetable brassicas.

Vegetable brassicas are an important and highly diversified group of crops grown world-wide that belong mainly to the species *Brassica oleracea* and *B. campestris*. *Brassica* vegetables are of great economic importance throughout the world as well as in India. India is producing world's 12.8% of cabbage and 37.5% of cauliflower and broccoli annually from 1.1 million hectare area and 20 million tonnes production. The principal *Brassica* vegetable species is *B. oleracea*, which provides a large range of unique cole and cabbage types. Cauliflower, cabbage and radish are one of the most popular *Brassica* vegetables in India which occupies almost 80% cultivated area and others like knol-khol, broccoli, brussels sprouts, kale etc. In cauliflower and cabbage there are different maturity groups ranging from 50 to 90 days. Still there are many OPV popular, particularly in cauliflower, radish and knol-khol. The breeding efforts are required for various qualitative and quantitative traits in these crops like heat tolerance, compactness, shelf-life and slow bolting etc.

T13 : PI-1

Doubling farmers income by 2022: Strategic issues and policy options

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Agriculture occupies a central place in the Indian economy because of its high share in employment and livelihood creation even though its proportionate contribution to the nation's GDP has been reducing over time. A series of successful agricultural innovations are being taken up from time to time, even though there are fluctuations in agricultural output and so in the recent times farming is becoming non-viable. Agricultural output and food security has remained the focus of the past strategies rather than farmers' incomes. On 29th February 2016 the proposal of Doubling Farmers' Income was announced by the Finance Minister Mr. ArunJaitley during his budget speech. Accordingly, on 22nd April 2016 a Task Group headed by Ashok Dalwai has been formed by the Ministry of Agriculture to suggest ways and strategies to double farm incomes. The targeted year 2022 i.e. from 2016-17 to 2021-22 (Six years) has been set by the govt. for doubling the farmers' income during which the real income of farmers is to be doubled, not output or value added or the GDP of the agriculture sector. PM Sh. Narendra Modi has suggested 7 point strategy to double farmers' income which includes irrigation, quality seeds, post-harvest crop losses, value addition, creation of a national farm market, removing distortions and e-platform (e-NAM) across 585 stations, New crop insurance scheme (PMFBY), promotion of ancillary activities such as poultry, sericulture, beekeeping, fisheries, etc. Various scholars have highlighted that high and increasing input cost, low and unrealizable MSP, lower TFP growth rate, non-remunerative price in the market, low share of farmers in consumer's rupee, absence of market infrastructure are the major constraints in achieving the goal of doubling farmers' incomes. Also different sources of growth has been identified such as increase in productivity of crops, increase in production of livestock, improvement in efficiency of input use (cost saving), increase in cropping intensity, diversification towards high value crops, improved price realization by farmers, implementation of MSP to reduce the distress sale, shifting cultivators from farm to non-farm occupations, improved value addition and processing, governance related – prioritization of research areas for investment, centre-state linkages, consensus among stakeholders. Only with a good strategy, well designed programmes, adequate resources and good governance in implementation this dream can be achieved.

T13 : PI-2 Empirical study on marketing analysis of fish in Jammu

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Due to pleasant favorable climatic conditions in J&K, it serves as favorite habitat for most variety of fish species, which has paved way for development of fish sector in the state. In the state, Kashmir province is a leading producer of fish, contributing more than 80 percent of the total production of the state followed by Jammu. Hence it has paved the way for consumption of the most produce of fishes in the state. For making the fish available in the market various market actors or chain actors has pivotal role in the marketing processes of the fish. The study depicted that in the state the marketing system started from the landing or primary market where the producers their fish produce by open auctioning method. From the centralized market, the fishes are mainly marketable by various channels. The main marketing channels identified and the flow of the fish mainly shifted and transferred from Primary market- Agents-Wholesalers – Commission Agent – Retailers – Consumer followed by another marketing channel viz:, Primary market – Agents (freezing points) – Wholesalers – Fish stalls – Consumers. The marketing channel of the fish in the sample area is not too well defined but needs a bit modification in order to smooth the market intermediaries functioning for the higher returns.

T13 : PI-3 Marketing channels and it's effect on farmer's share in consumer price of guava in Kaushambi district of Uttar Pradesh

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Income from farm produce is major concern for farmers. Multilayered marketing channels reduce the farmer's share in consumer price, and thus income from farm produce. Therefore, present study was carried out (n=120) to find out the various channels involved in the marketing of guava fruits and its effect on guava farmer's share in consumer price in Kaushambi District of Uttar Pradesh. Under the present study seven types of marketing channels were reported- 1. Producer consumer (LM_F), 2. Producer PHC consumer (LMf), 3. Producer WS/CA (LMf) retailer (LM_F) consumer (LMf), 4. Producer PHC WS/CA (LMf) Retailer (LMf) Consumer (LMf), 5. Producer PHC WS (DM_F) Retailer (DM_F) Consumer (DM_F), 6. ProducersPHCWS/CA(LM_F)WS(DM_F)Retailer (DM_F)Consumer(DM h) & 7. Producer WS (DM_F) Retailer (DM_F) Consumer (DM_F). Among the reported marketing channels for guava fruit, first channel wasfound to be most efficient and farmer's share in consumer price was reported 94.00 percent. Farmer's share in consumer price was reported 94.00, 42.67, 49.17, 18.84, 14.09, 12.50 and 29.39 percent in the reported marketing channels from first to seventh respectively. Therefore, it is herewith, can be concluded that involve middlemen are hampering the profitability of guava farmer and their income. Therefore, it is recommended that farmers as well as government should try to develop efficient marketing facility to improve the income from guava cultivation in Kaushambi District of Uttar Pradesh.

T13 : PI-4 Empirical study on apple production, marketing and its contribution to household income in temperate zone of Jammu province

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Apple production is one of the important sources of revenue for the economy in Jammu &Kashmir. Apple cultivation in J&K is fast expanding because apple has a comparative advantage over the other crops that can be grown in hilly regions. However, apple production has been low and concentrated in Jammu province forcing the country to importation to meet the national demand. This study, therefore, intends to analyze the current apple production and marketing chain to enhance household food security in Jammu province of Jammu and Kashmir. A multistage sampling technique is used for the present study. Doda, Kishtwar and Rambandistricts were selected purposively on the basis of maximum area and production under apple crop. The study has shown that apple production and productivity was low due to limited cultivation, poor agronomic practices, shortage of grafting and pruning materials, shortage of trained experts and poor research-extension and development linkage. The apple tree population was unevenly distributed among producers where few producers cultivate majority of apple and earn maximum share of income. The chain of apple marketing was long passing through producers, consumers, retailers and wholesalers. However, mismatch between supply and demand, lack of predetermined demand schedule, absence of transparency are affecting apple marketing. The study calls for all government and non-governmental organizations to work together to expand and improve apple production and establish apple marketing hub.

T13 : PI-5

Doubling farmer's income: need for policy interventions for better percolation of technologies in north eastern hill region

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Eight states namely Arunachal Pradesh, Assam, Manipur, Mizoram, Nagaland, Sikkim and Tripura ofthe North Eastern Hill (NEH) Region of India, covering about 8.3% geographical area with approximately 4% population of country. Out of the total 26.27 million hectare geographicalarea of NER of India, around 77% is hills and senile plateau, while only 12% of net area is under cultivation. Agriculture with Jhum land provides livelihood support to 70% of region's population. It produces only 1.5% of country's food grain production and continues to be net importer of food grains even for its own consumption. The central government has set seven point strategy for doubling the farmers income viz. focus on irrigation with large budget, with the aim of *"Per Drop, More Crop"*; Provision of quality seed and nutrients based on soil health of each field; Large investments in warehousing and cold chains to prevent post-harvest crop loses; Promotion of value addition through food processing; Creation of a nation farm market, removing distortions and e-platform across 585 stations; introduction of a new crop insurance scheme to mitigate risks at affordable cost and Promotion of ancillary activities like poultry, beekeeping and fisheries. Farmers' income could also be improved when productivity goes up, if the cost of production comes down, when we ensure agricultural commodities produced get a remunerative price through a transparent price discovery mechanism. There are certain focusedareas where technological interventions need to be percolated to farmers. In agriculture sectorinclusion of short duration pulses in Rice-fellow system under conservation agriculture; Replacement of cultivars through introduction of high yielding cultivars; Diversification of Jhum mixed farming and degraded land through pulses in Agroforestry system; Promotion of secondary agriculture enterprise with main crop. Minimize the Pre and Post harvesting losses from agriculture produce and promotion of small scale food processing and packaging especially pulses (*Dal Mill*) at farmers' threshold level. Experiences of working of ICAR Manipur Centre with its five KVKs reveal that there is greaterscope in organic farming in addition with high tech-horticulture including commercial nursery, protected cultivation of Fruits, vegetables, flowers with value and supply chain management of Pineapple, Khasi mandarin, Kachai lemon, Acid lime, Banana, Kiwifruit, High value crop. Development of effective technology and dissemination of the same to the ultimate beneficiaries are two basic component of technology adaptation, but there is a serious deficiency in agriculture extension in respect of percolation of technology. People's capacity should also be built in the use of technology. In the changing situation, farmers need to transform themselves from mere producer-seller in the domestic market to producer cum seller in a wider market sense to realize good returns on their investments, risks and efforts. Farmers have received most of the production technologies from the extension system. The extension system needs to be oriented with technological knowledge and skills related to farmers. Doubling the farmers' income need policy interventions for super transport facilities with proper ICT, rail and road network in Manipur in particular and in whole NEH Region general with adequate fund investment through PPP mode. Our resource-scare farming community in east centre and northeast regions deserve special attention with respect to doubling farmers' income scheme.

T13 : PI-6

Constraints faced by the farmers in *mushroom* production and marketing in Jammu district of J&K state

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An investigation was conducted in mushroom grown four different development blocks of Jammu district (R. S. Pura, Marh, Bilwal and Bishnah) during the agricultural year 2011-12. Three villages from each block were selected randomly. Further, from each village, 5 farmers were selected randomly, so as to constitute a total sample size of 60. Required data from sample farmers were collected through a pre-tested schedule and questionnaire by personal interview method for analyzing the constraints faced by them at various levels.The constraints faced by the farmers of sample area as a whole in production were mainly high spawn cost and its unavailability during peak period of demand (83.33 per cent),followed by compost cost and timely unavailable (76.66 per cent), lack of modern technology (71.66 per cent), rotting and disease problem (60.00 per cent), costly insecticide and pesticide problem (43.33 per cent) respectively. At marketing level, the grower expressed problems of storage facility was the major constraint as expressed by 86.66 per cent, followed by high transportation cost (75.00 per cent), lack of price received by growers and lack of market near village have the percentage is same as 60.00, malpractices by middle man and lack of market information have also the percentage is same as (55.00 per cent), besides these 40.00 per cent of grower have unavailability of market for mushroom sale.

T13 : PI-7

Strategy, programme and policy option for doubling farmers income in sugarcane based cropping system - A case study of Uttar Pradesh

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Sugarcane production and its diversified processing had key role in socio-economic transformation of rural India through agro-based industrialization. The present study attempted to identify the production constraints and suggest programme, strategies and polices for doubling sugarcane farmer's income in U.P. The study is based on primary data collected from four districts having more than 20 % gross cropped area under sugarcane. Two sugar mills from each selected district and 15 farmers from each sugar mills were selected to draw a total sample of 120 farmers. The data was collected with the help of survey schedule through personal interview during sugarcane crushing season 2015-16. Sugar mill contributes remarkably in state economy with income and employment opportunity to skilled workers. There were almost 2.35 lakhs workers in mills and 3.5 million farmers and large number of agricultural labour engaged in number of ancillary activities, constitutes 8% population. The result reveals that the sugarcane cultivation and its processing play a key in rural based agro industrialization. The strategies for sugarcane production were basically focused on enhancing crop productivity and improve sugar processing efficiency. These strategies were effective as globally, India become second largest sugar producer and able to fulfill domestic sugar and sweeteners demand. However, past strategy and policies did not clearly recognise need to raise farmer's income and promote welfare. The growth did not bring commensurate improvement in profitability and farmers income over the period of time. Economic benefits accrued in sugarcane cultivation, sugar and co-products processing value chain has not mutually shared with the farmers and other stakeholder. Sugarcane farmers in Uttar Pradesh has face challenges in enhancing productivity, because of cost escalation and poor mechanization due to close spacing in conventional method. It increases drudgery to labour in intercultural operational. The findings reveal that the production cost (Cost

C) was □ 153772 and □ 140073 per ha in conventional and ISPT method respectively in U.P. The net saving in cost of sugarcane production was 10 per cent and productivity gain nearly 23 per cent in ISPT vis.-a-vis. Conventional method. The farmers cultivate pulses, oilseeds and vegetables as inter crops in autumn planted sugarcane and pulses or cucurbits in spring planted sugarcane under ISPT and get additional net income. The study concluded that sugarcane cultivation is more remunerative under ISPT method than conventional method. However, the poor ratoon management, large area under rejected varieties, limited availability of quality seed cane of desired varieties, escalating input-costs, fluctuating output-prices and labour scarcity are the major constraints to improve productivity and profitability. They should adopt farm mechanization and new ago-techniques to overcome labour scarcity and improve per unit productivity. The productivity gain and cost minimization would be key factors for enhancing farmers' income. The study has concluded that the crop diversification, entrepreneurship development with primary processing and formation of farmers' producers' organization (FPO) could be effective strategies for achieving ambitious target of doubling sugarcane farmers' income by 2022 through adoption of cutting edge technologies, appropriate policies and infrastructural development.

T13 : PI-8

A major challenge: To doubling farmer income

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The importance of agricultural extension in providing appropriate information to farmers is paramount for increasing their income in commercialised agricultural sector with the chief objective of extension officers is increasing production through technology transfer. Profitability of the farmer depends on the right information in several aspects such as what is the right crop choice, right seed, how much fertiliser is required, from where to purchase, how and where to sell, and what are the current market prices etc.Restructuring and strengthening of agricultural extension machinery has to be a judicious mix of extensive physical outreach of personnel, enhancement in quality through regular training, new methods of information dissemination, public- private partnership, use of information & communication Technology (ICT), Mass Media and convergence of extension – related efforts under various schemes and programmes at state and central levels. Farmer – friendly mobile applications need to be adopted for information dissemination by the agricultural extension workers from state – district – block – village and ultimately to the farmers.Public Private Partnerships need to be encouraged through promotion of rural advisory services especially in hi-tech agriculture etc. where private sector is strong for the benefit of the farmers. There is a danger of concentrating on large farmers with prosperous areas, leading to neglect of small, marginal and women farmers and rain fed agriculture. Hence more focus should be on neglected people and areas for inclusive agriculture.

T13 : PI-9

Problem and Prospectus of Potato Seed Production in Bihar

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Bihar is a major potato growing state which accounts nearly 21% of area of the country. Inspite of having vast area under potato cultivation, productivity of the state is below the national average. Therefore, a sustainable efforts is needed to enhance the potato production in the state. Major problems faced by the farmers of the state are; lack of cold storage facilities, electricity, gluts and unavailability of good quality seed and low keeping quality of the potato varieties (B. Lal et. al. 2003). The study is based on survey report conducted on the farmers of Nalanda, Patna,

Muzaffarpur, Vaishali and Samastipur districts which are also leading potato growing districts of the state . The study revealed that 70-80 percent of the potato farmers rated unavailability of good quality seed followed by cold storage facilities and low sale price of potato seed as major problems of potato seed production in the state. It was also found that some of the potato growing areas particularly, Patna and Nalanda districts where early planting of potato being done ,having very favorable conditions for potato seed production and may be developed as potato seed production hub by concentrating the infra structure facilities like timely supply of good quality potato seed, training & demonstration and cold storage facilities.

T13 : PI-10 Exigent Barriers in Doubling Farmers' Income & Farm Profitability in Eastern Uttar Pradesh

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As per the Agriculture Census 2010-11, 67.10% of India's total farmers are marginal farmers (below 1 ha) followed by small farmers (1-2 ha) at 17.91%. It must be noted that agriculture and allied activities remains the main livelihood for more than half of the Indian population. The Socio-Economic and Caste Census (SECC) 2011, released in 2015, also indicates that out of 24.39 crore households in the country, 17.91 crore lived in villages and are more or less dependent on agriculture. Further, the Economic Survey of 2015-16 highlights that the share of agriculture in employment was 48.9% of the workforce while its share in gross domestic product (GDP) was 17.4% in 2014-15 at constant (2011-12) prices. Hence, raising productivity and income of marginal farmers and small farmers is challenging factor as on the one side resources like water and land are limited and on the other hand land holding is getting fragmented.

Eastern the eastern Uttar Pradesh is situated on alluvial plain. The flood and drought are common phenomena of this tract. The highest density of population is also found in this tract. On account of highest density of population, the per capita availability of land is very low in comparison to other tracts of the state. The area is categorized under Upper Gangetic Plains region which is further divided into three sub-zone (i) North Eastern Plains Zone of Uttar Pradesh (districts of Baharaich, Gonda, Balrampur, Basti, Gorakhpur, Sidharth Nagar, Maharaj ganj, Kushinagar and Deoria). Rainfall is high at about 1,210 mm, the climate is moist sub-humid to dry sub-humid. 73% of the land area is cultivated and about half of the cultivated land is irrigated. Tube wells are the major source of irrigation. (ii) Eastern Plain Zone of Uttar Pradesh- (Azamgarh, Mau, Balia, Faizabad, Ghazipur, Jaunpur, Sant Ravidas Nagar and Varanasi). Rainfall is adequate with a normal of 1,025 mm. The climate is dry sub-humid to moist sub-humid. Over 70% of the land is cultivated and more than 80% of the cultivated area is irrigated and (iii) Vindhyan Zone of Uttar Pradesh – (Mirzapur and Sonbhadra). Rainfall is adequate at about 1,134 mm; the climate is similar to the other parts of the eastern plains of Uttar Pradesh. Less than a third of this land is cultivated and only a third of this is irrigated. Rice, maize, pigeon pea, moong bean crops are common in kharif season. In post-rainy (rabi) season wheat, lentil, Bengal gram, pea, and sesame are grown. The important cash crops of the region are sugarcane, potato, tobacco chillies, turmeric and coriander with supplemental irrigation. Rice–wheat cropping system is more predominant.

The major factors that influence the farmers' choice of crops productivity and income are i.e. market and monsoon and crop diversification. Market fluctuates due to uncertainty of monsoon thereby putting farming sector in crisis. Climate change issues are also involved leading to extreme events which are difficult to predict.

The agrarian scenario of the region faces multidimensional involving social, economic, technological, gender and ecological lacuna in achieving the goal of Doubling of Farmers Income. The major constraints are poverty fragmented and very small holdings, migration of population leading to share Cropping, scarce and depleted water Resources, losses in quantity and quality of produce during harvest and post harvest stages, insufficient and unhygienic storage, and minimal support in terms of Local Processing and marketing facilities,

Therefore policy changes needs to be incorporated and agriculture progress can take place by synergy between policy and technology.

T14 : ICT-1

ICTbased initiatives for increasing farm income through krishivigyan kendra

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Agriculture is the mainstay of our rural economy. In India, agriculture has been the way of life since time immemorial. Agriculture supports 50 per cent of the population and the contribution of agriculture with allied sector to the gross domestic product (GDP) is 13.7 per cent. Food grain production in India has jumped from 50.8 million tons in 1950-51 to 272.00 million tons in 2016-17. This was made possible by the transfer of latest technology to the farmer's field in agriculture and allied areas. In India such transfer of technology programmes of ICAR are implemented by KrishiVigyan Kendra at the district level. KrishiVigyan Kendra provides farm advisories using ICT and other media means on varied subjects of interest of farmers. KrishiVigyan Kendra started various ICT based initiative for transfer of technology. Recently three major ICT initiatives namely mKisan Portal, web portal KrishiVigyan Kendra Knowledge Network Portal and KVK mobile app started by ICAR. These are helping farmers to connect with KrishiVigyan Kendra for transfer of technology. Present study shows how these initiatives are helping farmers to increase their farm income.

T14 : ICT-2

Study on extent of knowledge level of farmers about using mobile phone in Milkipur tehshil of Faizabad district

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A study was conducted in Milkipur tehsil of Faizabad district of Uttar Pradesh to know extent of knowledge level of farmers about using mobile phone during the year 2015-16. A sample of two hundred fifty farmers was selected randomly from the list of ten purposely selected villages. The relevant variables were selected after reviewing the literature available and the works done in the field prior to the present investigation. A well structured and pretested interview schedule was used for data collection through personal interview method. The data was analyzed by using percentage, mean and standard deviation. The findings of the study revealed that the majority of the respondents 64.80% found in medium categories (35-53 years) of age group, from which most of them (53.60%) were comes under the category of marginal farmers and Agriculture was as their main occupation. The study focuses that the village residents are becoming economically sound day by day which has enabled them to convent their houses Hut and Kuchcha houses is to Pucka and mixed type of houses. The maximum number of respondents (60.40%) has possessed mobile phone before more than 36 months from the time of survey taken for the study.

On the basis of the data collected it can be concluded that the overall knowledge level of the mobile phone users about using mobile phone was respectable. Majority of the respondents (65.20%) belonged to the categories of medium (34-61) for their overall knowledge about using mobile phone. Mobile phones were mostly used for the purpose of obtaining the marketing information by the respondents. Most of the farmers of the study area were belong from the medium category for their empowerment *i.e.* social, economic, technical and political which, shows they were empowering with medium rate.

T14 : ICT-3

Electronic customer relationship management: A strategic tool in agricultural business

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Agribusiness is the core subject and important for sustainability and profitability of a company. This field basically formed the matrix for efficiency and effectiveness among the various Agri business companies. This paper focuses on the applicability and indispensability of Electronic Customer relationship management in Agri –Business. As per various reports and review literatures, it is been found that for the effective and efficient business transactions, agro based industries need to transform and indulge themselves in adopting the changes endorsed by the modern technology and business strategies. The high rated development in information technology in agricultural and easier and cheaper access to it marks the development of electronic relationships with customers (e-CRM) which simplifies and automates the dialogue with customers and provides feedback and answer to their desired requests in real time, which leads to increase of customer loyalty and satisfaction. Electronic Customer relationship management has a vital role in attracting and binding the customer by providing them the first class services, product, easier accessibility and walking relationship with the customers for their maximum satisfaction, so as to make a strong loyal relationship with them for their profitability and sustainability as well in the competitive market. So e-CRM acts as a tool and strategy for the Agri business companies for building a strong relationship with their targeted customers for a long term approach towards their business.

T14 : ICT-4

Role of e-commerce in agricultural business

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E- Agribusiness is an electronic channel and source of marketing of agricultural produce in the competitive market across the globe. E-commerce and internet have revolutionalised and transformed the lives of maximum population in developing countries. With the access of the modern IT and E-Channels / portals, it has improved the livelihood of the poor through better communications and greater access to information. With the advancement in the E-Agribusiness, the most of the farmers are now able to receive better prices for their crops because they have access to information on market prices on various e portals channels like e-Choupal, agri watch etc. It allows for better and quicker customer service. Application of E-Agri business encompasses all agriculture and infrastructure projects in which ICT has the potential of enabling the empowerment of the community. Providing internet demand based agriculture information through E-agri-business portals and channels helping farmers to access information on commodity prices. Practices are for cultivation, crop care and in forging direct relationships with potential buyers in order to provide better value for their produce. It basically emphasise on providing global market, controls and minimizes inventory costs, providing the maximum consumer service, just in time distribution period and easy reach with having direct linkage among the various stakeholders in the agricultural sector.

T14 : ICT-5

ICT in agriculture: Beneficial for farming community

C.K. Tripathi[1], J.B. Singh[1], U.S. Gautam[2], A.K. Singh[1], V.K. Singh[3] and Saba Siddiqui[4]
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[2]ICAR-ATARI, Zone-IV, Kanpur
[3]ICAR- IISR , Lucknow[4]Research Scholars

ICT has proved to be extremely beneficial for farmers including small land holders, marginalized and poor farmers, and helped them in marketing, precision farming and improved profits. Through ICT, farmers have been empowered to exchange their opinions, experiences and ideas. It has given farmers more exposure and allowed them to use science that looks at agriculture from an integrated perspective. The efforts of the Government in the area of ICT have escalated the living standard of Indian farmers and made them ICT-friendly, which has resulted in increased penetration of useful information about crops, soils, climate and cultivation processes. Several measures have been taken for encouraging Indian farmers to be more ICT – friendly, which include echoupal, e – krishi , e-aid and many more. And, numerous mobile applications have also been launched by the Government of India for the same including Mandi trades, M power social, Kisan suvidha, Crop insurance, Agri market and m – Kisan application. The need of marketing agricultural produce at competitive prices will change the farmers' attitude towards ICT and thus this new technology will help and contribute more in sustaining the Indian agriculture.

ICT can play critical role in strengthening the capacities of not only farmers but also for the field level functionaries and intermediaries. There is a need to explore the possibility of mandating district level organizations like Krishi Vigyan Kendras (KVKs) in developing locally relevant content. Thus, there is a need to design a platform where all the players in the ICT in agriculture sector are willing to share and use data and experience, so that people can collectively learn while the initiatives are in progress and continuously innovate.

T14 : ICT-6

ICT Role in Agriculture

J.B. Singh[1], U.S. Gautam [2], C.K. Tripathi [1], A.K. Singh[1], V.K. Singh[3] & Saba Siddiqui[4]
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Agriculture in India is the core sector for food security, nutritional security, and sustainable development & for poverty alleviation. Milestones in agriculture development in India includes: Green revolution, Evergreen revolution, Blue revolution, White revolution, yellow revolution, Bio technology revolution and the most recent one is ICT revolution. ICT play a crucial role in disseminating information to farmers enabling them to decide on the cropping pattern, use of high-yielding seeds, fertilizer application, pest management, marketing, etc. Traditionally, Indian farmers have been following indigenous production methods and rely upon friends, relatives, fellow farmers and input dealers to get information regarding agriculture. It is evident from the replacement of indigenous varieties of seeds by high-yielding varieties and traditional equipment and practices by power tillers, tractors and others machines.

In ICT ensure last-mile digital connectivity, particularly for e-governance and financial inclusion, Facilitate Public-Private Partnerships & create comprehensive database of all government schemes and evaluate them for desirable changes, Channel S&T to address development challenges such as access to education, improving agricultural productivity and wastewater management & create a National Science, Technology & Innovation Foundation to identify and deliberate national issues, recommend priority interventions in S&T and prepare frameworks for their implementation.

T14 : ICT-7

Information and Communication Technology (ICT) Role in Extension

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In India productivity and production of agricultural commodity is in increasing trend year after year based on adoption of good management practices and innovative research in this sector, which contributes about 18 % of our GDP and 60% Indians get their livelihood from this fields. Information and communication are two words behind which the world is running and thus technologies associated with words are boon for millions of people including farming community. FAO has also established World Agriculture Information Centre (WAICENT) as a framework for agriculture information management and dissemination and to facilitate access of agriculture as an essential to eradicate poverty and achieving food security and sustainable rural development.The process of technology generation and dissemination in agriculture must be understood in a system perspective, where the ICTs are the main element. The major and diversified role of ICT cannot be neglected as from simple email to analysis of tedious statistical calculation, from social networking sites to exchange of research materials, from information kiosks to availability of e-resources related to agriculture. Researchers, extension functionaries, farmers are solely dependent on ICT, and now there has established a strong e-linkage with technology generating agencies and its end users (farmers). ICT ensure last-mile digital connectivity, particularly for rapid dissemination technologies, e-marketing and financial inclusion, facilitate Public-Private Partnerships, comprehensive database of all government schemes, improving agricultural productivity,weather information, etc. The present paper is a review of various research papers published in journals and magazines and emphasize on its forms, impacts, role and importance in present scenario as well as perception of researchers, extension personnel, policy makers, farmers towards its role.

T14 : ICT-8

Post-Harvest Management Practices among the Mango Growers in Jammu District of Jammu and Kashmir

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Mango occupies a pre-eminent place amongst the sub-tropical fruits grown in Jammu region and is extensively grown in Jammu district. To find out the post harvest management practices adopted by the farmers in Jammu district a study entitled “A Study on Post-Harvest Management Practices among the Mango Growers in Jammu District of Jammu And Kashmir” was conducted during 2014-15. Based on proportionate random sampling the selected 80 mango growers were interviewed using a structured interview schedule. The results showed that one-third (37.50%) of respondents were noticed to fall under medium age interval (59 -70 yrs) and 47.50 per cent of the respondents were having small landholdings. Rain water was the main source of irrigation as 48.75 percent of the respondents were found relying on it. Average area under mango orchards was 1.23 ha. 38.75 per cent of the respondents possessed medium level of knowledge about post-harvest management practices. The detailed analysis of individual management practices indicated that a cent per cent of respondents had knowledge of duration taken for fruit maturity, identifying maturity of fruits, method of harvesting, storage techniques, packing material and importance of grading and packing, a high percent of respondent possessed knowledge about use of fruits pickers for harvesting (88.75%) and causes of post harvest losses (56.25%) while, only a small percentage of respondents possessed knowledge of ideal time for harvesting (25.00%). The analysis of the adoption of post-harvest management practices showed that cent per cent of respondents adopted Dasheri variety, followed by hand picking as a method of harvesting (57.50%) and time of harvesting (25.00%). But, none of the respondents had adopted the washing of the fruit. The results of

binary regression showed that adoption of post-harvest management practices like storage facility were significantly determined by landholdings, number of trees, distance from market and artificial ripening were significantly determined by education, distance of market and extension contact. A cent percentage of respondents expressed the constraints of lack of processing unit followed by marketing problems (88.75%) and lack of technical knowledge and guidelines (86.25%).

Keywords: adoption, post harvest management

T14 : ICT-9

A study on the effectiveness of mass media and interpersonal communication sources as perceived by the farmers of J&K

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Communication plays a significant role in the development of modern agriculture. For doubling farmers' income it is necessary to disseminate fast and effectively new technologies to the farmers. This is only possible by effectively utilization of communication sources. A study was conducted on systematically randomly selected 120 farmers from the Samba district of J&K state to analyze the effectiveness of mass media and interpersonal communication sources as perceived by the farmers. The results revealed that among personal localite sources 91% expressed that progressive farmers were effective in dissemination of agricultural information. 100%, 88%, 91% and 95% reported that panchayat members, neighbours, relatives/friends/elders and group meeting respectively were effective in dissemination of agricultural information. Among personal cosmopolite sources 78%, 100%, 73%, 100%, 100% and 96% farmers reported that staff of department of agriculture, staff of agricultural universities, bank personnel, personnel of NGO, personnel of private company and private input dealers respectively were effective in transfer of agricultural information. Among personal cosmopolite channels 95%, 100%, 87%, 100%, 86%, 97% and 97% reported that method demonstration, farmer's training, result demonstration, field day, study tour, farm exhibition, kissan mela and campaign respectively were effective channels in dissemination of information. Among print media 96%, 85%, 100 and 92% farmers reported that newspaper, farm magazine, folders/leaflets and wall papers/banners/hoardings were effective in dissemination of agricultural information. In case of electronic media 100%, 100%, 85% and 92% of the respondents reported that mobile phone, internet, radio and television respectively were effective source of communication.

Keywords: Communication, utilization, effectiveness, personal localite, personal cosmopolite.

T14 : ICT-10

Production Of Moulding Frame And Cube Shaped Jaggery For Income Generation

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Jaggery is an important outcome of an important village based agro-industry. About 20% of the total production of sugarcane is being utilized for the jaggery making. Jaggery production includes juice extraction, clarification, concentration and molding in different shapes and sizes. The shape and size varies from place to place and ranges from spherical shape to Large balti shape. Large slabs of jaggery is also produced which is broken into irregular shape and size during distribution/ marketing. These shapes also create problem for packaging. Towards standardization of shape and size jaggery molding frame for making jaggery in cube shape (25x25x25 mm) has been developed at Indian Institute of Sugarcane Research, Lucknow. The frame is simple in design and cost Rs 7000 (Appox.). The capacity of

the molding frame is 7 kilogram jaggery. There is twofold potential of benefit for the rural youth. One as a manufacturer of the molding frame and other is production of cube shape jaggery. Added advantage of this shape of jaggery is the packaging of the product. The packed in attractive packets it is sold in market from Rs 60-100 per kilogram.. There is a huge potential of income generation in the rural areas.

T14 : ICT-11

Weed control studies in blackgram [Vigna mungo (L.) Hepper] under rainfed conditions of eastern UP

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Blackgram (Urad) is recommended for commercial cultivation mainly in kharif season under eastern UP, India. Weed management is an important factor for enhancing the productivity as weeds are strongly utilized all available growth resources and also limits crop yield drastically. Keeping the values of pulses and their limiting factors in to consideration that Krishi Vigyan Kendra, Kotwa, Azamgarh (UP) was conducted field experiment with five weed control treatments at Demonstrational Farm Kotwa, Azamgarh during Kharif 2012 and 2013 to evaluate the efficacy of herbicide against mix flora of seasonal weeds and productivity. Soil of experimental site was sandy clay loam in texture with normal in reaction and poor in fertility (nitrogen & phosphorus) except potassium. The crop variety Azad Urd-3 at 25 kg/ha was sown within first week of July by using recommended fertilizers for short duration pulses during both the years of experimentation. Application of Imazethapyr 35% + Imazemox 35% SG 100 g/ha at 25 days after sowing was found significantly quite effective in suppression of mix flora of weeds, dry weight and it was also comparable with hand weeding twice at 20 & 45 DAS. Among the herbicidal weed control treatments, company mix combination of herbicide proved its superiority than alone to escape completely crop-weed competition and provide congenial condition for better exploitation of growth resources. However, maximum average grain yield (13.4 q/ha) along with 95.3 per cent yield increase over farmer practice obtained under repeated manual weeding at 20 and 45 DAS followed by Imazethapyr 35% + Imazemox 35% SG 100 g/ha applied as post emergence. All treatments were recorded higher monetary returns (benefit: cost ratio) over weedy check and found remunerative for doubling the income of farming communities.

Key words: Blackgram, economics, herbicides, grain yield, weeds

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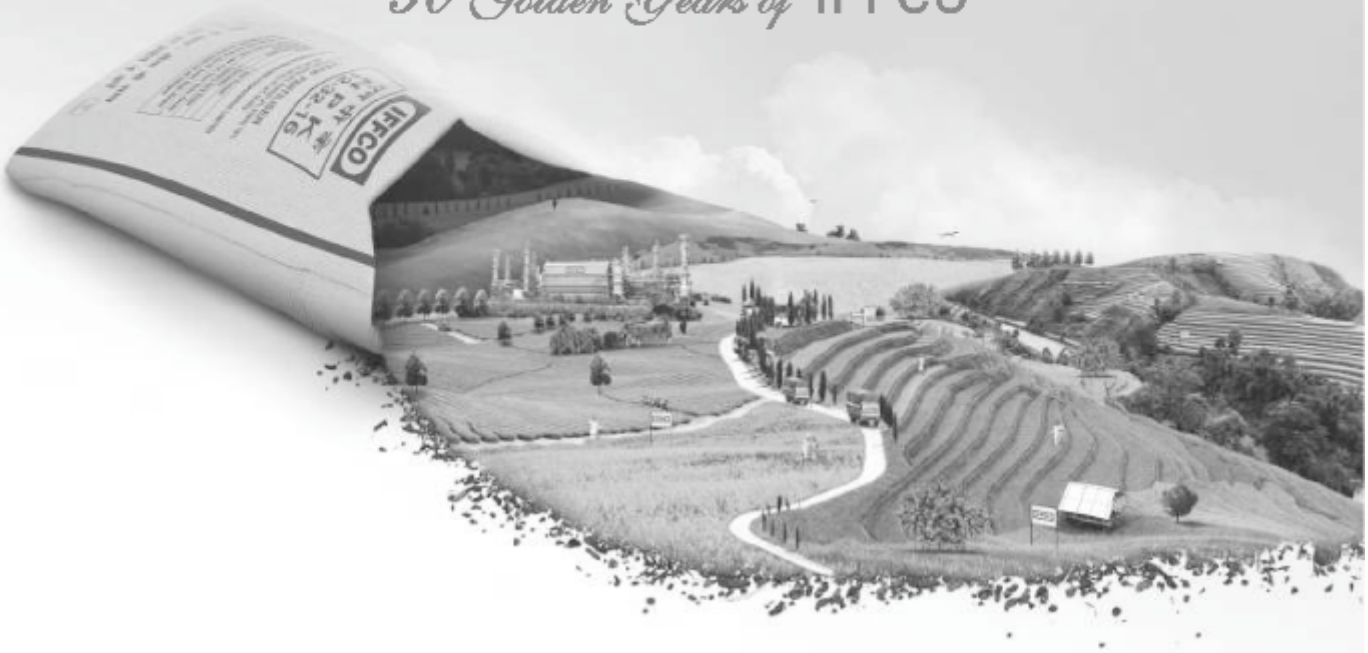

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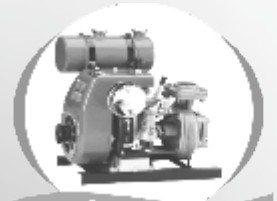
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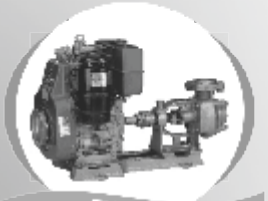
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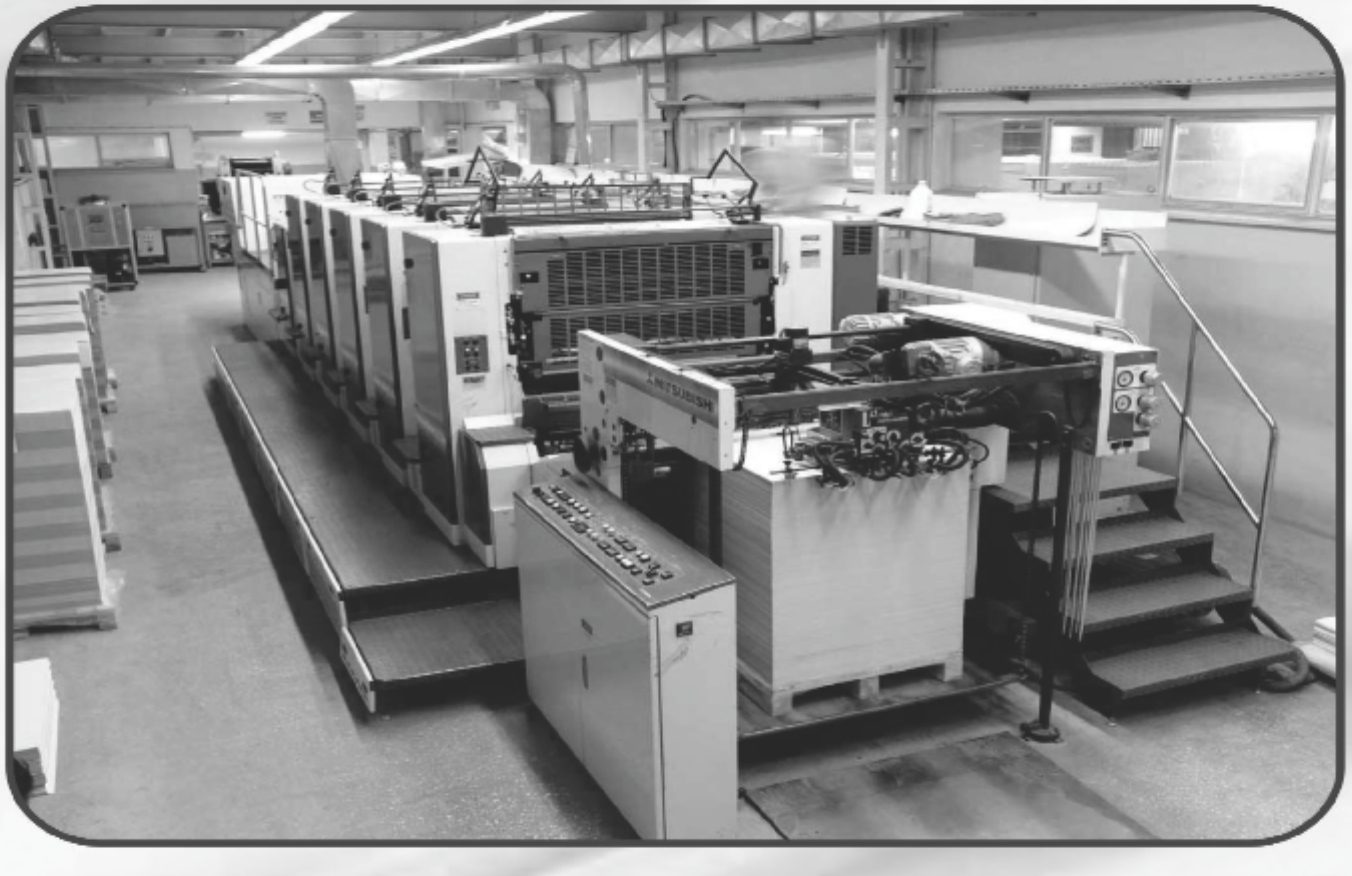

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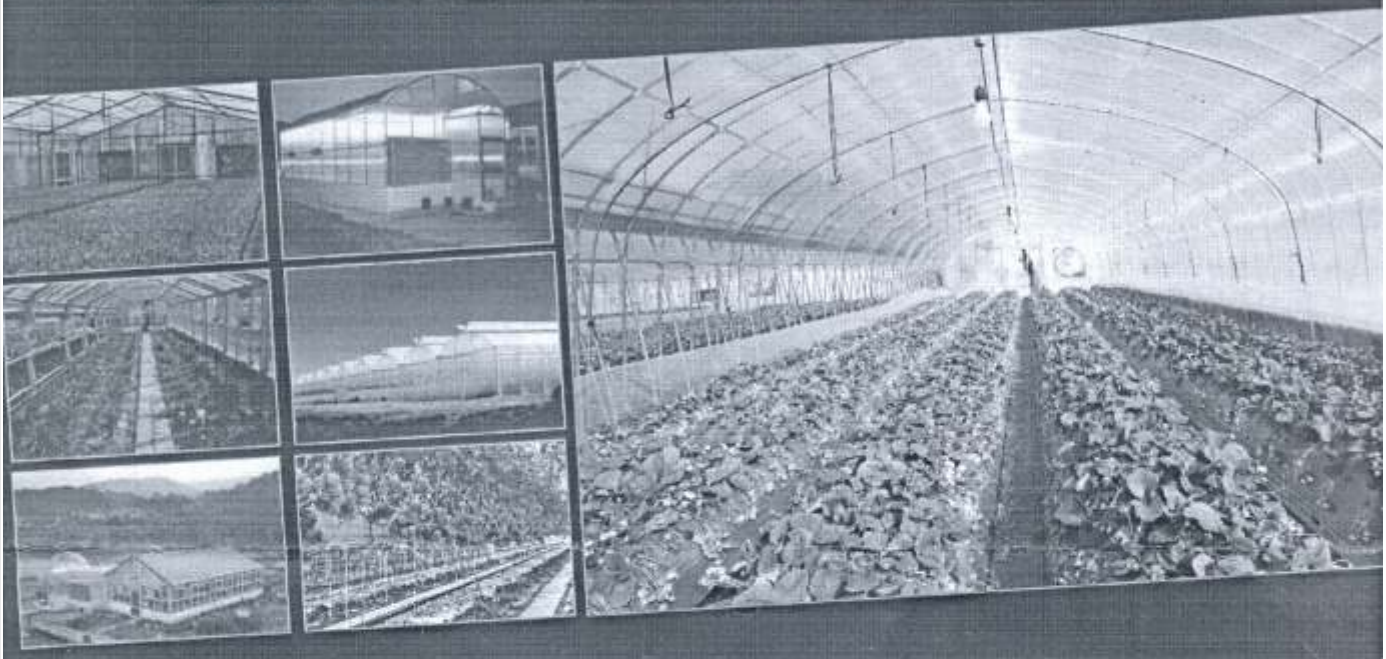

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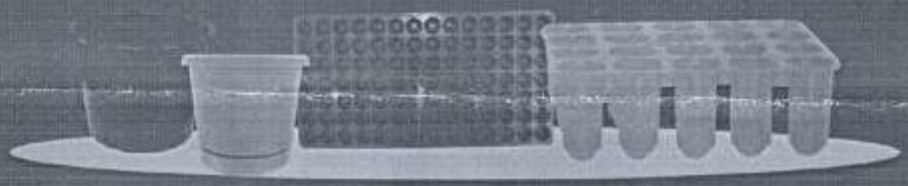

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Core Committee

Dr. S.R Singh, Ex.VC, RAU, Pusa
Dr. U S Gautam, Director, ATARI, Kanpur
Er. A. K. Singh, President, RASSA
Dr. Jaswant Singh, Ex. HOD (AE), IISR, Lucknow
Dr. G.P.Rao, Principal Scientist, ICAR-IARI, New Delhi
Dr. Rana Pratap Singh, President, RASSA U.P.
Dr. Kumud Singh, Professor, NDUAT, Kumarganj
Dr. S.K.Singh, Jt. M.D., UPBSN, Lucknow
Dr. J.Singh, Principal Scientist,ICAR- IISR, Lucknow
Dr. S.P. Singh, Principal Scientist, IARI, New Delhi
Dr. Anil Kumar Singh, Principal ScientistICAR- IISR, Lucknow
Dr. Vinay Kumar Singh, Senior Scientist ICAR-IISR, Lucknow
Dr. Rudra Pratap Singh,Scientist,KVK, Mau

Inauguration and Valedictory

Dr. Jaswant Singh, Ex. HOD (AE), IISR, Lucknow
Dr. Rana Pratap Singh, President, RASSA Uttar Pradesh, at Lucknow
Dr.KumudSingh, Professor, NDUAT, Kumarganj
Dr.J.Singh,Principal Scientist, ICAR- IISR, Lucknow
Dr. Anil Kumar Singh, Principal Scientist,ICAR- IISR, Lucknow
Dr. S.P. Singh, , IARI, New Delhi

Publication

Dr. Rana Pratap Singh, President, RASSA Uttar Pradesh, at Lucknow
Dr. V.P Singh,ICAR- IISR, Lucknow
Dr. G.P.Rao, Principal Scientist, ICAR-IARI, New Delhi
Dr. J. Singh, Principal Scientist, ICAR- IISR, Lucknow
Dr. A.K.Singh, Pr. Sci, ICAR- IISR, Lucknow
Dr. V. K. Singh, Senior Scientist, ICAR-IISR, Lucknow
Dr. Vishal Somvansi, Senior Scientist IARI New Delhi
Dr. Rakesh Kumar Singh, KVK, ICAR-IISR

Registration

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Dr. S.B. Singh, Associate Professor, NDUAT, Kumarganj
Mr. Abhishek Singh,ICAR- IISR, Lucknow
Dr. Deepali Chauhan, Scientist, KVK, Raebareli
Ms. Ekta Singh, KVK, Lucknow

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Mr. Upendra B. Singh, Lucknow
Dr. K K Singh, Head, KVK, Raebareli
Dr. Suresh Singh, Head, KVK, Sitapur
Dr. Rudra Pratap Singh, Scientist, NDUAT, Mau
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Technical session Committee

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Food and Hospitality

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Mr. Jaskaran Singh, Lecturer, CBGKM, BKT, Lucknow
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Mr. Akhilesh Kumar Singh, IISR, Lucknow

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Dr.K.K.Singh, Head, KVK, Raebareli
Dr.Rakesh Kumar Singh, KVK IISR, Lucknow
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About RASSA

Innovations of Science do not reach the needy people timely. Science-led interventions carry potential for development of people. Efforts from all responsible organizations and citizens including Government is needed to ensure that the potential of scientific innovations are realized for the benefit of the masses, to improve their income and living conditions.

A group of like-minded Scientists/ Technocrats/ Business persons and other luminaries joined together to create this platform, for helping the needy people to improve the status of society, in the name of 'Royal Association for Science-led Socio-cultural Advancement (RASSA)' to attain noble goals for overall advancement of the people in a sustainable manner, protecting natural resources and eco-systems.

Vision

To create a strong and coherent community sensitive to the social, cultural & educational needs to serve the society especially the resource poor people by adopting science-led approaches.

Mission

To engage like-minded intellectuals in serving the needy people of the society though science-led interventions.

Objectives

1) **To create a platform of likeminded people for overall sustainable advancement of the society.**
2) **To promote educational and economic well-being of people in changing social dynamics by formulating the plans and creating interest for entrepreneurial activities through skill development.**
3) **To mentor and provide economic support to bright young individuals from the unprivileged section of the Society.**
4) **To provide opportunity and help to business professionals to setup and run their businesses in emerging fields.**
5) **To organise conferences, meet, fare, Kisan Gosthi, etc., to update community on science-led techniques.**
6) **To publish multi-disciplinary journal and Sandesh for farmers.**

For more information please Email royal.association2016@gmail.com

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