

THEME 3: ENVIRONMENT, SUSTAINABILITY & CLIMATE CHANGE (ESCC)

ESCC: 1.

CLIMATE CHANGE AND AGRICULTURE: IMPACT, ADAPTATION AND MITIGATION STRATEGIES

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India is a vast country covering 3.28 million km², occupying only 2.4 per cent of the world's geographical area but supporting 16.2 per cent of the global human population. It is endowed with varied climate supporting rich biodiversity and highly diverse ecology. More than sixty percent of its population is dependent on climate sensitive activities such as agriculture. Climate change projections made up to 2100 for India, indicate an overall increase in temperature by 2-4°C with no substantial change in precipitation quantity. The expected changes in climate, especially rainfall, are also marked by significant regional variation, with the Western Ghats, the Central Indian and the North Eastern regions projected to receive more rainfall compared to the other parts of India. Further, an increase in intensity and frequency of extreme events such as droughts, floods, and cyclones is also projected. All these changes are likely to have adverse impacts on India's water resources, agriculture, forests and other ecosystems, coastal zones, energy and infrastructure and on human & animal health. Agricultural impacts due to climate change have received considerable attention in India as well as North Gujarat. They are closely linked to the food security and poverty status of a vast majority of population. Increase in temperature is reducing crop duration, increase crop respiration rates, alter photosynthetic partitioning to economic products, effect the survival and distribution of insect-pest and diseases and hasten nutrient mineralization in soils, decrease fertilizer use efficiencies, and increase evapo-transpiration. All these can have a tremendous impact on agricultural production and hence food security of North Gujarat region.

There are several mitigation and adaptation practices that can be effectively put to use to overcome the effects of climate change with desirable results. These methods fall into the broad categories of under crop/cropping system-based technologies, resource conservation-based technologies and socio-economic and policy interventions. To mitigate the effects of climate change on agriculture and animal production and productivity, a range of adaptive strategies need to be considered. Change in cropping calendars/sequences or pattern involving some alternative crops and late or early-maturing varieties could be the immediate option, conservation of soil moisture and efficient water-harvesting techniques are also important for North Gujarat region. The long-term strategy should utilize genetic resources to develop heat and drought tolerant varieties that could be better adapted to new climatic and atmospheric conditions including greater availability of CO₂. The strategies to address the impacts of climate change on agriculture thus, some of the issues like unbalancing in impacts of rise in temperature, atmospheric CO₂ levels and uneven distribution of rainfall are also needed urgently to be addressed.

ESCC: 2.

RESPONSES OF EARLY AND LATE SOWN WHEAT CULTIVARS UNDER ELEVATED OZONE CONCENTRATION

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Tropospheric ozone (O₃) is a long range transboundary secondary air pollutant, a major component for global climate change, causing significant damage to agricultural crops worldwide. The increasing emissions of O₃ precursors due to urbanization and industrialization led to progressive increase of ground level O₃. The current level of yearly O₃ concentration in India is around 55 ppb which is above the threshold level (40 ppb) for sensitive crops.

Therefore, a study was planned to assess the growth, biomass and yield responses of wheat (*Triticum aestivum* L.) cultivars HUW468 (early sown) and HUW234 (late sown) were grown in ambient (AO₃) (52.7 ppb) and elevated levels of O₃ (EO₃) (ambient+20 ppb) using open-top chambers (OTCs). The stomatal flux of O₃ was higher in early sown as compared to late sown cultivar under elevated O₃. Plants grown under AO₃ showed better growth performance and higher biomass accumulation compared to those grown under EO₃ in both early and late sown cultivars. Late sown cultivar showed high growth rate due to short life span as compared to early sown cultivar. The loss in grain yield was 30% in early sown and 22% in late sown cultivar under EO₃. Path analysis approach showed that stomatal flux of O₃, absolute growth rate, relative growth rate, specific leaf area, plant biomass were the most important variables influencing grain yield under O₃ stress. The current study clearly showed that the early sown wheat cultivar is more sensitive under projected future O₃ scenario than late sown cultivar.

ESCC: 3.

EFFECTS OF ELEVATED ULTRAVIOLET-B ON *WEDELIACHINENSIS* AT THREE DEVELOPMENTAL STAGES

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Medicinal plants usage is nowadays receiving greater consideration, but changes in climatic conditions, anthropological actions and overexploitation of medicinal plants cause superfluous degradation of these plants, leading to habitat destruction, phyto-chemical constituent alterations and degradation of vital compounds. To estimate the effects of elevated UV-B on medicinal plants, experimental study was performed using *Wedeliachinensis* at three growth stages to evaluate changes in their various physiological, biochemical and morphological parameters. Photosynthetic pigments and photosynthetic rate showed significant decline under elevated UV-B in summer and post monsoon compared to winter. Stomatal conductance increased during summer and post monsoon in the test plant under UV-B stress. Total phenolic contents showed augmentation at all stages compared to controls. An increase in anthocyanin accumulation was observed with advancement in growth phases, but an opposite trend was noticed for membrane damage. Morphological characters such as number of branches, leaf area, shoot and root lengths showed positive response; while, root-shoot ratio showed reduction against applied dose of UV-B at all the growth stages. So, it can be concluded that defensive strategies of the plant performed better under prevailing stress which can be various form of morphological characters of the plants with accumulation of secondary metabolites.

Keywords: *Wedeliachinensis*; UV-B; photosynthesis; morphology; secondary metabolites.

ESCC: 4.

AN ENTREPRENEURSHIP MODEL OF A SUSTAINABLE BIOENERGY SYSTEM IN THE INDIAN CONTEXT

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Sustainable bioenergy systems have immense potential to generate employment, support rural development and produce green energy. However, such systems must encompass technical, commercial, and social elements as well. Therefore, the development of an adaptive and sustainable bioenergy system calls for a multidisciplinary approach to address the challenges of diffusion and commercialization. In this study, an entrepreneurship model of a bioenergy system was designed to promote small scale energy enterprises in India. The designed system has three components: bioresource (i.e., agro waste), technology (i.e., pelletization and gasification) and local market. The model offers an opportunity to examine the role of different stakeholders on a new business engagement. The findings

from customer discovery interviews and field demonstrations of technology underscore the need of a holistic approach for establishment of a successful bioenergy system. Furthermore, a detailed economic evaluation was conducted for the proposed bioenergy system. The designed system (optimal pellet plant capacity of 0.5 ton h⁻¹) showed acceptable economics and the net present value (*NPV*), internal rate of return (*IRR*), and discounted pay back period (*DPBP*) were ₹ 9.35 million (\$0.13 million), 41% and 2.8 years, respectively. Market value of pellet price was the most sensitive factor. Monte Carlo simulations predicted a wider distribution with the average *NPV* of about ₹ 9.3-2.0 million (\$133.2-29.1 thousand). Overall, this research is of particular importance to address the burning issues of agro waste management and contribute to farmer's income using a sustainable entrepreneurship model.

Keywords: Bioenergy system; entrepreneurship model; economic analysis; farmer's income

ESCC: 5.

ASSESSMENT OF CLIMATE CHANGE IMPACT ON HYDROLOGY AND WATER AVAILABILITY

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Regional hydrology severely perturbed by vastly changing climate affects human societies and also life in general. The changing climate cloud causes more frequent extreme meteorological events which leads to exacerbated hydrological disasters viz., floods or droughts. This requires an estimate of the impact assessment of climate change on hydrological processes before any adaption plans are to be made. The rate at which the temperature of the global surface increases will have a significant impact on local hydrological regimes and water resources. Temperature and precipitation are main and closely related parameters to climate change. Therefore, there is a need of an integrated analysis that can quantify the impact of climate change on various aspect of water resources such as precipitation, hydrologic regimes, floods, drought, etc. There have been several studies of climate change effects on hydrology and water availability and its resources which usually includes : (a) use of climate models (General Circulation Model-GCM), (b) use of downscaling techniques to model the hydrologic variables (e.g., precipitation and temperature) at a smaller scale based on large scale GCM outputs and (c) use of hydrological models for assessment of global climate impacts. This paper deals with the studies on existing methods for assessing the hydrological impact of climate change and discusses for future studies in this field.

ESCC: 6.

COVER CROP RESIDUE AMOUNT AND QUALITY EFFECTS ON SOIL ORGANIC CARBON MINERALIZATION

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Decline in soil organic carbon (SOC) and the associated impacts on crop production under conventional farming raises concerns on how alternative management practices increase SOC sequestration and improve agricultural sustainability. This study aimed to understand SOC mineralization kinetics with different cover crop (CC) residue amendments. Soil samples were collected from a fallow and three CC (pea, oat, and canola) plots. Soil samples from the CC plots were manipulated with zero, five, and 10 Mg ha⁻¹ of the respective CC residues. All soil samples were incubated for eight weeks, SOC mineralization was monitored, and the first order kinetic and parabolic equation models were fitted to the observed data for estimating labile SOC (C₀), and the decomposition rate constant (k). The C₀ varied with the residue amount while k varied with CC type. The CC residue stimulated cumulative carbon mineralization (C min) irrespective of CC type, suggesting that cover cropping has potential to improve SOC cycling in agro ecosystems.

Keywords: soil carbon mineralization; decomposition rate constant; cover crops; crop residue

ESCC: 7.

SUSTAINABLE ASPECTS OF ORGANIC FARMING IN THE STATE OF KERALA

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Sustainable development is the need of the hour. With the increase in population our compulsion would be not only to stabilize agricultural production but to increase it further in sustainable manner. Through organic farming a healthy interface between human resource and natural resources in general and commons in particular can be ensured. GODS' OWN COUNTRY heading to GODS' ORGANIC COUNTRY. The notion of Organic farming is gaining gradual impetus in Kerala. The increased awareness about health and environmental issues associated with the rigorous use of chemical inputs has necessitated alternate forms of agriculture in Kerala. Kerala is already halfway towards its ambitious goal— 100 percent organic by 2020.

Agriculture is an inevitable part of any economy – whether industrialised or not. Affluent and health conscious consumers are increasing world wide. The absence of organic food products across all segments in the market is a concern. But State of Kerala is now meeting over 70% of its demand for vegetables on its own compared with just 20% a few years ago. A third of the state's agricultural land is devoted to export crops like black pepper, turmeric, rubber, coffee and coconuts. The demand for organic food is steadily increasing both in developed and developing countries, with annual average growth rate of 20 - 25%. In this context there is wide scope for Organic Farming in Kerala.

Keywords: Sustainable Development, Organic, Agriculture, Framing

ESCC: 8.

ENHANCEMENT IN THE PRODUCTIVITY OF VARIOUS CROPS THROUGH WATER HARVESTING BUNDS AND CHECK DAMS IN VINDHYAN REGION

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The study was carried out in the National Agricultural Innovation Project (NAIP) under component –III. Mirzapur and Sonbhadra districts in *Vindhyan* region are among 150 disadvantaged districts of the country. These two districts are on the extreme South East corner of Uttar Pradesh. Large area is rainfed with undulating topography. A large number of rivulets flow in the area; however, most of the rain water remains untapped as surface run off is very high, soil moisture retention capacity is low and proper soil and water conservation practices are not followed. Therefore, conservation of rain water for use in agriculture is very important in this area. Three clusters of villages from two target districts i.e. Mirzapur and Sonbhadra were selected in three development blocks for project interventions pertaining to the set objectives of the sub project. Through the construction of check dams and water harvesting bunds additional 140.7 ha area was brought under irrigation. As compared to baseline values, the crop yield near WHBs increased from 56% (green gram) to 95% (barley), whereas, the yield improvements due to check dams were 85% (mustard) to 109% (wheat). The Cropping intensity near the WHBs enhanced by 32.8% while near CDs, it was increased by 42.1%. The improvement in cropping intensity was also due to the use of short duration improved crop varieties by the farmers. The labour engagement in crop production was enhanced by 17.5% and 26.3% with improved water availability due to WHBs and CDs, respectively. Similarly, the crop based household income of the farmers in the surroundings of WHBs and CDs increased by Rs 7,292 and Rs 15,148 /year/HH, respectively.

Key words: Productivity, WHBs, Checkdams, Rainfed, Cropping intensity, Household income

ESCC: 9.

CROP RESIDUE IN CONSERVATION AGRICULTURE: THE FATE AND THE PATHWAY

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Burning of crop residues is not just an error, it is a crime. It destroys the rich source of carbon which could have otherwise been sequestering into the soil. Retention and incorporation of crop residue into the soil is one of the main principles of conservation agriculture. The co-genital impacts are improvement of soil health with addition of nitrogen, activation of soil microorganisms and better retention of soil moisture. But in most cases, the fate of these residues can be found in the form of grey colour ashes; and thanks to the farmers' ignorance in perceiving the importance of crop residue in maintaining soil health and ecological services. This paper highlights the pathway of crop residue in selected villages in the alluvial zone of West Bengal. The pathway of crop residue includes source of residue generation, present volume of crop residue generation and percentile status on the use of these crop residues. A score of 75 respondents who are following differential level of Conservation Agriculture, both in cognitive and non-cognitive way, have been selected following both purposive and non-random snowballing method. The results reveal that following variables viz. cropping intensity, number of holding fragments, homestead land, education level, farm income and orientation towards natural resource management are substantially correlated to the mode of disposal of crop residues. The canonical covariate analysis (CCA) was also administered to understand the movement of the predicted characters that are moving together to create a neo-conglomeration, which can be perceived as a complex whole of perception on conservation agriculture. A calibrated technique of crop residue management can prove helpful beyond a gross approach or a kind of extension intervention like mass communication.

Keywords: Conservation agriculture, cropping intensity, crop residue management, farm income, soil health.

ESCC: 10.

SUSTAINABLE ENERGY MANAGEMENT ANDECONOMIC GROWTH IN INDIA

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The objective of the paper is to analyse the trend, linkage and challenges of Energy Consumption and Economic growth in India and comparison with other south Asian Countries like Banladesh, Nepal, Pakistan, Sri Lanka. The study is based on secondary data from 1981 to 2017 collected from Energy Statistics and reports of South Asian Countries, World Bank Database and TERI reports. The study is based on descriptive statistics, elasticity, line graphs and variance analysis. It is observed that the consumption of electricity and petroleum products is increasing significantly in all South Asian Countries. The study further highlights that growth rate of all forms of energy do not cause the growth rate of GDP but GDP growth rate causes the growth rate of energy consumption and demand in the South Asian Countries. GDP growth fuels rate of energy consumption but the reverse does not hold good in the context of India and other South Asian Countries. The consumption of primary energy in the world grew at a low compounded annual growth rate (CAGR) of 1.1% during 1991-2001, it experienced a higher growth of 4.3% in India. Oil and gas account for 62.2% of the total world primary energy consumption. The commercial energy constitutes a higher proportion of total primary energy compared to non-commercial energy. The share of primary energy consumption is projected to increase from 550 MTOE in 2006-07 to 2043MTOE in 2031-32 and the share will increase from 72.2% to 90.4% during the same period. The share of non-commercial energy will significantly reduce to 9.1% in 2031-32. This elasticity is 0.54 for total primary energy, 0.56 for final energy and 0.99 for gross generation of electricity. The paper highlights many suggestions for sustainable energy management in India.

Keywords: Consumption, Economic Growth, Electricity, Energy, Natural Gas, Petroleum, Sustainability

ESCC: 11.

ASSESSMENT OF CLIMATE CHANGE IMPACT ON RICE YIELD IN KANGSABATI RIVER BASIN

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Changing climate is one of the factors affecting to decline food production in the world because of crop growth being highly sensitive to any changes in climatic variables. In this study, Decision Support System for Agro technology Transfer (DSSAT) and Agricultural Production Systems Simulator (APSIM) models have been calibrated and validated at 16 different locations of the Kangsabati river basin and compared with each other to identify best crop model to simulate rice yield in the study area. The results suggest that DSSAT model can simulate rice crop growth and yield better than APSIM model in this region. Bias corrected outputs of regional climate model (HadGEM3-RA) have been linked to the DSSAT model to analyse yield changes of three popular rice varieties (Swarna, Lalat and MTU 1010) under historical (1981-2005), transition (2006-2015) and future climate scenario (2016-2050) conditions. The model simulation results indicate that significant reduction in rice yield has occurred due to climate change. Analyses also shows that the average rice yield reduction of 14% is expected by 2030s and 19% by 2040s if future unfolds following RCP 4.5 projections whereas under RCP 8.5 scenario, yield reduction up to 19% by 2030s and 22% by 2040s is possible. Increase in daily maximum and minimum temperature and decrease in seasonal rainfall might be the primary responsible conditions for the reduction in yield. Simulation results also show that the changing climatic variables may cause maximum effect on Swarna rice variety in comparison to Lalat or MTU 1010 varieties. However, yield reductions in short duration rice varieties are comparatively low. Model simulated results also suggest that DSSAT modelling system could be a useful tool for assessing possible impacts of climate change and management practices on different varieties of rice.

ESCC: 12.

APPLICATION OF EARTH OBSERVATION DATA IN LAND AND CROP TYPE CLASSIFICATION USING VEGETATION INDICES

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For natural resource management and in other applications about earth observation revolutionary remote sensing technology plays a significant role. One of such application is in monitoring and classification of land and crop types at spatial and temporal scale, as it provide latest, most precise and cost-effective information. Present study emphasizes the land and crop classification with the use of Maximum Likelihood algorithm of supervised classification in Erdas Imagine13. It is used in order to analyze the spectral information contained in the satellite images. The use of two different vegetation indices in crop type classification is used. It also analyzed the effect of each indices on classification accuracy. Landsat 8 is highly demanded and preferred for agricultural and forestry sectors as it has NIR bands. The two indices used in this study are: the Normalized Difference Vegetation Index (NDVI), the Soil Adjusted Vegetation Index (SAVI). The study area is Varanasi district of Uttar Pradesh, India. Classification is performed with these two vegetation indices. The contribution of each indices on image classification accuracy was also tested with single band classification. Highest classification accuracy of 85% was obtained. The study concluded that The LULC classes in the study area are divided into eight categories using supervised classification method. Normalized Difference Vegetation Index (NDVI) and Soil Adjusted Vegetation Index (SAVI) are also calculated to estimate the changes in LULC classes.

Keywords: Supervised classification, Landsat, NDVI, SAVI, Vegetation indices.

JUDICIAL ACTIVISM FOR THE EMERGENCE OF ENVIRONMENTAL JURISPRUDENCE , SUSTENANCE OF SUSTAINABLE DEVELOPMENT , AND LEGAL INITIATIVES OF ENVIRONEMNTAL JUSTICE. IN INDIA

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Though Sustainable Development, the word has come in to existence from Rio Declaration (1992) .but if any one could trace the history of the Indian culture, whatever the practices we were doing from time immemorial were all of towards Sustainable Development. But most unfortunately due to the intrusion of western culture in to our system, it has slowly changed into consumerist culture. From the repair to remove and replace to use and throw culture. Even though the Sustainable Development principle has come into existence since Rio Declaration (1992), strictly and judicially speaking it was in the form of soft law only , which is judicially non enforceable and non obligatory on the part of signatories. It is needless to say India was also partner for the Declaration. But still the soft law was given hard law status in India by our Hon Supreme Court in its land mark judgement in the Vellore Citizen Welfare Forum vs Union of India case in the year 1996.

For the effective Environmental Management three “E” s are essential vide Engineering, Education and Enforcement. From engineering point of view to attain the sustainable development we have to have a comprehensive look and control of all the sources and types of pollution through technological input and ways and means. It is highly imperative to blend the scientific principles into the engineering and develop technology to control and manage the pollution both at the source and end pipe treatment with clean development mechanism wherever it is possible. The second “E” is Education –namely creating an awareness and sensitizing the people the importance of pollution control, changing the life style and behaviour of the people and practice more ecofriendly methods. Infact Hon Supreme Court in one of its land mark judgements made Environmental Education as one of the compulsory paper in the college and University curriculum irrespective of the branch of study, with same syllabus throughout the length and breath of the country. Finally with reference to third “E” namely Enforcement here the laws play good amount of role in managing and controlling the Environmental pollution and Environmental Protection. Laws are the tools in the hands of the enforcement agencies to control and combat the pollution. Again for the purpose of enacting the laws the Constitution has given room for the legislature. In this connection it can be very proudly said that India is one among the few countries in the world where the Environmental Protection is given the Constitutional status. We have enacted a plethora of Environmental Legislations in the last two decades in addition to the Indian Penal Code for the effective environmental management.

For the effective enforcement of legislations permanent and independent statutory bodies have also been created. Apart from this Legislature, Executive, the third arm and pillar of the democracy namely Judiciary also played a very active role and paved the way for the emergence of environmental Jurisprudence. Infact the Environmental Policy of 2006 is Judicial Driven. In this paper, a detailed discussed is made , how far the Sustainable Development has been given a hard law status by the Judiciary and more so the higher judiciary innovatively interpreting the Constitution elevated the Environmental Right in to a Constitutional Right from the ordinary simple public nuisance under the IPC. Apart from that the judiciary also ingrained certain principles and doctrines into our Environmental Jurisprudence .Finally a blend of technological solution with Economic, ecological and legal regime alone can solve the Environmental problems effectively and for the sustenance of Sustainable Development. A detailed discussion is made in this paper , inspite of Environmental Protection is given constitutional status, with the availability of plethora of environmental legislations, an independent statutory body for the effective enforcement of these legislation , and an independent constitutional body namely judiciary for the interpretation of these legislations are very much available still why the expected result is not got .

Keywords: Judicial Activism, Sustainable development, Supreme court, Environmental Jurisprudence, social justice, public interest litigation

ESCC: 14.

SPATIAL DISTRIBUTION OF PHYSICOCHEMICAL CHARACTERISTICS OF GROUNDWATER IN KAIMUR DISTRICT OF BIHAR, INDIA

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Nowadays it is necessary that the quality of groundwater/drinking water should be checked at regular time interval. In the present study, an attempt has been made to estimate the content of spatial distribution of physicochemical characteristics of groundwater in Kaimur district of Bihar, India. 83 groundwater samples of various depths and different source like the hand pumps, tube-wells, bore-well were collected and measured for physicochemical water quality parameters. The study area was divided into optimized grid size of 6 x 6 km using latitude– longitude as reference coordinates for screening. The major objective of the present study was to investigate the drinking water quality parameter of groundwater being used for the drinking purposes in the study area and thus determination of its correlation among them. It has been observed from the analysis of samples that value of pH, EC, TDS and salinity in the water samples were found to vary in the range of 6.8–9.7; 78.1–1293 $\mu\text{S}/\text{cm}$; 46.9–775.8 ppm and 40–586 ppm, respectively in some of the locations. Fluoride, chloride, nitrate and sulphate average levels in the samples were found to be 1, 250, 45 and 200 ppm, respectively. A positive correlation of EC, TDS, hardness, chloride and sulphate also has been observed. The present work represents the comprehensive study to establish the baseline data of water quality characteristics of groundwater/drinking water sources in Kaimur district (densely populated area) of Bihar. Future work will be including other adjacent districts of the study and in addition, heavy metal and isotopic analysis of groundwater.

Keywords: Groundwater, physicochemical characteristics, spatial distribution, Kaimur

ESCC: 15.

A CRITICAL ANALYSIS OF CLIMATE SMART AGRICULTURE BY THE FARMERS OF TELANGANA STATE

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Agricultural production has always been closely linked with variations in weather. Climate change is projected to have significant impacts on conditions affecting agriculture, including temperature, carbon dioxide, glacial run-off, precipitation and interaction of these elements. The overall effect of climate change on agriculture depends on the various measures adopted to balance these effects. Agriculture, as both an area of human activity at risk from climate change as well as a driver of climate and environmental change, features prominently in the global climate change agenda. To alleviate some of the complex challenges posed by climate change, agriculture has to become “climate smart”, that is, sustainably increase agricultural productivity and incomes, adapt and build resilience to climate change, and reduce and/or remove greenhouse gases emissions, where possible (FAO, 2013). Climate Smart Agriculture (CSA) is defined as an approach for transforming and reorienting agricultural development under the new realities of climate change (Lipper *et al.*, 2014).

Despite the recognized importance of Climate Smart Agriculture (CSA), the dissemination and uptake of climate-smart technologies, tools and practices is still largely an ongoing and challenging process. The adaptation of climate-related knowledge, technologies and practices to local conditions, promoting joint learning by farmers, researchers, extension worker and widely disseminating CSA practices, is critical. Strategies to fasten adoption of sustainable agriculture practices are not being effective; one potential reason is ineffectiveness of the proposed

interventions in relation to the existing climatic variability of the area (Rodriguez, B. 2005). In principle, a CSA practice must simultaneously achieve all the aims. However, in practice, farmers' decisions to adopt CSA practices usually depend on the economic benefits associated with these practices (Khatri-Chhetri *et al.*, 2016). In addition, technology adoption decisions can be path dependent, i.e., recent technology adoption may be partly associated with earlier technology choices. Hence, the analysis of technology adoption without properly controlling for technology interdependence can either underestimate or overestimate the influences of various factors on the adoption decision.

ESCC: 16.

NATURAL DISASTER VULNERABILITY OF AGRICULTURAL LANDS IN INDIA: A REVIEW

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The ecosystems act as productive engines of the planet and people at large depend on them for their livelihood. The many possible ecosystems are agro-ecosystem, coastal-ecosystem, forest-ecosystem, freshwater-ecosystem, grassland-ecosystem etc. Disasters are highly disruptive events that cause suffering, deprivation, hardship, injury and even death, as a result of direct injury, disease, the interruption of commerce and business, and the partial or total destruction of critical infrastructure such as homes, hospitals, buildings, roads, bridges, power lines, etc. Natural disasters include hydrometeorological disasters and geophysical disasters. Agricultural production is highly prone to natural disasters, and substantial parts of the population which are rural farmers depend on agriculture for their livelihood are mostly affected. The occurrence of natural disasters such as floods, droughts and cyclone have led to crop failure, famine, loss of property, mass migration and negative economic growth, and this, in turn, affects the household income of the rural farmers that depend on agriculture as their means of livelihood. In India, out of 35 states and union territories in the country, 27 are prone to different disasters. This review is to identify the frequency and impacts of natural disasters that affect small and marginal farmers, assess the vulnerability of small and marginal farmers to natural disasters and to identify policy options to strengthen their adaptive capacity. In addition to that this review will also explore the different agricultural strategies that can be adopted by these farmers to cope up with the natural disasters. Thus, in conclusion, this would provide us with insights about the critical circumstances in which the farmers are left after a natural disaster and how the policies can be structured to meet their needs.

Keywords: Natural disaster, ecosystem, small farmer, marginal farmer, economic growth, government policies.

ESCC: 17.

ENHANCING OXIDATION STABILITY OF BIODIESEL USING GREEN TEA (*CAMELLIA ASSAMICA*) EXTRACT AS AN ANTIOXIDANT ADDITIVE

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Green tea leaves (*Camellia assamica*) extract as an antioxidant additive and its influence on the oxidation stability of biodiesel synthesized from waste cooking oil (WCO) has been studied. Extraction of phenolic compound from dried fresh tea leaves using ethanol as a solvent and extraction was performed at 60°C for 4 h. The total phenolic content of green tea extract was determined using Folin-Ciocalteu's reagent at 765 nm. Concentration of phenolic compound present in green tea extract was determined by using Gallic acid standard curve (10-50 ppm in methanol). *Camellia assamica* was capable to enhance the oxidation stability of biodiesel produced from WCO. Biodiesel having 1000 ppm concentration of green tea extract was capable in enhancing induction period from 2.88 h to 7.11 h which met the European standard (EN 14214) biodiesel specification for oxidation stability. Hence, *Camellia assamica* can

be used as an alternative natural antioxidant for enhancing production of biodiesel instead of synthetic antioxidants produced from non-renewable resources.

Keywords: Waste cooking oil; green tea leaves; oxidation stability; biodiesel

ESCC: 18.

ACCUMULATION OF ARSENIC IN PADDY FIELD SOILS OF GHAGHRA BASIN

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Arsenic (As) is one of the toxic compounds which pose a high risk to large human populations. The contamination of arsenic in South Asian groundwater aquifers was first reported in the mid-1990s and since then, a lot of work had been done for the past two decades. The utilization of these groundwater sources for irrigation and for drinking affected the various forms of life including humans, cattle, crops and soils. In India, eighteen states and three union territories are facing ground water arsenic problem. Uttar Pradesh, one of the severely arsenic affected states, is located at north of India bordering on Nepal. The Ghaghara, sub-basin of Ganga basin has a total catchment area of 58,634 Sq.km. where two big rivers flowing from the northwest to the south-east are Ghaghara and Sarda. Up to now the As contamination has been said to be mostly confined in Ganga basin originating from Himalaya. However, recent studies have shown that several districts situated in Ghaghara basin also have higher level of As in ground water. The Terai plain of Ghaghara is particularly As contaminated. Ghaghara basin covers 6 districts of Nepal (two are arsenic affected), fifteen of Uttar Pradesh (nine are arsenic affected) and seven of Bihar (two are arsenic affected) in India. These arsenic affected districts of Ghaghara basin having different levels of ground water arsenic contamination. The total arsenic accumulation during rice seedlings transplantation in paddy fields soil of Lakhimpur Kheri was found in the range of 14-18 $\mu\text{g g}^{-1}$ dw, while it ranges between 13-26 $\mu\text{g g}^{-1}$ dw in Ballia, while the range of arsenic in rhizospheric soil of paddy fields of the selected districts was low in comparison to total arsenic level in paddy field soils. The range of arsenic was 2-9 and 1-7 $\mu\text{g g}^{-1}$ dw in the rhizospheric soil of Lakhimpur Kheri and Ballia districts respectively. The co-relations between level of arsenic in tube well water, physico-chemical properties of soil, rainfall pattern and arsenic accumulation in paddy field soils is needed to find out the factors responsible for the arsenic buildup. This will help to develop mitigation strategies of arsenic problem in the basin that will lead to sustainable agriculture.

Keywords: Ghaghara basin, Arsenic, Arsenic Ground water problem, paddy soils

ESCC: 19.

INFLUENCE ON NANOFERTILIZERS ON AGRICULTURAL GROWTH AND DEVELOPMENT

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Agriculture stands to benefit from nanotechnology in areas such as combating growth, development pests and pathogens, regulating the growth quality of crops, and developing intelligent materials and nanosensors. Here showing an overview of the use of nanofertilizers in plant nutrition, highlighting their advantages and potential uses, but also reviewing their possible environmental destination and effects on ecosystems and animal. Nanofertilizers have been shown to be an attractive alternative for the manufacture of nanocoated sensors (NFs), which are more

effective and efficient than traditional fertilizers. Because of their impact on crop nutritional quality and stress tolerance in plants, the application of NFs is increasing. Nanofertilizers in the environment can be directly toxic to plants and other organisms as well as generate changes in biodiversity or the abundance of organisms, which may impact ecosystem function. Considering the cost of time and resources involved in carrying out experiments with the necessary magnitude, greater effort should be applied toward the development and implementation of models that predict the behavior of ecosystems exposed to these materials under different concentrations, forms of assimilation and even environmental conditions and exposure times

ESCC: 20.

IMPACT OF CLIMATE CHANGE ON INDIAN AGRICULTURE

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Climate change occurs when changes in Earth's climate system result in new weather patterns. It has its impact on all sectors. Agriculture is one of them. Agricultural production is already facing uncertainty due to increasing regional variations in rainfall and temperature in India. There is an increasing concern amongst farmers, researchers and policy-makers about the potential impacts of climate change on food security and livelihoods. Rice is the major staple food crop in India and the expected yield reductions due to climate change are seemingly important. By some estimates, over a quarter of all rice production in a majority of the river basins in India may be lost due to climate change. Researchers are using innovative approaches to predict the possible climate change and provide inputs to agronomists to plan future strategies.

India's future rice production is projected to be about 104 m.t during mid-century (2021-2050) and 101 m.t during end century (2071-2100) under medium emission scenario indicating an overall reduction in rice production from the current level by 2.5 to 5% during these periods. According to a study under high emission scenario, rice production will be reduced by about 3 to 10% during these periods. As there will be only marginal increase (0.4%) in rice area in the future. As climate change is a continuous phenomenon, in order to minimize the rice yield reductions as well as variability (risk) in rice yield, each region needs specific adaptation strategies, such as direct seeding of rice, modified system of rice intensification (MSRI), supplemental irrigation, alternate wetting and drying, improved management practices etc. But the problem is the access to and adoption of these strategies by farmers varied largely between regions and between States. Hence, region specific appropriate and affordable adaptation strategies need to be identified for up-scaling. Transaction cost which refers the costs incurred while taking the technology to the fields by the farmers is a major component in technology adoption. However by proper planning and taking right steps within a desirable period the intensity of impact of climate change can be reduced. At the same time we should be careful not to aggravate the factors that causes climate change, then only we can have an improved agricultural sector for our country.

ESCC: 21.

DEVELOPMENT AND PERFORMANCE EVALUATION OF CUP-CHAIN TYPE METERING MECHANISM FOR GLADIOLUS CORMS IN THE SOIL BIN

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Gladiolus is a very popular flowering plant for its elegant cup spike. Presently, the Gladiolus corms are planted manually which requires more time and labour and also it involves considerable drudgery and human discomfort. In order to carry the panting operation in specific time and to mechanize this aforesaid operation for Gladiolus crop, a cup-chain type metering mechanism was developed and evaluated its performance in the soil bin.

The experiment was conducted for three levels of nominal spacings (15, 20 and 25 cm) and four levels of forward speeds (1.5, 2.0, 2.5 and 3.0 km/h). The performance parameters namely, mean spacing, multiple index, missing index, quality feed index, coefficient of uniformity, precision, coefficient of precision (CP3), visible damage and number of corms per meter length were determined during the test conducted in soil bin. The data was statistically analyzed using two factorial completely randomized design. The results indicated that the metering mechanism was able to drop the corms at desired nominal spacing at forward speed of 1.5 km/h with 100 % quality feed index. The lowest missing and quality feed indexes were observed as 0 and 95.76 % respectively with zero percent of multiples. The mean value of precision was found less than 10 % for all the three nominal spacings at all four levels of forward speed. The overall performance of metering mechanism was found better for 25 cm nominal spacing at forward speeds of 1.5 and 2.0 km/h.

Keywords: Planter, Gladiolus, Metering device and cup-chain.

ESCC: 22.

METALLURGICAL CHARACTERIZATION OF FAST WEARING COMPONENTS OF AGRICULTURAL MACHINERY IN INDIA

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Various types of steels are used in agricultural applications. Presently, low carbon steels especially mild steels are being used for making many farm tools and implements. Medium carbon steels, high carbon steels and some low alloy steels, specially boron-chromium based are also used for fast wearing components of farm implements/machines to provide high strength, toughness and wear resistance. These properties can be achieved by selection of proper material and heat-treatment of the components. A study was undertaken to know the status of material and treatment carried out on fast wearing components of soil and crop engaging components of agricultural machinery by collecting information from various farm machinery testing centers. Based on information collected from farm machinery testing centers of the country it is observed that only 39.20 and 32.53% tested components are confirming BIS standards in case of chemical composition and hardness respectively. It is also evident from the data that Rotavator blade (60%), Chaff cutter blade (57%) Rotary tiller (43%), Disc of harrow (34%) are used in heat-treated condition. Testing centers are not concerned with actual chemical composition of the components, they are just following the guidelines of DOAC. Based on the carbon percentage, the tested samples could be categorized into low carbon steel (25.00%), medium carbon steel (33.00%), high carbon steel (38.50%) and tool steel (3.50%).

Key words: Steel, Heat-treatment, Agricultural Implements, Manufacturers.

ESCC: 23.

INTERVENTIONS FOR IMPROVING PRODUCTIVITY OF COLD DESERT FARMING SYSTEMS – A CASE STUDY

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Cold deserts in western Himalayas spread over an approximate area of 74809 km² covering Leh and Kargil districts of Ladakh and Lahaul & Spiti along with some parts of Chamba and Kinnaur districts of Himachal Pradesh. A case study was carried out in Pinal, Thorang, Mooling Lote-II, Dhwansha, Jundha, Udgos-III, Jhooling, Ratoli-II and Tinno (Chopar) panchayats belonging to Keylong block of Lahaul valley. The climate is extremely cold and harsh and mercury drops even up to minus 35°C during winters (November-March). This area remains cut-off from rest of the world due to heavy snowfall. *Rabi* and *Kharif* crops are grown simultaneously during spring and summer seasons (April-October) due to comparatively mild climate. The rains are scanty and humidity remains low during this period. Agriculture (pea-toria/buckwheat, potato, rajmash), Agriculture + Animal rearing, Agriculture + Horticulture and

Agriculture + Horticulture + Animal rearing are major farming systems prevailing in the area. Pea and potato are main cash crops grown in the area. Poor fertility, dominance of single crop variety, occurrence of diseases and insect-pest incidence and huge technological gaps are major factors responsible for poor productivity of these crops. Interventions including use of high yielding and disease resistant varieties, integrated pest and nutrient management can be helpful in improving their productivity. Horticulture is another component of farming system. Apple and cherry are main fruit crops which are grown in a small area. Suitable varieties of horticultural crops will be helpful in enhancing its productivity. Animal rearing is an important activity for livelihood along with agriculture and horticulture. Animals are reared by tribal farmers for milk, meat, wool and FYM. Productivity of these animals is very low which can be improved through pasture improvement, fodder tree plantation and introduction of improved grasses in addition to supply of uromin bricks and mineral mixture.

ESCC: 24.

MODELLING OF ENERGY CONSUMPTION IN WHEAT CROP PRODUCTION USING NEURAL NETWORKS

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The excessive use of energy in developing countries have created several environmental, commercial, technical, and even social problems. This study was conducted on irrigated wheat fields in Himalayan Tarai region. Total 150 farmers were interviewed and information on their education level, annual income and their resources for crop production were collected. Total energy consumption in wheat production was estimated at 23,947.7 MJ/ha. The direct energy sources like diesel and electricity account only 34.6% of total energy sources. Fertilizers consumed maximum energy in all categories of farmers followed by harvesting and threshing. Several direct and indirect factors were identified to create an ANN model to predict energy use in wheat production. The final model can predict energy consumption based on farm conditions (size of crop area), level of education of farmer, and irrigation frequency and the final ANN infrastructure was simulated to generate output energy predictions. Model predicted data was able to precisely explain 40.75% of the experimental results for the energy consumption. Similarly a WNN infrastructure was developed which predicted data was able to precisely explain 83 % of the experimental results for output energy.

ESCC: 25.

INFLUENCES OF NO-TILL PLANTERS ON MAIZE PLANTING IN MAIZE-WHEAT CROPPING SYSTEMS UNDER CONSERVATION AGRICULTURE

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The present study was conducted at ICAR-Central Institute of Agricultural Engineering, Bhopal research farm to study the effect of no-till planters such as inclined plate planter and broad bed shaper-cum-planter on yield, energetics and economics of maize crop and compared with conventional practices of maize sowing using seed-cum-fertilizer drill. The maize hybrid variety of DMRH-1303 was sown in kharif season of 2019 using inclined plate planter and broad bed shaper-cum-planter under wheat residue load 8 t/ha (HI-1544). The wheat was harvested by combine harvester and its residue was chaffed using shredder. The performance parameters of selected maize planters were compared with conventional seed-cum-fertilizer drill. The energetics and economics involved in the maize planting in maize-wheat cropping system under conservation agriculture were also evaluated. The actual field capacity and field efficiency of inclined plate planter, broad bed shaper-cum-planter and seed-cum-fertilizer drill were

observed as 0.31, 0.32 and 0.39 ha/h and 51.67, 58.18 and 76.47%, respectively. The energy consumption for shredding of wheat straw was 399.31 MJ. The energy consumption was higher in case of sowing with convention seed drill (1965.30 MJ) including single pass of each cultivator and rotavator, which was followed by broad bed shaper-cum-planter (792.39 MJ) and inclined plate planter (468.77 MJ). The broad bed shaper-cum-planter and inclined plate planter reduced energy consumption by 59.7% and 76.14%, respectively compared to conventional seed-cum-fertilizer drill. The 67% cost of operation was saved using inclined plate planter (Rs. 652 per ha) and broad bed former-cum-planter (Rs. 664 per ha) over seed-cum-fertilizer drill (Rs. 2017 per ha).

Keywords: No-till planter, Conservation agriculture, Maize-wheat cropping system, Energetics, Cost economics.

ESCC: 26.

ERGONOMIC DESIGN OF SOLAR POWERED PRIME MOVER OPERATORS' WORKSTATION

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Solar energy is being popularized mostly for water pumping and in some cases chemical spraying using manual knapsack sprayers for crop production. In order to enhance field efficiency of solar based gadgets, to provide better work environment and to explore possibilities for other agricultural field operations, development of a solar powered prime mover for different farm operations is very necessary. Any new development of machinery/equipment/workplace required ergonomical interventions to increase work productivity, human performance and reduce workers'/operators' fatigue. In the present study, possibilities of accommodating large population of operator in the small space and locating different controls of prime mover in operators' reach to bring comfort in field operation have been worked out. The operators' workstation has been designed by considering 5th and 95th percentile of workers' body dimensions along with their capabilities and limitations. The prime mover controls viz. steering, brake, accelerator, etc. has been placed to fall in operators' reach. Driver seat has been provided with adjustment of 100 mm in order to facilitate the smaller operator. Location of all the controls are decided when operator seat is located at extreme backward position. The mock up has been developed considering the reach and clearance of small and larger operator. On the mock up, steering wheel is located 374 mm vertically upward and 488 mm forward of SRP. The brake pedal is placed 303 mm vertically downward, 573 mm forward and 110 mm laterally on right side of SRP. The accelerator pedal is located besides brake pedal 303 mm vertically downward, 573 mm forward and 125 mm laterally on right side of SRP. Subjective evaluation on the mock up for ingress, egress and accessibility to controls has been conducted with 15 subjects having age, weight and height range of 19-61 years, 49-102 kg and 1600-1766 mm, respectively. Different postural angles viz. trunk, elbow, hip, knee and ankle angle have been measured for 15 subjects and compared with the comfort angle range. The range of trunk, elbow, hip, knee and ankle angle are 5-15°, 95-128°, 87-99°, 95-119°, 82-94°, respectively, which are within comfort angle limits reported by various authors.

Keywords: Solar prime mover, Workstation, Controls, Ergonomical interventions, Seat reference point

ESCC: 27.

SUSTAINABILITY OF PEARL MILLET PRODUCTION WITH PHOSPHORUS AND ZINC MANAGEMENT UNDER GUAVA BASED AGRI-HORTI SYSTEM

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Pearl millet (*Pennisetumgalauicum*) is the most widely cultivated cereal in semi arid region and suitable crop under agri-horti system. The soil of this region is not only thirsty but also hungry. Phosphorus and zinc besides

nitrogen is a limiting nutrient to plant growth and productivity under arid and semi arid soil. Thus the adequate and optimum amount of these nutrients is one of the challenges to sustain production and productivity of pearl millet under fragile arid and semi arid region. Considering the importance of phosphorus and zinc a field experiment was conducted at RGSC farm of Banaras Hindu University, Mirzapur (UP) during kharif season of 2011 with an aim to find out adequate phosphorus and zinc fertilizer to enhance grain yield of pearl millet under agri-horti system. The experiment was laid out in a randomized block design (factorial) with three replications, comprised with three phosphorus rates (0, 7.5, 15 kg P₂O₅ ha⁻¹) and three zinc levels (0, 5 and 10 kg Zn ha⁻¹). The pearl millet (Var. Kaveri Super Boss) was sown with 45 × 15 cm spacing in between the alleys of guava tree planted at 7x7m. Application of 15 kg P₂O₅ ha⁻¹ recorded significant higher growth attribute (plant height, number of leaves, number of tillers, number of internodes and dry matter accumulation), yield attribute and yield of pearl millet than the lower levels. The increase in the grain yield of pearl millet with 15 kg P₂O₅ ha⁻¹ was 12.12 and 36.37 per cent higher than 7.5 and 0 kg P₂O₅ ha⁻¹. Zinc level had also significant effect on growth and yield attribute and yield. The grain yield with 10 kg Zn ha⁻¹ was 7.28 and 15.50 per cent higher than 0 and 5 kg Zn ha⁻¹.

ESCC: 28.

ASSESSING THE IMPACT OF WATER SALINITY THROUGH PITCHER IRRIGATION ON CHILLI UNDER DIFFERENT TILLAGE PRACTICES IN COASTAL-SALINE ZONE OF WEST BENGAL

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Pitcher irrigation, a self-regulative, low cost and eco-friendly technique of irrigation is found suitable where water salinity becomes a major stress for crop production. In order to investigate the impact of water salinity through pitcher irrigation and tillage methods on the yield and water use efficiency of chilli, an experiment was carried out at the farmer's field of the Simabandh village, Kakdwip, South 24 Parganas, West Bengal under Coastal saline Zone in summer of 2017 and 2018. The crop (variety local Pirek) was grown under ten treatments viz. T₁ = Non-saline water(100%)+Conventional tillage, T₂= Non-saline water(100%) + Mulch Tillage, T₃= Non-saline water (25%) + saline water (75%) + Conventional tillage, T₄= Non-saline water (25%) + saline water (75%) + Mulch tillage, T₅= Non-saline water (50%) + saline water (50%) + Conventional tillage, T₆= Non-saline water (50%) + saline water (50%) + Mulch tillage, T₇= Non-saline water (75%) + saline water (25%) + Conventional tillage, T₈= Non-saline water (75%) + saline water (25%) + Mulch tillage, T₉ = Saline water(100%) + Conventional tillage, T₁₀= Saline water(100%) + Mulch Tillage were used for the experiment in a Split Plot Design with four replications. Results showed that the yield, attaining the highest value of 8.74 ton/ha in T₈ which is statistically at par with treatment T₆ which showed an yield of 8.55 ton/ha and also the highest benefit-cost ratio of 2.6 : 1 and lowest in treatment T₉ (4.72 ton/ha). The moisture use efficiency of the crop, was increased significantly by 63.13% in treatment T₈ over the lowest (treatment T₉). Though the best results were obtained in T₈, in terms of benefit-cost ratio T₆ had been proven more beneficial than any other treatments and also for improving soil properties and building up soil fertility.

Keywords: Coastal saline soil, Moisture use efficiency, Mulch tillage, Pitcher irrigation, Saline water.

ESCC: 29.

USE OF NEEM COATED UREA AS A EFFICIENT FERTILIZER

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Nitrogen is the most critical nutrient which is required for the growth of crop and this nitrogen is provided by urea as it is a rich source of nitrogen. However 50% of nitrogen provided by urea is lost due to nitrification. Solution to

this problem of nitrogen loss is to coat the urea with a substance that can prevent the bacterial activity of nitrification. Neem oil is spread on the urea to produce neem coated urea. Neem has a proven nitrification inhibition property. This way, it slows down the process of nitrogen release from urea. It is best nitrification inhibiting agent. So neem coated urea can be used than that of normal urea. The current study was undertaken to evaluate the impact of neem coated urea on rice (*Oryza sativa*). It is a staple food for 2.5 billion people. The factors such as plant height, no. of effective tiller, panicle length, panicle weight was much greater due to use of neem coated urea.

ESCC: 30.

EFFECT OF CROP ESTABLISHMENT METHODS AND NITROGEN MANAGEMENT IN MAIZE-WHEAT CROPPING SYSTEM ON SEED PRODUCTIVITY

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Seed is the most vital and basic input for sustained agricultural production through enhancing crop productivity. Since the total cultivable area is decreasing due to ever growing population and urbanization, the increased agricultural productivity is the only option for food and nutritional security. Use of quality seeds alone could increase 15-20 per cent of the yield. As maize has wide adaptability and compatibility under diverse soil and climatic conditions therefore, it is cultivated in sequence with different crops under various agro-ecologies of the country. It is considered as one of the potential driver of crop diversification under different situation. Among different maize based cropping system, maize-wheat ranks 1st having around 1.8 m ha area mainly concentrated in rain-fed ecologies. Maize-wheat is the 3rd most important cropping systems after rice-wheat and rice-rice that contribute about 3 per cent in the national food basket. Maize crop was grown for hybrid seed production (Variety - HM 10 = HKI193 -2 X HKI-1128) during *kharif* 2015 and wheat crop (Variety- DBW 39) were grown for quality seed production during *rabi* 2015-16 under different tillage method (zero tillage, conventional tillage and raised beds) and different level of nitrogen application (Control, 80, 120 and 160 kg/ha). Crop management practices were adopted as per standard procedure. The total number of treatments combination was 12 with three replications, thus the total number of plots were 36. Seed productivity of wheat and hybrid maize has been assessed under different tillage practice and different doses of nitrogen application. In case of maize number of cobs per hectare was observed highest in raised bed method and in 160 kg nitrogen per hectare. The yield attributes parameter like cob length, cob girth, number of grain per cob and 1000 seed weight were non-significant with respect to different tillage practice and nitrogen application. The highest biological yield for hybrid maize (34.3 q/ha) was observed in zero tillage method among different tillage practices and at 160 kg nitrogen application among different doses of nitrogen application (44.8 q/ha). The highest seed yield for hybrid maize (9.0 q/ha) was observed in raised bed method among different tillage practices and at 160 kg nitrogen application among different doses of nitrogen application (9.5 q/ha). Yield attributes of wheat seed production shows that number of spikes per meter square (401) was significantly higher in raised bed method and in 120 kg nitrogen/ha among different nitrogen dose (381). The other yield attributes parameter like spike length, number of seed per spike, seed weight per spike and 1000 seed weight were non-significant with respect to different tillage practice and nitrogen application. The highest biological yield in case of wheat was observed in raised bed method (88.2 q/ha) and in nitrogen application 120 kg/ha (98.7 q/ha). Similarly, the highest seed yield in case of wheat was observed in raised bed method (33.0 q/ha) and in nitrogen application 120 kg /ha (38.8 q/ha).

Keywords: Hybrid maize, wheat, seed production

ESCC: 31.

INFLUENCE OF DIFFERENT NUTRIENT MANAGEMENT PRACTICES ON CROP AND WATER PRODUCTIVITY, GRAIN QUALITY, ENERGY PRODUCTIVITY AND PROFITABILITY IN PROMISING RICE CULTIVARS OF EASTERN HIMALAYAS

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Rice is a staple food crop of north-eastern states of India occupying acreage of about 3.51 m ha which accounts for more than 80% of the total cultivated area of the region and 7.8% of total national rice area. However, its share in national rice production is only 6.5% owing to various production constraints and resource vulnerabilities. But at the same time, there is ample scope for enhancing and sustaining the rice productivity and soil fertility by developing the efficient nutrient management practices for promising rice cultivars of the region. Hence, the current field experiment was at the Experimental Farm of ICAR–Research Complex for North Eastern Hill Region (ICAR–RC–NEHR), Barapani, Meghalaya, India during wet season of 2016 (*Kharif* 2016) to investigate the effect of different nutrient management practices and rice cultivars on growth, yield, quality and profitability of rice and (ii) resource-use efficiency. This experiment was conducted in a split-plot design replicated thrice with four main plots and three sub-plot treatments *viz.*, organic nutrient management (through FYM + remaining P through rock phosphate), integrated nutrient management (INM) (50% NPK through fertilizers + 50% N through FYM + remaining P through rock phosphate), inorganic nutrient management (fertilizers) and absolute control assigned to the main-plots, and 3 rice varieties namely Shagsarang–1, Lumpnah and Megha semi-aromatic–2 are assigned to the sub-plots. The results showed that rice grain yield was significantly higher in INM practice (4.18 t ha⁻¹) followed by inorganic and organic practice and least in control treatment. Similarly INM practice exhibited highest hulling (68.58%), milling (59.96%), head rice recovery (53.55%), protein content (7.56%) and protein yield (329.0 kg ha⁻¹) followed by inorganic, organic practices and control. Highest TWUE (3.17 kg ha⁻¹ mm⁻¹), water productivity (47.6 INR ha⁻¹ mm⁻¹), energy output (140342 MJ ha⁻¹) as well as highest net energy (130813 MJ ha⁻¹) were also recorded in INM practice but the control treatment had highest energy-use efficiency (15.33) and energy productivity (1.976 kg MJ⁻¹) followed by inorganic, INM and organic practice.

ESCC: 32.

SUSTAINABILITY IN YIELD AND QUALITY OF DARJEELING TEA AND IMPROVED SOIL HEALTH UNDER ORGANIC NUTRIENT MANAGEMENT

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Darjeeling tea also known as 'The Champagne of Teas' originated from Darjeeling region of West Bengal, India is world famous for its muscatel flavour and aroma. Exploitative cultivation with high inorganic fertilizers not only deteriorates soil physico-chemical properties but also causes biological disturbance in rhizosphere, decline soil fertility and productivity of Darjeeling tea whereas eco-friendly systematic organic nutrient strategies found to be sustained soil health and enhanced productivity and quality of tea too. Long term study was undertaken to evaluate the effect of available organic sources like compost, vermicompost, mixture of de-oiled cakes and biodynamic formulation on yield and quality of tea. Higher Darjeeling tea yield was obtained with application of mixture of de-oiled cakes, vermicompost and compost which also shows beneficial impact on organic matter content and nutrient status of soil. Quality assessment of polyphenolic and caffeine content increased with increase in nitrogen content of

organic inputs applied through the mixture of de-oiled cakes and compost application. Carotenoids, theaflavins and thearubigins content were increased with application of vermiwash as foliar 4 round a year. The content of total nitrogen in the pluckable shoot was relatively higher in the treatment compost @ 7.5 MT ha⁻¹ whereas phosphorus and potash were higher with 112.50 kg N ha⁻¹ supplied through de-oiled cake mixture. Restoration and sustenance capacity of soil fertility was increased where de-oiled cake mixture followed by vermicompost and FYM applied.

ESCC: 33.

INFLUENCE OF ORGANIC AND INORGANIC SOURCES OF NUTRIENTS ON THE PERFORMANCE OF FODDER COWPEA (*Vigna unguiculata*)

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Livestock sector is the strength of agriculture by providing food security, self-employment and plays an important role in poverty alleviation of small holder livestock farmers. Any farmers' community does not remain below poverty level if they have livestock share in their livelihood. Livestock production can't sustain without green fodder although concentrates may fulfill the requirement but that is not affordable to the small farmers. For making available of green fodder, a field experiment entitled "Influence of organic and inorganic sources of nutrients on the performance of fodder cowpea (*Vigna unguiculata*)" was conducted during *khariif*, 2017 at Research Farm of Agronomy Section, ICAR-National Dairy Research Institute, Karnal. The experiment was laid out in Randomized Block Design of twelve treatments (Control (N₀P₀K₀); RDF (N₂₀P₆₀K₄₀); RDF+PSB; RDF+KSB; RDF+ZnSB; RDF+Rhizobium+PSB+KSB+ZnSB; 2/3rd of RDF+Rhizobium+PSB+KSB+ZnSB; 15 kg N+60 kg P₂O₅+40 kg K₂O ha⁻¹+Rhizobium; 10 kg N+60 kg P₂O₅+40 kg K₂O ha⁻¹+Rhizobium; 60 kg P₂O₅+40 kg K₂O ha⁻¹+Rhizobium; 5 t ha⁻¹ FYM+Rhizobium+PSB+KSB+ZnSB; 10 t ha⁻¹ FYM) with three replications. Yield contributing attributes like plant height [204.6 cm], primary branches [6.1], crop growth rate [8.13 gm m⁻² day⁻¹] and relative growth rate [4.68 gm gm⁻¹ day⁻¹] significantly higher in case of RDF along with four biofertilizers (Rhizobium, PSB, KSB, ZnSB) treatment at the time of harvest which leads to higher green fodder yield (334.5 q ha⁻¹) and dry matter yield (59.5 q ha⁻¹). However, highest net return (Rs. 31351.73 ha⁻¹) and Benefit-Cost ratio (1.45) was obtained from 2/3rd of RDF along with four biofertilizer. Comparing all treatments, we were found that 2/3rd RDF along with four biofertilizer was a profitable combination for fodder cowpea cultivation.

Keywords: Fodder cowpea, Yield and Economics, PSB, KSB, ZnSB – Phosphorus, Potash, Zinc solubilizing bacteria

ESCC: 34.

EFFECT OF INTEGRATED NITROGEN MANAGEMENT PRACTICES ON PERFORMANCE OF OKRA CROP

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The performance of okra as affected by the application of various nitrogen sources either as sole or in an integrated manner was evaluated through experimental field trials conducted during summer seasons of year 2016 and 2017 at Vegetable Research Centre of G.B. Pant University & Technology, Pantnagar, Uttarakhand. The experiments were laid out in randomized block design with fourteen treatments replicated three times. The treatments consisted various integrations of inorganic (normal urea and neem coated urea) and organic (farm yard manure and vermicompost) nitrogen sources along with a control, a complete organic treatment (50% N FYM and 50% N vermicompost) and two soil test-based crop response (STCR) treatments (with or without organic manure). The two year data revealed that among all these treatments, treatments containing neem coated urea and vermicompost applied

in different ratios were found best in terms of increase in plant growth and yield parameters as compared to STCR, fully organic and control treatments. There was found a significant effect on plant height, number of primary branches, main stem girth, leaf area index, number of green pods and yield of green pods per plot. As per the economics is concerned, treatment T₄(RDN- 100% NCU) proved economically best with highest B: C ratio, while treatments T₆(RDN- 75% NCU + 25% VC) and T₁₀(RDN- 100% NCU + 2.5 t ha⁻¹ VC) proved to be the most productive and also economically feasible in terms of productivity. Therefore, it is advised to the farmers of Uttarakhand region to integrate the application of neem coated urea and vermicompost so as to achieve higher okra production per unit area with optimum net returns.

ESCC: 35.

EFFECT OF BLACK GRAM GENOTYPES AND NITROGEN LEVELS ON THE PERFORMANCE OF MAIZE UNDER MAIZE + BLACK GRAM INTERCROPPING SYSTEM

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A field experiment was conducted during rainy season, 2017 at Agronomy Research Farm, Chaudhary Sarwan Kumar Himachal Pradesh KrishiVishvavidyalaya, Palampur to evaluate different genotypes of black gram suitable for intercropping with hybrid maize under different levels of nitrogen. The experiment was laid out in randomized block design comprising of five genotypes (Him mash-1, DKU-118, DKU-82, DKU-98 and DKU-99), two nitrogen levels (50 % and 100% recommended dose of nitrogen) and two sole crops (maize and black gram). Half dose of nitrogen as per the treatment (100% and 50% of RDN, 120kg/ha) and recommended dose of phosphorus and potassium (60 kg/ha and 40 kg/ha) were applied uniformly as basal application. The remaining half dose of nitrogen was applied at knee high stage of maize as top dressing. Recommended dose of fertilizer was used for sole plots of black gram (20:40:20) at the time of sowing only. Sole maize and intercropped maize were recorded similar number of plants. Number of cobs per plant of maize intercropped with black gram genotypes remained unaffected. Significantly higher cobs per plant were recorded with 100 per cent recommended dose of nitrogen. Statistically equal number of cobs per plant was noted in sole maize and intercropped maize. Maize intercropped with Him Mash -1 and 100 per cent recommended dose of nitrogen recorded higher number of grains per cob and test weight than 50 per cent recommended dose of nitrogen. Sole maize recorded significantly higher number of grains per cob and test weight than intercropped maize. Sole maize recorded significantly higher yields and harvest index than intercropped maize.

ESCC: 36.

EFFECT OF DIFFERENT MOISTURE CONSERVATION TECHNIQUES ON PERFORMANCE OF TRANSPLANTED BASMATI RICE

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The present investigation was undertaken at the Crop Research Centre, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (U.P.) to study the Effect of different moisture conservation techniques on performance of transplanted basmati rice. Three irrigation regime viz., continuous flooding I₁, irrigation at field capacity I₂ and irrigation at 25% 25% depletion of available soil moisture I₃, with six moisture conservation techniques viz., Control, crop residues, pusa hydrogel, Seed treatment with *Pseudomonas* (PF6), Seed treatment with *Pseudomonas* (PF2), and Seed treatment with *Tricoderma* (IRRI 1) were tested in split-plot design with 3 replications.

Meerut is lies in the heart of Western Uttar Pradesh (latitude of 29° 40' North, longitude of 77° 42' East and at an altitude of 237 meter above mean sea level) with sub-tropical climate. The experimental field had an even topography with good irrigation and drainage facilities. The experimental soil was sandy loam in texture, low in organic carbon (0.4%) and available N (221.0 kg/ha), medium in available P (15.5 kg/ha) and K (160.5 kg/ha) with slightly alkaline in reaction. Pusa hydrogel was applied in mixed with recommended basal fertilizer dose and incorporated them during puddling operation. The crop was grown as per standard recommended package of practices.

The results revealed that irrigation applied at field capacity resulted in to significantly higher grain; straw and biological yield as compared to irrigation applied at 25% depletion of available soil moisture (I3) but remained on par with continuous flooding. The percent increment over I3 in grain yield was 10.8. Among the moisture conservation practices, the highest grain straw and biological yield was obtained with application of crop residues @ 5t/ha followed by PUSA hydrogel @ 7.5 kg/ha. Although seed treated with *Trichoderma* (IRR11) showed 11.1 and 9.2 % higher grain and straw yield over control (M1).

ESCC: 37.

YIELD, UPTAKE AND SOIL PROPERTIES AS INFLUENCED BY INTEGRATED USE OF INORGANIC AND ORGANIC FERTILIZER WITH *TRICHODERMA* UNDER SUGARCANE PLANT-RATOON SYSTEM

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Field experiment was conducted from 2012-2016 to study the integrated use of inorganic and organic fertilizer along with *Trichoderma* on productivity of sugarcane plant-ratoon system in calcareous soil. The dose of K was substituted through biocompost (BC). Number of millable cane ($70-99.1 \times 10^3$ /ha), cane yield ($62.0-83.7 \text{ t ha}^{-1}$) and sugar yield ($7.25-10.12 \text{ t ha}^{-1}$) varied significantly due to integrated use of organic and inorganic fertilizer. The application of 100% NPK + BC @ 5 t/ha + *Trichoderma* was found effective in improving cane and sugar yield, maximum to the tune of 35.0 and 39.6 per cent respectively, in plant crop which was found at par with plots receiving 100% NP + 75 % K through inorganic fertilizer + 25 % K through BC + *Trichoderma*. The residual effect of treatment receiving organic and inorganic fertilizer in combination with *Trichoderma* was also pronounced on Number of millable cane ($94.0 \times 10^3 \text{ ha}^{-1}$), yield (79.50 t ha^{-1}) and sugar yield (9.32 t ha^{-1}). The uptake of nutrients under plant - ratoon system varied significantly and followed the similar trend as cane yield. Addition of biocompost with *Trichoderma* significantly improved the soil properties in terms of organic carbon, available macro and micro nutrients, microbial communities with significant reduction in bulk density of post harvest soil. The application of *Trichoderma* inoculated biocompost substitute 25% recommended dose of potassium in sugarcane plant-ratoon system. Thus, application of 100% NP + 75 % K through chemical fertilizer + 25 % K through biocompost along with *Trichoderma* improved soil fertility status and nutrient uptake by crop which in turn helped in getting higher yield under sugarcane plant-ratoon system in calcareous soil.

Keywords: Biocompost, *Trichoderma*, Nutrient uptake, Soil Properties, Sugarcane

ESCC: 38.

INTEGRATED NUTRIENT MANAGEMENT PRACTICES: AN APPROACH TO MAINTAIN SOIL QUALITY AND PRODUCTIVITY OF SUGARCANE IN CALCAREOUS SOIL

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Field experiment was conducted with various nutrient management practices with integration of chemical fertilizer through vermicompost, neem cake and castor cake along with biofertilizer on productivity and soil quality

of sugarcane (BO 154) during the year 2016-17 in calcareous soil. The biometric observations indicated that germination, plant height, tillers, millable cane, single cane weight and cane yield were significantly affected due to integrated use of nutrients through inorganic and organic nutrient sources. The highest cane yield (73.21 t/ha) was recorded due to application of 50% N through inorganics + 75% N through organic manure (Vermicompost + Castor cake + Neem cake) 1/3 each along with biofertilizer (*Azotobacter* and *PSB*) each applied @ 4.0 kg/ha and being lowest in treatment receiving 50% RDF + 25% N as vermicompost + Biofertilizer (48.58 t/ha). The mean value for organic carbon (4.6-5.1 g/kg), water soluble carbon (0.18-0.81 mg/kg), CO₂ evolution (10.26-16.79 mg/100 gm Soil/day) and carbon storage (95.85-106.0 kg/ha) varied significantly and being lowest in plots receiving 100% NPK (Control). Nutrient management through organic and inorganic combinations was also found effective in improving available NPK content of post harvest soil over control (100% NPK). The cane juice quality viz. brix, sucrose and purity coefficient remains unaffected due to different treatments however, cane juice extraction (65.39-73.56 %) and sugar yield (5.39-8.30 t/ha) varied significantly. Thus, this typical nutrient combination supplying 50% N + 100% PK through chemical fertilizer + 75% N through organic sources (Vermicompost + Castor cake + Neem cake) 1/3 each along with *Azotobacter* and *PSB* each applied @ 4.0 kg/ha meet the demand of N for obtaining higher cane and sugar yield besides improvement in quality of soil.

Keywords: Nutrient Management, Soil Quality, Yield, Sugarcane

ESCC: 39.

INFLUENCE OF LONG-TERM CROP ESTABLISHMENT METHODS ON WEED SEED BANK DYNAMICS UNDER RICE-WHEAT CROPPING SYSTEM

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Knowledge of weed seed bank (WSB) describes the past field management practices, and helps to forecast the weed problems, crop rotation planning, and formulation of suitable weed control strategy. Keeping these facts, the present study was undertaken in five-years old rice-wheat cropping system trial at Agriculture Research farm, BHU, Varanasi, during rainy season 2017, the treatment comprised of 4-crop establishment methods [CT (Conventional till) TPR (transplanted puddle rice—CT wheat (CE₁), CT dry DSR (Direct seeded rice)—CT wheat (CE₂), CT dry DSR—ZT (zero tillage) wheat (residue retention in rice) (CE₃) and ZT DSR—ZT wheat (residue retention in rice and wheat) (CE₄)] and three soil depths (0-10cm, 10-20cm and 20-30cm). On 30 June 2017 soil sample were drawn and provided suitable condition for seed germination. Seedling emergence was used for the assessment of WSB. Results revealed, WSB consisted of 11-weed species [3-grasses, 1-sedge and 7-broad leaved weeds]. CE₄ recorded the highest density of *Echinochloa* spp. and *Ammaniabaccifera* because the weed seeds remain lie on upper surface and were not decomposed, whereas, the lowest density observed under CE₁. Furthermore, the highest density of *Cyperus* spp. was observed under the CE₁ and lowest in CE₂ which was at par to CE₄ and CE₃. This might be due to in dry DSR, seedbed was exposed to sun before onset of monsoon which reduce the population of sedges. However, the density of other species didn't vary appreciably among the crop establishment methods. Density of weed decreased with soil depth, might be due to surface soil having higher organic carbon, nutrients and low bulk-density helps in microbial decomposition of weed seeds.

ESCC: 40.

SUSTAINABLE AGRICULTURAL DEVELOPMENT IN CHANGING GLOBAL SCENARIO

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With reference to the above subject the agricultural development has not to address only to the internal food needs but also to worlds market needs and ecological issues and be highly competitive .The role of knowledge and skill is paramount education holds the key to all these emerging pre-requisite low agricultural productivity also needs to be address, particularly in marginal ecological regions with poor soils and high climatic variability. In modern environment due to the growing global problems, much attention is focused on the concept of sustainable development which is supported by various documents and activities followed by various international organisations and institutions. Given the complexity of the world economic, the place and the significance of agriculture on it as well as numerous other economic and non-economic factors that impact development (climate change, political factors, international conflict monopolies, population migration etc). It is very important to ensure the development of agriculture on sustainable basis. It is very difficult to achieve due to a various external and internal factors whose impact can hardly be foreseen. Agriculture is the single most largest and important livelihood sector for the masses in India as well as it affects the economy of this country too. Government has taken an encouraging initiative for the welfare of farmers due to increased suicidal issues and launched beneficial policies for their sound financial development, leading towards a new dawn bright agriculture. Sustainable agriculture is the prime need for developing India for the sustainable development of whole country. The growth driven by green revolution technology has made a significance dent on aggregate supply of food grains, ensuring food security to the growing population.

ESCC: 41.

CLIMATE CHANGE AND HORTICULTURAL CROPS

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Climate change and global warming is greatest concern in any national and international level conference, seminar or meetings. Climate change has a great effect on horticultural crop production. There are many high yielding varieties and better crop management practices but the crops are fail to response in that manner it was expected due to aberration of climate. It is not possible to make available many fruits/vegetables to every person by growing the crops in controlled conditions due to increasing population, so the most affected area due to it is commercial crop production in an open field condition. High temperature and moisture stress two most important factors that affect the crops from sowing to last day of crop period. Spongy tissue of mango and fruit cracking are the example of physiological disorder due to high temperature. In tomato crops, fall of flowers and immature fruits due to high temperature is very common problem. Sunburn and cracking in apples, cherries and apricot is very common due to high temperature and moisture stress. Some of the horticultural crops fail to bloom or flower with less abundance of necessary climatic conditions. Due to the climate change the rainfall pattern is also changed at a very large scale so plant species requiring high humidity and water may find them under difficult conditions for survival. Commercial production of flowers in open field conditions will be severely affected leading to poor flowering, improper floral development and colour. In conclusion we can say that the climate pattern is most deciding factor for the horticultural crop production. It can be achieved by some improved varieties and best management practices but under a rapid change climatic condition that has also a limit. So everyone should come forward and take steps to check the climate change.

Keywords: Climate change, sunburn, commercial crops and moisture stress.

ESCC: 42.

APPLICATION OF DIFFERENT FRUIT PEELS FORMULATIONS AS A NATURAL FERTILIZER

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Fertilizer is the natural or artificial origin of any organic or inorganic material added to a soil to supply one or more plant nutrients needed for plant growth. The present study mainly deals with the use of fruit peels for effective growth and high yield of plants, by focusing on nitrogen, phosphorus, and potassium. Various fruit peels such as pomegranate, sweet lime orange and banana were used. The peels of these fruits contain nutrients like potash, iron, zinc, calcium, citrate content etc. Fruit peels were collected from fruit juice vendors. Typically, about 10 kg of fruit peels were collected from a fruit juice vendor. The peels of those fruits were well separated on site and dried. Fruit peels were dried in natural sunlight for 20 to 25 days and dried peel powder was made by grinding. The results of the study showed that citric peel powder had higher nitrogen content (8.9 mg / g), While alkaline peel powder contains higher amounts of phosphorus (4.1 mg / g) and potassium (2.3 mg / g). This powder can be used as soil fertilizer, pH regulator (to improve soil morphology), micronutrient complement (Iron, calcium, zinc) and also for horticultural purposes. PH using the fruit peel formulation; We can determine how much different amount of powder is required for that particular soil. These peels can be used for cultivation of various fruits like banana, orange, sweet lime, pomegranate etc. This fruit has no effect on the peel content and thus helps in converting this waste into a useful resource.

Keyword: Fruit peel; Fertilizer; Supportive nutrients; pH Regulator

ESCC: 43.

CHARACTERIZATION OF *PENICILLIUM* SPECIES FOR GROWTH AND PHYTASE PRODUCTION UNDER INFLUENCE OF ABIOTIC STRESSORS

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Phytases are a group of enzymes capable of releasing soluble phosphate from phytate, one of the most abundant forms of organic phosphate in the natural environment. The present study was taken up with an aim to study the phytase production ability of *Penicillium* sp. under the influence of abiotic stressors. A fungus was isolated and identified as *Penicillium* sp. on the basis of its morphological features and microscopic observations. The growth behaviour of the fungus was studied under the influence of abiotic stressors like salinity, heavy metal and pesticide. The fungus exhibited tolerance against these stressors at various levels. Under salt stress the fungus exhibited tolerance upto 500 mM. In presence of heavy metals Lead, Cadmium and Arsenic, the fungus showed good mycelial growth at 750 μ M of lead nitrate and 300 μ M of cadmium chloride while appreciable growth was observed at 10 mM of sodium arsenate. The fungus also exhibited tolerance to pesticide SAAF upto 2000 μ g/L of media. The influence of variation in pH value of growth media of the fungus was also studied to check the growth behaviour of the fungal isolate. A pH range from 6 to 10 was observed to support good mycelial growth while acidic pH (3 to 5) hampered mycelial growth. Further the fungus was examined for phytase production under the influence of above mentioned abiotic stressors. The fungus showed zone formation exhibiting phytase production at NaCl (100 mM) and 300 μ M of Cadmium chloride. Significant phytase production was also observed at pH values ranging from 6-8. There was no phytase zone observed at 750 μ M of Lead nitrate and 2000 μ g of pesticide while fungal growth was observed

suggesting that these concentrations are hampering phytase activity of the fungus so lower concentrations should be preferred. These results obtained here suggest that the isolate of *Penicillium* sp. was able to produce phytase under the influence of diverse abiotic stressors and may serve as potential candidate for mineralizing organic form of phosphate present in soil.

ESCC: 44.

FUTURE NEEDS AND PROSPECTS OF SOLAR DRYING FOR VEGETABLES

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Solar drying is environment friendly and will enhance conservation of energy. Drying is an essential process in the field of food and agricultural area as well using in the other field like cement, wood and timber, textile, dairy and clay brick. This review Objectives- upon new drying technologies and advantages and disadvantages, future aspects in solar drying Drying is the oldest preservation processes available to the mankind, in today scenario dried food play an important role in the household as well as commercial area. As for fruits and vegetables it can be estimated that they establish about 1% of the total drying in the food industry, by large being the grains the most important. The main feature of this process comprises on lower the moisture content to avoid or slow down food spoilage by microorganism. At this point some understanding can arise derived from the vocabulary employed; common words found are “drying” or “dehydration”, or even “dewatering”. Methodology-The paper is written by conducting a review of information gathered from various secondary sources of information like the internet, research articles, newspaper and thesis Conclusion-There are various aspects that must be considered when drying fruits and vegetables. A system which minimizes exposure to light, oxidation and heat, may help conserve critical bioactive compounds.

Keywords: solar drying method; food; fruit; vegetable; dehydration.

ESCC: 45.

BENTHIC MACROINVERTEBRATES DIVERSITY AND ABIOTIC STRESS IN LOW-ORDER STREAMS OF BADIYAR GAD BASIN OF LESSER HIMALAYA, UTTARAKHAND

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Benthic macroinvertebrates are good bioindicators in determining the health of the aquatic ecosystems. Diversity of macroinvertebrates depends upon abiotic factors like Temperature, pH, dissolved oxygen, free CO₂, transparency, turbidity, alkalinity, hardness etc. Monthly samples of water and macroinvertebrates were collected for six months from three low-order streams of Badiyar Gad basin. The density of macroinvertebrates was computed to be maximum in the month of May and minimum in the month of January and February in all the three stream orders of Badiyar Gad basin. The density ranges from 222.23 to 825.76 individuals m⁻² in 1st order stream, 144.52 to 1037.02 individuals m⁻² in 2nd order stream and 337.69 to 1414.54 individuals m⁻² in III order steam of Badiyar Gad basin. Density increases with the increase in stream orders. Shannon-Wiener's diversity index ranged from 1.2912 to 2.3809 in all three stream orders. Water temperature and turbidity were observed to show positive correlation with macroinvertebrates density but found inversely correlated with conductivity, velocity, TDS and pH. However, diversity was observed positively correlated with hardness, alkalinity and pH but inversely with TDS. Physicochemical parameters of the water were found to affect the density and diversity of macroinvertebrates.

ESCC: 46.

BIOTIC AND ABIOTIC STRESS MANAGEMENT FOR SUSTAINABILITY

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Stress is adverse force or a condition inhibiting plants normal functioning. Sustainable agriculture tries to improve or maintain the quality of food without compromising the environment. Abiotic stress especially salinity, drought, temperature and oxidative stress refers to negative impact of non-living factors on the living organisms in a specific environment. High temperatures reduced the grain filling period in wheat, oat, and field corn thus improving abiotic stress tolerance in crop cultivars. Small molecules that act as osmoprotectants include glycine betaine, sarcosine, trimethylamine-N-oxide, glycine, proline, glutamate, mannitol, and trehalose correct the cytosolic imbalance caused by stress exposure. Biotic stress is instigated by fungi, bacteria, viruses, parasites, weeds, insects, and other native or cultivated plants with studies done on viruses i.e., genera Tobamovirus, Potyvirus and Begomovirus and species Pepper Mild Mottle Virus; bacteria i.e., *Pseudomonas Syringae*, *Xanthomonas Oryzae* P.v. *Oryzae*; Fungi i.e., *Fusarium oxysporum*, genus *Alternaria* and species *Piriformospora Indica*; Insects i.e., Orders Lepidoptera and Hemiptera; nematodes i.e., *Meloidogyne javanica* and *M. incognita*. Two bacterial strains of *Azotobacter chroococcum* 67B and *Azotobacter chroococcum* 76A exhibited high tolerance to salt and drought stresses and could alleviate the negative effects exerted by abiotic stress in tomato plants. *Trichoderma* strains with improved plant growth promotion traits and transgenic wheat expressing different stress related genes with increased resistance to various abiotic and biotic stresses with the intervention of molecular biology and nanoscience (combination of NMR- and LC/MS-based metabolomics). Employing transgenic technology, functional validation of various target genes involving signaling, transcription, ion homeostasis, antioxidant defense etc. for enhanced abiotic stress tolerance. Transgenic plants resistance to pests, pathogens and herbicides achieved in maize, potato, squash, sugar beet, wheat, cotton, soybean, oilseed rape, tomato, tobacco, rice, barley, papaya and alfalfa. Virus resistance is achieved by using gene silencing, antisense RNA and RNAi techniques. The growing understandings on plant defense mechanisms against biotic and abiotic stress are expected to lead to increased levels of protection in the near future.

Keywords: Abiotic stress, Biotic stress, Bacteria, Fungi, Virus, Insects

ESCC: 47.

USE OF LINEAR PROGRAMMING MODEL TO DETERMINE OPTIMUM CROPPING PATTERN FOR IRRIGATED AND RAIN FED REGIONS OF BIDAR DISTRICT, KARNATAKA

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In the present study, optimal solutions were found for net farm returns using Linear Programming model on the sample farmers of Bidar District, Karnataka. The study examines the possibilities and prospects of increasing income and employment through rational allocation of resources under different Capital and technological environment. The study was carried out through collection of data by interview method and linear programming technique was used to develop optimum plans for small and large farmers in the study area. A total of 120 farmers were selected and categorized into two types of farmers one Small farmer with less than 2 hectares of land and other large farmers with more than 2 hectares. The results obtained from optimal solutions were compared with existing technology and in case of S1, net farm returns increased from Rs:74520 to Rs:105196, an increase of Rs:30676

(29.16%) and in S2 it increased to Rs:38988 (34.35%) and in case of S3 the increase was Rs:90812 (54.92%) and in S4 the increase was Rs:137709 (64.88%). Similarly for large farmers the net farm returns in case of L1 were increased to Rs: 544405 (47.07%) and in L2 the increase was Rs: 1159681 (65.45%) and L3 the increase was Rs: 591796 (49.15%) and for L4 the increase was Rs: 1939975 (76.01%). In S1 model, red gram, sugarcane and onion emerged as feasible solutions, in S2 again red gram sugarcane and onion found their places. In S3 black gram and onion and in S4 soya bean Bengal gram found their places. In large farmers, chilies, *jowar*; wheat and paddy found their places as feasible solutions. Credit played an important role in augmenting income. The effect of credit on income was inversely related with the size of the farm where as the credit need were directly related to the farm size.

Keywords: restricted capital; cropping pattern; reorganization of resources; impact of credit; Linear Programming Model; net farmers returns

ESCC: 48.

NEED OF ORGANIC FARMING FOR SUSTAINABLE AGRICULTURE DEVELOPMENT: A CASE STUDY OF MORIGAON DISTRICT

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Organic farming is a major agricultural challenge of current period. At this present era of transformation of agriculture non-conventional processes of agriculture under the name of organic farming draws attention among the farming community. The health hazards and the question of sustainability bring the massive popularity of organic farming among the selective group of people. But organic farming is still a less popular agricultural practice among the farming community from lower strata. Assam's agriculture undergoes lots of vagaries arisen because of natural (flood and drought) and institutional factors (marketing and exchanges). Though it is an agriculture-based state, it has lots of institutional lacuna apart from the natural calamities like flood and drought. The crop-diversification and the multi-cropping pattern of farming are still not popular in Assam. Farming community is still much dependent on chemical fertilisers and allied chemical mechanisms. Extreme chemical dependence has been creating hazards among the people.

Assam's agriculture mainly depends on climate and monsoon. So agriculture management and proper utilization of cost-benefit mechanism are rarely implemented. Research and development of agriculture among the common farmers are still at a cradle stage. So at this transformation period of agriculture, the farming community has to concentrate on sustainable agriculture with due concentration and cooperation with Governmental authority. Morigaon is a backward district of Assam with agriculture as the prime occupation. The farming community is spatially divided in normal agricultural fields and char areas near the river Brahmaputra. Almost all of the farmers use chemical fertilisers for higher production concentrating on cost-benefit analysis. Only a few numbers are concentrating on organic farming in very recent years. From the sake of soil management, water management, input management etc are seen in organic farming as well as sustainable agriculture. From the effective management of organic farming an integrated approach is important. Honest attempts are made in this paper through field survey to find out the importance of sustainable agriculture leading to organic farming for better development of the region.

Keywords: Sustainable agriculture, organic farming, flood, Assam, Morigaon, char area

ESCC: 49.

ECO-FRIENDLY DISEASE MANAGEMENT WITH SUSTAINABLE AGRICULTURE

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Organic Farming is recognised globally as a priority area in view of the growing concerns on environmental pollution due to increased awareness about the fallouts of the indiscriminate use of agro-chemicals. Demand for safe and healthy food has been increasing with every passing day. The ill effects of chemicals on the flora, fauna, humans and environment as a whole are the major concerns. Though the use of chemical inputs in agriculture is inevitable to contain dreaded pests and meet the growing demand for food in a populous nation like India, there are opportunities in selected high value fruit and vegetable crops where organic production can be encouraged to meet the domestic and export demand for fresh fruit and vegetables. There are several non-chemical environmentally techniques which can be prudently and strategically incorporated in a well crafted organic production technology module for specific crops. Modification in cultural practices, mechanical destruction of source of inoculum, clean cultivation use of organic amendment and bio-fumigation, developing pesticides of organic origin, encouraging natural biological agents, use of cover and trap crops, use of heat treatment, cold temperature, solar energy etc. can be conveniently used to manage disease incidence below economic injury level. This context mainly focused on the sustainable plant disease management for long duration without using the chemical pesticides.

Keywords: Eco-friendly, Sustainable agriculture, Disease management, Bio-agents, Organic farming

ESCC: 50.

EVALUATION OF NEEM BASED BIOPESTICIDE, CHITIN SYNTHESIS INHIBITOR, U.V. RADIATION AND CHEMICAL INSECTICIDE AGAINST PULSE BEETLE, *Callosobruchus chinensis* (L.) IN CHICKPEA, *Cicer arietinum* (L.)

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The pulse beetle, *Callosobruchus chinensis* (L.) (Coleoptera: Bruchidae), is a worldwide insect pest that infests pulses in the fields and seeds in storage. An investigation for evaluation of neem oil, diflubenzuron, deltamethrin and U.V. radiation has been conducted in Department of Entomology and Agricultural Zoology, BHU, Varanasi under laboratory conditions during 2016-17. During the course of study fresh and infested chickpea grains have been treated with above mentioned treatments and samples were withdrawn at various intervals viz., 24, 48, 72, 96 and 120 hours after treatment and different parameters like percent seed infestation, weight loss, seed germination, adult mortality and adult emergence were recorded after 30, 60, 90 and 120 days of storage, respectively. The bioefficacy of these seed protectants can be arranged in following order as deltamethrin>diflubenzuron>neem oil > U.V. radiation in preventive measure experiment, whereas in curative measure experiment it can be arranged as deltamethrin>diflubenzuron> U.V. radiation >neem oil. Thus deltamethrin and diflubenzuron could be recommended for long periods of storage of chickpea seeds after thorough investigation. Both of the recommended seed protectants can be used with no toxic residues and economically sound for suppressing the population of pulse beetle in storage.

Keywords: *Callosobruchus chinensis*, life history, ovipositional preference, biological parameters and fecundity.

ESCC: 51.

THE GROWING THREAT OF CLIMATE CHANGE IN INDIA

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Today climate change is one of the biggest issues of human being on the planet and the effects of climate change are undeniable. Climate change has brought many environmental risks to human health such as ozone layer depletion, loss of biodiversity, high temperature, warming of coastal waters, rising sea levels, increased intensity and frequency of storm, change in rainfall patterns, increased pressure on food producing systems and spread of infectious diseases. Climate change has extreme impacts in India. Rise in average global temperatures have led to a worrying trend of no rain for long periods and then sudden bout of excessive rainfall causing extreme weather events particularly floods which took lives, destroyed homes and agricultural yields as well as resulted in huge revenue losses.

This summer in Chennai locals were praying for some rain, in Mumbai people were reeling under a deluge. Long ago these extreme disparities may have been solely blamed on nature's vagaries, but now science has established that human induced climate change is playing a major role. Climate change caused by emissions from industries and other human activity is making the world warmer disrupting rainfall patterns and increasing the frequency of extreme weather events no country is immune to these forces but India is particularly vulnerable. In 2018-19 as many as 2400 Indians lost their lives to extreme weather events such as floods and cyclones according to environmental ministry. The India meteorological department (IMD) says these events are increasing in both frequency and intensity extreme events may be the most tangible and immediate impact of climate change but another more long term and equally dangerous effect is rising temperatures. In India to according to IMD data released by statistics ministry average temperatures have increased by 0.6^o C between 1901-10 and 2009-18. At the annual level this seem trivial but projections deeper in to future paint a more alarming picture.

The World Bank estimates that if climate change continues unhindered, the average temperature in India could reach as high as 29.1^o C by the end of the century. Climate change becomes more palpable in parts of Rajasthan, Gujarat, Tamil Nadu, Kerala and North East, average temperature over last decade has risen by nearly 1^o C compared to the historical average in the 1950-80 periods. Hotter weather and disrupted rainfall hurt crop yields. According to the 2017-18 economic survey extreme temperature and droughts shrinks farmer incomes to the tune of 4-14% for key crops. In other hands worker are affected too. In industries such as constructions high temperatures can make life miserable for workers and decrease their productivity. According to ILO the loss in productivity because of heat stress could be the equivalent of India losing 34 million full time jobs – the highest among the world's most population's nations. According to Global Climate Risk Index – India is the 14th most climate change affected country in the world.

ESCC: 52.

STUDIES ON POTENTIAL OF PLANT GROWTH-PROMOTING RHIZOBACTERIA (PGPR) FOR SUSTAINABLE AGRICULTURE IN INDIA

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India has one of the richest and wide varieties of plant cultures throughout the world. They have many different forms such as huge trees, others are herbs or some have bushy form in which agriculture is integral components of human life. Normal agriculture practices involve huge application of chemical to obtain the maximum yield which is the major source of chemical contaminants in our daily life. Recently there has been a great interest in eco-friendly and sustainable agriculture. PGPR are known to improve plant growth in many ways when compared to

synthetic fertilizers, insecticides and pesticides. In this sense, Plant Growth Promoting Rhizobacteria (PGPR) may be used to enhance plant health and promote plant growth rate without environmental contamination. PGPR are group of bacteria that can actively colonize plant roots and can enhance plant growth using the above mentioned mechanisms. Keeping in view, rhizospheric engineering was the objective to work out the novel and environmentally sound strategies for growth promotion of agricultural crops under changing scenario of cropping system to sustain the productivity. PGPR were isolated from the rhizospheric soil samples collected from ten different districts of Uttar Pradesh by serial dilution technique (Johnson and Curl 1972). All the isolates obtained were maintained at 4°C in glycerol stock for further PGPR characterization.

Results revealed that five rhizobacterial isolates were isolated *viz.*, H1(1), H1(2), H1(3), H2(1) and H2(2), and all were found Gram negative. Out of five isolates tested for Indole Acetic Acid (IAA) production, all were found positive for IAA production. Isolate H1(1) was found in decreasing pattern with the progress of time where as other were rated in increasing pattern with time factors. H1(2) was rated as fastest IAA producer followed by H1(1) with 0.26 concentration of inoculums in mg/ml (after 24 hr.) and 0.39 concentration of inoculums in mg/ml (after 72 hr.). All the five isolates of the rhizospheric bacteria tested for hydrogen cyanide (HCN) production under in vitro conditions were found positive in respect to said inhibitory compound production. Catalase assay activity resulted that, out of five isolates tested were found positive. Isolate H2(1) recorded as maximum catalase producer and rated as high whereas three isolates namely H1(1), H1(2) and H1(3) were rated as low producer. Isolates H2(2) was resulted as moderate catalase producer. All the isolates tested for ammonia production were found positive. Isolate H1(3) resulted as maximum ammonia producer as compared to the other isolates tested.

ESCC: 53.

BIOCHAR AND BIOCHAR-BASED NITROGENOUS FERTILIZERS: A CRITICAL REVIEW

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Biochar can be defined as a carbonrich product derived from the pyrolysis of biomass at hightemperatures (400–1300°C) in the absence of oxygen. Because of its large surface area and rich functional groups, biochar has been used as an inhibitor to regulate the release of nitrogen from inorganic nitrogenous fertilizers. The detailed review was carried to investigate the effect of biochar application and compared to the control condition (CK; no nitrogen and no biochar) with tratments like ammonium nitrate and no biochar (AN), biochar and no nitrogen (BC), blending-processed biochar-based nitrogenous fertilizer (BP-BNF), adsorption-processed BNF (AP-BNF), and reaction-processed BNF (RP-BNF). The properties of biochar and BNFs and their effects on chemical properties of soils, winter wheat growth, and grain yield were investigated. The order of the nutrient-loading capabilities and quantities and retention intensities of BNFs compared to AN was RP- >AP- >BP-BNF. Biochar and BNFs had no significant effects on the soil nutrient indexes; however, the productive tiller, 1000-grain weight, and biomass and grain yield of winter wheat increased by 5.50, 8.46, 23.85, and 23.42%, respectively, owing to the addition of BNFs. Additionally, the quantity of nitrogen in grain increased significantly with BNF treatments. By quantifying nitrogen utilization, a conclusion was drawn that the RP-BNF treatment was the most effective of the three kinds of BNFs.

ESCC: 54.

VERTICAL GARDENING: A GREEN WALL SYSTEM FOR SUSTAINABLE GARDENING

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It is an activity of growing plants in a wall or out of a wall often because there is not much space available on the ground. These gardens are another way of looking towards the gardens and of implanting them in an unexpected location within the cities. A stack of well grown plants, that may include kind of vegetables, ornamental fruit plants or flowering plants, are nested together above the reservoir. The reservoir contains the nutrient rich materials that help in supplying minerals and nutrients to plants for their healthy growth. The practice of developing vertical gardens is not common in India, but due to space scarcity, it has been adopted in metro cities of our countries like in Bangalore, Delhi, etc. It can have its own various names viz., green wall, green roof, trellis and arbor, hanging baskets and window boxes. Green wall can absorb heated gas from the air, providing a healthier indoor air quality as well as more beautiful space. They hold or slow rain water, providing food and shelter for wildlife. Green roof covers vegetation and growing medium partly or completely. For growing creepers such as *Wisteria*, *Thunbergia*, *Senecio*, etc. trellis or arbor can be constructed. However, hanging baskets now-a-days is the most attractive beautification technique that is acceptable in every house for enhancing the beauty of that particular space. Above all, vertical gardening is the burning issue in this modern world that helps in protecting the environment by removing harmful gases. The most suitable area for constructing vertical garden/green wall is where there is excessive pollution exist such as near traffic areas. Suitable plants for vertical gardening are pansy, petunia, nasturtium, portulaca, etc; vegetables like beans, peas, tomato, etc. Awareness rising about vertical gardening or growing plants at any wall vertically must be exercised and practiced with appropriate knowledge.

Keywords: vertical gardening, green wall, green roof, harmful gases, creepers, etc.

ESCC: 55.

CLIMATE-SMART WEED AND NITROGEN MANAGEMENT THROUGH BROWN MANURE IN CONSERVATION AGRICULTURE BASED PEARL MILLET-GREEN GRAM-MUSTARD SYSTEM

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A field experiment was carried out during 2017-18 at the ICAR-Indian Agricultural Research Institute, New Delhi to standardize the nutrient and weed management strategies for pearl millet-mustard-green gram cropping system under conservation agriculture in split-plot design with three replications. In rainy season the main plot, three weed management options, viz. unweeded check, Atrazine (0.75kg/ha) + Oxyfluorfen (0.15 kg/ha) as pre-emergence tank-mix application and *Sebania* co-culture with pearl millet knocked down by 2,4-D @ 0.5 kg/ha at 25 DAS. For mustard during winter season, in main-plot the treatments were unweeded check, application of fluzifop-p-butyl (0.05 kg/ha)+ pendimethalin (0.75 kg/ha) as pre-emergence tank-mix application and fenoxaprop-p-ethyl (0.05 kg/ha)+ oxyfluorfen (0.075 kg/ha) post-emergence tank-mix application at 30DAS. In the sub-plot, 100% NPK (Inorganic), biofertilizer+ (30:20:10:: N: P₂O₅:K₂O), biofertilizer+(60:40:20:: N: P₂O₅:K₂O) and biofertilizer+ (90:60:40:: N: P₂O₅:K₂O) were applied for both pearl millet and mustard. The yield of both mustard and pear millet is more negatively correlated with weed density at 60 DAS than at 30 DAS. Hence, a post emergence weed management either through herbicide application or any cultural method is more crucial. After 2 years of experimentation, it can be concluded that *Sebania* co-culture with biofertilizer+ (90:60:40:: N: P₂O₅:K₂O) resulted in highest pearl millet yield

(2.3 t/ha) which was 16.4% higher over unweeded check. Likewise, in mustard the application of fenoxaprop-p-ethyl (0.05 kg/ha)+ oxyflurofen (0.075 kg/ha) post-emergence tank-mix application at 30 DAS with biofertilizer+ (90:60:40:: N: P₂O₅:K₂O) resulted in highest mustard yield (2.9 t/ha) which was 31.9% higher over unweeded check. In the system perspective, the adoption of brown manure in pearl millet, wherein the *Sebania* was knocked down by 2,4-D@ 0.5 kg/ha at 25 DAS, followed by fenoxaprop-p-ethyl (0.05 kg/ha)+ oxyflurofen (0.075 kg/ha) post-emergence tank-mix application at 30 DAS in mustard.

ESCC: 56.

SUGARCANE CANOPY SPRAYING: A PERSPECTIVE SOLUTION WITH ERGONOMICS AND MECHATRONICS APPROACH

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Chemicals application is very significant for control of disease and insect infestation in sugarcane crop. The problem observed with existing methods are inefficient spraying, inconvenience of operation; workers prone to injuries and being a tall crop working above the shoulder height. To overcome these issues, a novel approach to develop canopy sprayer for sugarcane crop based on the application of mechatronics and ergonomics is worked out with 1kW DC motor. The unit consists of Base unit for movement in field, Power unit, Spraying unit and Environmental parameter sensing unit. It will be equipped with variable height platform for safety and comfort of operator along with effective spraying at desired height. The concept of sugarcane canopy sprayer can be applied for fabrication and this will ease the spraying work with increased effectiveness. The battery power will reduce the operator efforts for movement and pumping of sprayer system. Application of sensors integrated with electronic circuit accomplishes the opening and closing/folding and unfolding of boom for adequate coverage width at desired height. The advantage of unit will be crop protection from infestation damage by uniform and efficient spraying, safety of worker with reduced drudgery, potential for automation of unit, environmental friendly power source and versatility of spraying other tall crops.

ESCC: 57.

DESIGN AND DEVELOPMENT OF A MANUALLY OPERATED BIOCHAR BLOCK MAKING MACHINE

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The world is presently facing the vague catastrophe of the energy crisis and environmental deprivation. India is the fourth leading consumer in the world of crude oil and natural gas. Presently, conventional energy sources i.e. coal, oil, natural gas, nuclear and hydropower account for 85% to 90% of primary energy consumption in India. Renewable energy sources provide approximately 10% of the total energy demand in India. Biomass is considered as renewable, sustainable and carbon natural fuel source which is available in huge amount in India about 500 MMT/yr. In Indian Himalayas region, the availability of pine needle (*Pinus roxburghii*) is about 15.9 MMT/yr, whereas in Uttarakhand is about 2.06 MMT/yr. The research work was carried out for the design and development of a manually operated biochar block making machine. The machine was ergonomically designed with M.S. frame of height 90 cm, 150 cm long compaction lever (G.I. pipe), compressing unit, base plate and moulds of diameter 12.7 cm, height 17 cm. The biochar blocks were prepared with different types of binders such as soil, cattle dung, cement and lime as 30%, 40% and 50% proportion by weight. By block making, bulk density of loose biomass increased from 40-200 kg/m³ to 600-1200 kg/m³ with an increase in calorific value and reduces transportation cost and storage space requirement as compared to raw biomass. The prepared blocks were having a diameter of 12.7 cm, height of 8 cm and weight of 600 g.

The average moisture content, volatile matter, ash content and fixed carbon was 5%, 36%, 25% and 40% respectively. The results indicated the maximum shattering resistance and water absorption resistance as 83% and 76% for B50C50 and B50L50 respectively, whereas the maximum calorific value was 29 MJ/kg for B70S30. The biochar blocks with 40% binder ratio were found optimal as per optimization of treatments using RSM. The machine capacity was 48 blocks/h (24 kg/h) and the cost of production of biochar blocks for soil and dung was ₹6.30/kg whereas ₹10.30/kg for cement or lime. The break-even point of the biochar blocks making machine was 507 units of blocks.

ESCC: 58.

IMPACT OF CLIMATE CHANGE ON FOOD SECURITY

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Population growth of India and demand for food both are positively correlated and showing an everincreasing trend. Indian economy, the fastest growing economy of the world could not match with its hunger index value. According to Global hunger index report, 2018 India has ranked 103 among 119 countries of the world. Therefore, Food security should be the major concern on development priorities to attain sustainable development goals (SDGs) for India. *Food security* means that all people, at all times, should have physical, social, and economic access to sufficient, safe, and nutritious *food* that meets their *food* preferences and dietary needs for an active and healthy life. The major domains of the food security are: Food production, food accessibility and food nutritional quality which largely depends upon climate. Climate change has very adverse effect to food security challenges of India. At food production level climate change effect due to change in different weather parameters and the lack of farmers' knowledge about adaption and mitigation strategies. According to food and agricultural organisation (FAO, 2019) 70 per cent of Indian population depends on agriculture, Small and marginal farmers and agricultural labourers lack accessibility to food throughout the year due to climate change. Climate change also lead to micro nutritional deficiencies due the weather changes during the growing season. To achieve sustainable development in agricultural production, food security should be ensured with the climate change scenario with optimal greenhouse gas emission from the agricultural sector.

Keywords: Climate change, Food security, Food accessibility, Sustainable development

ESCC: 59.

SUSTAINABLE AGRICULTURE: AN ALTERNATIVE SOLUTION FOR CLIMATE CHANGE AND FOOD SECURITY

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Food security is the major threat under climate variability and highly vulnerable to continuously changing climatic patterns. Studies have predicted that the average global temperature may increase by 1.4–5.8 °C and there would be substantial reduction in fresh water resources and agricultural yield by the end of the 21st century. Agriculture and food security are key sectors for intervention under climate change. Agricultural production is extremely susceptible even to 2C predictions for global mean temperatures, with major implications for rural poverty and for both rural and urban food security. Agriculture also presents untapped opportunities for mitigation in the form of sustainable agriculture. The most common advantage of sustainable agriculture is the production of greater yield on a given piece of land by making more efficient use of the available growth resources using a mixture of crops of different rooting ability, canopy structure, height, and nutrient requirements based on the complementary utilization of growth resources by the component crops. Intercropping provides insurance against crop failure or against unstable

market prices for a given commodity, especially in areas subject to extreme weather conditions such as frost, drought, and flood. Thus, it offers greater financial stability than sole cropping, which makes the system particularly suitable for labor-intensive small farms. This paper also presents easily and economically feasible options to ensure food security under climate change and recommend formation of effective adaptation and mitigation policies and strategies to minimizing the impact of climate change on irrigation.

Keywords: Sustainable Agriculture, Global Temperature, Climate Change, Food security

ESCC: 60.

ORGANIC COMPOST: AN ECO-FRIENDLY APPROACH TO RESTORE SOIL NUTRITIONAL PROFILE

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This review paper focused on the composting of organic waste. Organic wastes are wastes that easily biodegradable and these wastes are produced from many sources such as agricultural waste, market waste, kitchen waste, urban solid food wastes and municipal solid waste. Although without proper management, these waste could create several environment problem. Therefore, composting is the best low cost alternative solution to solve this problem. The use of chemical fertilizer is increasing day-by day to increase production but excess use of it, the fertility of soil and health also deteriorate. Hence the use of organic manure is one of the alternative ways for enhancing production and improves the soil health. Organic compost are natural products to enhanced sustainable crop production and there is a number of organic fertilizers such as farm yard manure, green manures, crop residues and other farm wastes, vermicompost, oil cakes, and biological wastes. Organic fertilizers are natural products used by farmers to improve sustainable agriculture production, organic manures increase the organic matter in the soil and these manures also enable a soil to hold more water and also help to improve the drainage in clay soils. Organic fertilizer provide organic acids that help to dissolve soil nutrients and make them available for the plants and also reduces the risk of pollution.

Keywords: Organic compost, eco-friendly, nutritional profile.

ESCC: 61.

ERGONOMIC ASSESSMENT OF WORK, WORKER, WORKPLACE IN FOOD PROCESSING UNITS

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The present study was conducted to assess the work, worker and workplace interface in the small scale food processing units of Punjab state. Out of the five randomly selected units, 30 respondents were randomly selected and interview-cum-observation technique was used to collect the data. Activities selected for the study were removing seeds and chopping of *amla*, sun drying of *amla*, peeling of mango and its pulp extraction for squash making. Job strain Index (JSI), Rodgers Muscle Fatigue Analysis and Workplace Ergonomic Risk Assessment (WERA) were used to achieve the objective. Results revealed that the job of removing seeds from *amla* and chopping it required majority (40%) of the shift time. It may also place 77.27 per cent of the respondents at increased risk for distal upper extremity disorders and had medium risk involved. In the job of *amla* drying, 68.18 per cent of the respondents were at the risk of distal upper extremity disorders but the job involved low risk as was indicated by the WERA score of 20.5. Peeling of mango and pulp extraction may place 87.5 per cent of the respondents at increased risk for distal upper extremity

disorder and had medium risk involved. So, there is a need to provide the workers of food processing units with an intervention which will improve their posture while working and will also reduce risk of any body fatigue or pain.

Keywords: Ergonomics, fatigue, food processing, posture

ESCC: 62.

SPRAY APPLICATION CHARACTERISTICS OF BIOLOGICAL PESTICIDE SOLUTION CONTAINING *Bacillus thuringiensis* AND *Beauveria bassiana* THROUGH HYDRAULIC NOZZLE

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Hydraulic nozzles are typically used in spray application equipment and their choices such as orifice size, spray pattern width, and operating pressure, affect the spray performance. A scientific basis can be generated from this research for choosing nozzles and operating parameters that efficiently and effectively deliver biological pesticides (bio-pesticide) with controlled spray application characteristics. The objective of this research was to evaluate the spray parameters and droplet size distribution parameters of two different classes of bio-pesticides *Bacillus thuringiensis* and *Beauveria bassiana* discharged through three different types of hollow cone nozzles sizes (HCN/PA, HCN/PB and HCN/PC) at four operating pressure (145, 245, 345 and 445 kPa). Discharge, spray width, cone angle, coefficient of uniformity, volume mean fraction (VMD), Droplet volume fraction at 90% ($D_{v0.9}$) and 10% ($D_{v0.1}$), and Relative Span Factor (RSF) of water only solution and two bio-pesticides solutions through selected nozzles at different operating pressure were measured. The results indicated that there was no significance difference was found in mean discharge among water only solution, BBP solution and FBP solution at 5% significance level but it differ significantly ($p < 0.001$) with different level of nozzle and operating pressure used. The types of solutions, nozzle sizes and pressure shown there was significant effect ($p < 0.001$) on their mean VMD, $D_{v0.1}$, $D_{v0.9}$ and RSF. The LS-means of solutions showed that the values of droplet spectra were highest in FBP solution followed by BBP solution and water only solution.

Keywords: Spray application characteristics, biological pesticide, hydraulic nozzle etc

ESCC: 63.

INDIGENOUS PEOPLE AND CLIMATE CHANGE

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The United Nations' Intergovernmental Panel on Climate Change (IPCC) has expressed unequivocally that human effect on the atmosphere framework is clear: discharges of ozone harming substances from human movement are the most noteworthy ever, and ongoing changes in the atmosphere have significantly affected human and characteristic frameworks over the world. Environmental change has officially expanded the force and recurrence of extraordinary climate occasions, for example, floods, dry seasons, heat-waves, rapidly spreading fires and twisters, and has added to changing precipitation examples and rising ocean levels. Such limits and changeability in the atmosphere mischief individuals legitimately and have extreme ramifications for environments, the universe of work, wellbeing, employments, nourishment generation, framework, settlements and different regions that are major to human prosperity. Indigenous people are first people groups who are the first pilgrims of a given place, rather than gatherings that have settled, involved or colonized the zone all the more as of late. Indigenous people groups are among the first to encounter the immediate effects of environmental change, despite the fact that they contribute little

to ozone depleting substance discharges. They are additionally straightforwardly influenced by ecological demolition, which is a main source of environmental change, for example, deforestation, land corruption, and contamination from mining and oil and gas extraction. Environmental change presents serious dangers to their vocations, societies, characters and lifestyles in light of the fact that most of indigenous people groups have a nearby social association with the earth, and are regularly subject to land and normal assets to meet their employment needs. Environmental change likewise dangers upgrading their current financial vulnerabilities. The proximate relationship of indigenous individuals with their regular habitats makes them particularly touchy with the impacts of climate change.

Keywords: Indigenous people, Climate change, Impact and adoption.

ESCC: 64.

IMPACT OF PAINTS ON ENVIRONMENT

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Paints generally include pigment (the colour), carried by a resin and/or binder, a solvent to help the paint application, and a dryer. Some will include formaldehyde, arsenic, thinners, and foamers. Every year we like to paint our home, furniture, etc. for decoration, protection, identification, sanitation. But we forget the impact of paint on our environment. This can cause some serious hazardous effect on our body like headaches, trigger allergies, asthmatic reactions, irritate skin, eyes, and put increased stress on vital organs such as the heart and not only paint but also its byproducts and hence paints has a dangerous impact on human beings and our environment too. The most important environmental impact from paints is the release of volatile organic compounds (VOCs) during the drying process after the coating is applied. Virtually everything but the solids in a typical paint formulation is released to the air. Once in the atmosphere, VOCs participate in the formation of ozone. In the presence of nitrogen oxides (NOx) and sunlight, VOCs react with oxygen in the air to produce ozone, the most toxic component of the form of pollution commonly known as smog. Ozone attacks lung tissue, and is very injurious, even in very low concentrations. Hence the present study aims to explore the effect of paints and analyse the impact of them on the environment.

Keywords: Sanitation, Vital organs, Allergies.

ESCC: 65.

CLIMATE CHANGE AND CO₂ CONCENTRATION: IMPACT ON PLANT GROWTH AND DEVELOPMENT

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Assessing the impacts of climate change will be a vital task in developed as well as in developing countries because of many interdependent physical, biological and chemical processes are ongoing in earth and human systems. These processes can be affected by change in climate, causing an effect on natural resources, on biodiversity, ecosystem services and on plants in general, some positive and on others negative effects, such as, altering biophysical relationship, shrinking of habitats, desertification and general shift in natural world. Warming directly affects rate of plant respiration, photosynthesis, and other biogeochemical processes. In the future it is thought that the increase in CO₂ and other greenhouse gases will cause an increase in global mean temperature, with larger increases at high latitudes than elsewhere and larger increases during winter than summer. For instance, enhanced CO₂ concentration can increase photosynthetic rate especially for plants growing under warm and dry condition such as C₃

plants. Naturally, plants have their own mechanism to tolerate a certain level of increased temperature. Thus, the interaction and different combination effect of rise CO₂ concentration and temperature is determined by soil properties, water, mineral and nutrient availability etc, as a result the expected response of plants in different environments and climate variability can be either positively or negatively affected.

Keywords: Climate changes, ecosystem services, plant growth, productivity, land use change, biodiversity, adaptation, species, mitigate and vulnerability.

ESCC: 66.

EFFECTS OF LIQUID ORGANIC FERTILIZERS ON PLANT GROWTH AND RHIZOSPHERE SOIL CHARACTERISTICS OF CHRYSANTHEMUM

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Organic fertilizers are generally thought to be an effective way to sustain soil fertility and plant growth. To promote the productivity of chrysanthemum, five sources of liquid organic fertilizers (L1–L5), as well as a chemical fertilizer, were applied at an early stage of the growth cycle to investigate their effects on plant growth. In the short-term pot experiment, the liquid organic fertilizers significantly promoted root and aboveground growth by 10.2–77.8% and 10.7–33.3%, respectively, compared with the chemical fertilizer. The order of growth promotion was: L1 (shrimp extracts) > L2 (plant decomposition) > L4 (seaweed extracts)/L5 (fish extracts) > L3 (vermicompost). Morphological and chemical analyses indicated that, compared with other organic fertilizers, the treatment with shrimp extract (L1) produced the greatest increases in root dry weight, total length, surface area, volume, tips, and thick root length, respectively. Furthermore, the shrimp extract treatment significantly increased the nutrient contents and altered the soil's functional microbial community at the rhizospheric level compared with the chemical fertilizer treatment. Thus, the shrimp extract liquid organic fertilizer could be part of an effective alternative to chemical fertilization during the early stage of chrysanthemum growth.

Keywords: liquid organic fertilizer; chrysanthemum; root architecture; nutrient level; microbial community

ESCC: 67.

ROLE OF INHIBITORS AND BIODEGRADABLE MATERIAL IN MITIGATION OF NITROGEN LOSSES FROM FERTILIZED LANDS

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Loss of N, occurring mainly through NH₃ volatilization, biological denitrification, and NO₃⁻ leaching, has both economic and environmental implications. Therefore, the economic benefits of reduced environmental pollution and future damage to our environment as a result of the use of urease inhibitors are of higher significance to the production of gains over the long-term. The literature review discussed the role, effectiveness and mechanism of urease inhibitors as well as coating of urea to reduce ammonia volatilization loss from urea fertilizer. Coating with urease inhibitors can improve the bioavailability of N, resulting in increased dry matter yield and N uptake. Such increases result from delayed urea hydrolysis by urease inhibitors and coating materials. The value of inhibitors in mitigating N loss would depend on their rate of biodegradation and persistence in soils. Previous studies have proven that micronutrients could be competent urease inhibitors, but the information about their effects on soil, nutrient uptake of plants and dry matter yield is poorly documented. Some nutrients such as Cu and Zn as urease inhibitors and natural biodegradable material such as agar, gelatin and palm stearin were found effective in reduction of nitrogen losses from nitrogen fertilizer especially from urea fertilizer.

Keywords: Nitrogen, urea, fertilizer, inhibitors, biodegradation, land, nitrogen loss

ESCC: 68.

EFFECT OF INTEGRATED CROP MANAGEMENT PRACTICES ON YIELD AND QUALITY OF PIGEONPEA IN NORTH INDIAN PLAINS

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Pigeonpea [*Cajanuscajan*L.] is second most important pulse crop of India with protein content of ~21.7 % helps in achieving nutritional security. But its productivity is quite poor (885 kg ha⁻¹) because of numerous production- and climatic-vulnerabilities. Integrated crop management (ICM) is a best crop management concept which may cope-up these vulnerabilities with higher productivity, quality and resource-use efficiency over conventional farming practices. Hence, a field study was conducted during *Kharif* 2017 at research farm of ICAR–Indian Agricultural Research Institute, New Delhi to study the effect of 09 ICM practices [04 conventional tillage (CT); 04 conservation agriculture (CA); 01 organic agriculture based ICM practices] on pigeonpea productivity and quality. The results revealed that ICM practices varied significantly in protein content, protein yield and productivity of pigeonpea. The ICM₇—a CA based ICM module [Zero-tillage–permanent raised bed + crop residue retention @ 3 t ha⁻¹ + 100% RDF + (Glyphosate-PP fb Pendimethalin-PE fb Imazethapyr-POE + 1 hand weeding and mulch) + 2 irrigations + need based IDM/IPM] reported significantly higher protein content (19.9%) and protein yield (382 kg ha⁻¹) over other CT-based and organic ICM modules. ICM₇ also recorded significantly higher productivity (1.92 t ha⁻¹) and higher net returns over other CT-based and organic ICM modules.

Keywords: Integrated crop management, pigeonpea, productivity, organic, quality.

ESCC: 69.

FARM ENERGY METABOLISM AND CONSERVATION AGRICULTURE

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Energy is the prime mover for any kind of production process and agriculture is the no exception. Starting from microbial function to creation of carbohydrates we need energy. And farm energy metabolism is a new concept, which takes into account the ratio of creation and emission of energy as commences in an operating form. The present study takes into account the main principles of conservation agriculture in terms of farm energy metabolism and its efficiency. A score of 75 respondents by following both purposive and non-random snowballing method from two districts of Nadia and Hooghly wherein agro-ecosystems are functioning with a new alluvial agro-ecology and socio-ecological bearing, energy characters of a farm from the farmers perception have been the dependent variables, a score of 40 independent variables, socio-economic and agro-ecological by nature have been selected for the study. The variables viz. the fragmentation of holding, cropping intensity, distance between the fragments has been found to be strongly correlated with the farm energy proficiency. In a stepwise regression analysis variable retained at the last step can be traced as marker variables as to have swashbuckling functional effect on farm energy metabolism level and proficiency. Canonical co-variate analysis (CCA) has further been executed to isolate the clandestine variables from the right side selecting effective variable from the left side, variables have got an isochronous movement with the dependent variable farm energy metabolism. The new strategy can be frameworked wherein methodologies for enterprise co-integration can make an effective intervention for efficient energy balance rather than thinking for a kind of co-operative farming. In case the energy balances are badly jeopardised at the sub-lithospheric level, it is very difficult to usher a sustainable backup for the collateral function for the other factors of production, ultimately leading to sustainable yield behaviour of effective farms.

Keywords: Climate change perception, conservation agriculture, cropping intensity, farm energy metabolism, fragmentation of holdings.

ESCC: 70.

SUSTAINABLE AGRICULTURE AND ORGANIC FARMING FOR CROP IMPROVEMENT IN THE ERA OF CLIMATE CHANGE

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Organic farming is one of the several approaches found to meet the objectives of sustainable agriculture. Most of the techniques used in organic farming like inter-cropping, mulching and integration of crops and livestock are not alien to agriculture systems including the traditional agricultural practices. However, organic farming is based on various laws and certification programmes, which prohibit the use of almost all synthetic inputs and the central theme of this method is the health of soil. The adverse effects of modern agricultural practices on the farm and also on the health of living beings and thus on the environment has been well documented all over the world. Application of technology, particularly the use of chemical fertilizers and pesticides all around us has persuaded people to think aloud. Sustainable agriculture is necessary to attain the goal of sustainable development. According to the Food and Agriculture Organization (FAO), sustainable agriculture is the successful management of resources to satisfy the changing human needs while maintaining or enhancing the quality of environment and conserving natural resources. All definitions of sustainable agriculture lay great emphasis on maintaining an agricultural growth rate, which can meet the demand for food of all living beings without draining the basic resources towards crop improvement. As a result of global climatic changes, their negative effects on the environment are manifested through soil erosion, water shortages, salination, soil contamination, genetic erosion, Organic farming is one of the widely used methods, which is thought as the best alternative to avoid the ill effects of chemical farming. It also has far more advantages over the conventional and other modern agricultural practices that are available today.

ESCC: 71.

COTTON PRODUCTION AND SUSTAINABILITY: A REVIEW ON FACTORS AFFECTING COTTON PRODUCTION IN INDIA

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Cotton, being a major commercial cash crop in India, has a major impact on the overall Indian agriculture sector. India is one of the largest producers of cotton and contributing a major share to the domestic and global economy. Still, the farmers are facing various problems related to overall production which leads to low yield of cotton. Lower production of cotton not only affects the Indian economy but also affecting the global economy. Although the Cotton Advisory Board of India (CAB) has forecast India's cotton output at 36.10 million bales (1 bale=170 kg) for 2019-20 compared to 37 million bales estimated for the previous year. According to the US department of agriculture (USDA) for 2019-20, India is forecast to return as the leading cotton-producing country, supplanting China, which had surpassed India in 2018-19. For 2019-20, India's cotton crop is projected at 28.5 million bales -10% above the previous year - as both higher area and yield are expected. India is forecast to account for 23% of the world's cotton production in 2019-20. The objective of this study is to review and identifying various factors affecting cotton production and the problems encountered by the cotton growers. This paper also discusses on the minimization of the factors of the problem for sustainable cotton production.

Keywords: Cotton production, sustainability, factors affecting, India

ESCC: 72.

ENVIRONMENT, SUSTAINABILITY AND CLIMATE CHANGE

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Climate change has overturned environmental sustainability and resulted in the raising rate of melting of the ice cap on mountain and thus the raise in ocean levels. Climate change may allow pest migration or population expansions which may adversely affect agricultural productivity, profitability and possibly even viability. An attempt is made to assess the sensitivity of food production to various aspects of global change and environmental degradation during the next few decades. Green computing, green economy etc have emerged as consumer facing measurements of friendliness to the environment and sustainable development. A sustainable business or green business has minimum negative impact on the global or local environment, community and society. A sustainable business is the process of assessing how to design products that will take advantage of the current environmental situation and how well a company's product perform with renewable resources. Business take a wide range of green initiatives; one of the most common example is the act of "Going paperless" or sending correspondence in lieu of paper when possible. There are also some modern technology i.e. Performance evaluation of gypsum block wireless sensor network system for the real time irrigation scheduling for the sustainability of the environment. Management of natural resources refers to the sustainable utilisation of major natural resources such as land, water, air, animals, forest, fisheries, wild flora and fauna which maintain soil productivity, nutrient recycling and maintain balance in the climatic cycles. However, conservation agriculture promotes maintenance of permanent soil cover, minimum soil disturbance and diversification of plant species.

Keywords: Green energy, Green business, Renewable energy, Green computing, Conservation Agriculture.

ESCC: 73.

ECONOMICS OF THE ORGANIC FARMING

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Farmers all the world are aware of ecological hazards of conventional chemical based farming whereas organic farming ensures improved soil fertility and is beneficial for environment and human health. In spite of this, the major roadblock to its growth as revealed by various studies are lower yield, high labour cost and lack of market ensuring prices. With the help of this paper we compared the input cost of conventional farming and organic farming. In addition to this we studied the circumference of problem that fertilizers have created. Our area of study is Dhar district of Madhya Pradesh lying within 22.6013° N, 75.3025° E. Madhya Pradesh has a certified area of 2.32 lakh hectare under organic farming out of total 7.23 lakh hectare in India. We collected primary data of the input cost borne by 93 organic and conventional farmers by conventional sampling method. For analyzing the outcome, we used dummy variable regression method to test the significance of the variables. The empirical evidence show that input cost is less in organic farming of wheat, onion and cabbage, while it is more in soyabean. Study of respondents show that fertilizers are main threat to beneficial land based micro-organism and the soil fertility. We found the ways to reduce the input cost which will make organic farming sustainable. The lower yield in organic farming can be balanced out with the help of reduced input cost by maintenance of livestock. Premium pricing, government policies for incentivizing organic farming will ensure vibrant future of organic farming in India.

Keywords: conventional farming, organic farming, sustainable, soil fertility, labour cost, fertilizers.

ESCC: 74.

EFFECT OF CLIMATE CHANGE ON AGRICULTURE, BIODIVERSITY AND ECOSYSTEM: A REVIEW

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The earth allows us to dwell in it, but we the humans, snatched away the right from our fellow dwellers. Changes in climatic conditions which are the result of mainly anthropogenic activities are not only effect the agricultural aspect but also limit the existence of other species in our nature. The ongoing changes in our biophysical environment are the resultant of overconsumption and overexploitation of existing natural resources. The climate change is creating an enhancement in the level of biotic and abiotic stresses, which in turn elevates multiple stresses among plants. The sudden reformation in climate has infelicitous effect on plant's growth and development. In agricultural sector the major concern regarding climate change is yield reduction due to subtle change in summer-winter cycle. The base for agricultural crop production is soil and it takes thousands of years for a soil to form but it is also getting destroyed due to mining, deforestation and industrialization. The unforeseen behavior of temperature and irregular precipitation not only results in decreased agricultural production but also affect the biodiversity and ecosystem. The cross talk among all the pernicious activities that lead to climate change needs to be limited. The devastation due to climate change will have severe impact in the coming decades, affecting the functioning and stability of ecosystem and the biosphere, taking toll on living organisms and the economy.

ESCC: 75.

IMPACT OF CLIMATE CHANGE ON FOOD SECURITY AND SOCIO-ECONOMIC CONDITION OF FARMERS.

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Climate Change happens in the world ranging from a gradual increase in temperature, change in precipitation pattern, a gradual increase in sea level due to the melting of glaciers. This scenario adversely affects food security through its impact on all global, national and domestic systems. Population of India increases at the rate of 1.1% per year but our food production and income of farmers declined year by year due to erratic rainfall and unexpected climatic changes which indicate the gap between consumption and production of food grains. As the civilization rate is increasing in higher percentage and production of food grains, agricultural land declined due to various reasons which create an economic imbalance in the agriculture-based country like India. 61.5% of the population of India depends on agriculture and contribution of the agriculture sector in the GDP of the country is only 17.3% which indicates the uneven distribution of wealth of country and poor condition of farmers. Food insecurity primarily affects the intake of calories of peoples below the poverty line which leads to 'Malnourishment' and 'Malnutrition'. Climate change not only affects food security but also increases the stress on urban resources due to the migration of farmers in urban areas. We can achieve food security and reduce the economic exploitation of farmers considerably by adopting Zero budget farming, Conservation farming, adequate irrigation facilities and smart cropping pattern. In this paper, we interpret data available from the 'Remote Sensing' technique to study the global scenario of climate change and the current rainfall pattern. This paper deals with the relationship between climate change, food security and contribution of the agricultural sector in the economy ultimately the financial status of farmers and different smart solutions to overcome the problem of climate change and food insecurity to achieve prosperity in the agricultural sector.

Keywords: Climate Change, Food Security, Agriculture, Economy, Remote Sensing.

ESCC: 76.

TREND ANALYSIS OF WEATHER PARAMETERS IN AGRO-CLIMATIC ZONES OF UTTAR PRADESH

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Climate change is a phenomenon that varies spatially and seasonal temperature variation is more crucial in effecting the growth of the crop. The present study was carried out to analyze the trend in maximum temperature, minimum temperature and rainfall of different agro-climatic zones of Uttar Pradesh during rabi season i.e. November to April. Varanasi, Mirzapur, Muzzaffarnagar, Pilibhit, Shahjahanpur, Lalitpur, Hardoi district representing each agro-climatic zone was selected for the study. Mann Kendall test was used to identify the trend for a period of 1981-2011. The results revealed that maximum temperature has increased in Muzzaffarnagar, Hardoi and Lalitpur district at a rate of 0.01 over the period. An increase in minimum temperature has been observed for all the study districts. A decrease in rainfall for Pilibhit and Varanasi was observed in the study period at a rate of 1.97 and 1.39. For a single state the changing climate, will be different in different agro-climatic zones. Thus, emphasizing the need to develop specific plans to build climate resilience depending on the vulnerability of the area.

Keywords: Mann Kendall, Climate trend, Seasonal variation, stress management.

ESCC: 77.

ROLE OF RAG PICKERS IN WASTE MANAGEMENT AND CONSERVING THE ENVIRONMENT

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Human activities always generate waste. Waste material is a nuisance and is the major source of pollution in air, water and soil. Consequently, a high incidence of illness is caused, such as dysentery, typhoid, fever, dengue, cholera and diarrhea. It is very common to find large heaps of garbage lying in a disorganized manner in and around the cities due to the inability of municipal corporations to handle the large quantity of waste. Rag pickers play a major role in keeping our society clean. Rag-pickers are the people who rummage through garbage bins to pick out 'rags' for their livelihood. Rag-pickers generally comprise women, children and men who are extremely poor and illiterate. Different climate conditions affect the life of rag pickers. Nevertheless, they help society by removing a considerable portion of the wastes generated in the society and, thereby, reduce costs borne by the municipal bodies responsible for waste management. They live in urban slums in poor, unhygienic conditions that may lead to the spread of various diseases. The growth of population, increasing urbanization, rising standards of living due to technological innovations have contributed to an increase both in quantity and quality of waste. Instead of accepting rag picking and rag pickers as the nuisance of city environment, we need to integrate them with city's integrity. Keeping their role in view it can be concluded that through supplying waste material to the recycling industry, they reduce the pressure on natural resources and thereby conserving the natural resources and environment to work in the direction of sustainable development.

Keywords: Rag pickers, waste disposal, environmental protection

ESCC: 78.

CLIMATE CHANGE: ITS IMPACT ON VEGETABLE CULTIVATION AND POSSIBLE SOLUTIONS

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Climate change is one of the major concerns affecting the cultivation of vegetables in future. The changes in the climatic factors leading to increase in temperature, erratic rainfall pattern, drought, flood and soil salinity may lead to decrease in produce yield and quality. In tomato, high temperature can cause significant losses due to reduced fruit set and smaller and lower quality fruits. Saline conditions in soil can cause losses in form of loss turgor, wilting, decreased photosynthesis and even death of the plant. In order to ensure nutritional security for the whole population, new technologies must be developed to improve the production and quality. The World Vegetable Centre has identified cultivars resistant to high temperature, flooding, drought, etc. for major vegetable crops. Use of genomics and biotechnology has open new doors to introduce stress resistant genes in a genotype, which was otherwise impossible or extremely difficult and time consuming through traditional breeding methods. Use of molecular markers can be very useful to prevent the negative impact of climate change on vegetable cultivation as they are precise, time saving and highly efficient and require small population size, thus speeding up the crop improvement programme. Besides these methods, resource saving technologies such as drip irrigation, remote sensing and crop modeling should be adopted. Recent techniques like vegetable grafting (using resistant stock) and modern concepts like urban agriculture and floating garden are promising in order to meet the future needs. More research is needed to explore the scope of underutilized vegetables to ensure the food and nutritional security.

ESCC: 79.

SUSTAINABLE FOOD SECURITY IN CHANGING CLIMATE SCENARIO: A CASE STUDY OF PURSLANE

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Sustainable food production or food security is very much important for meeting the UN-Sustainable Development Goals. Globally, most of the food supply comes from cereals and these cereals are highly sensitive to changing climatic and weather conditions. Therefore, climate resilient underutilized local crops may be a good option before scientist and farmers. As it requires very less natural resources and can be considered as potential crops for dietary diversification. In this background, the present review on *Portulaca oleracea* L. commonly called Purslane, having remarkable nutritional, medicinal, and pharmacological and phytoremediation properties shows significance. It is a highly nutritious and having all essential minerals, vitamins and proteins. It contains dietary minerals like potassium, magnesium, calcium, phosphorus, iron etc. There are four different types of omega-3 fatty acids found in Purslane. This is required for normal health, development and prevention of numerous cardiovascular diseases, and maintenance of a healthy immune system. Purslane (*Portulaca oleracea* L.) species is highly nutritious and can be easily cultivated in tropical, subtropical and temperate regions of the world. Since this plant is wild in nature, does not require much agronomic skills and can be easily cultivated so it can be an ideal substitute for resource-poor farmers in developing region and also good under changing climatic condition.

Keywords: Purslane, underutilized plant, food security, nutritional security

ESCC: 80.

MECHANIZATION WITH RENEWABLE ENERGY – A REVIEW

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Mechanization should not do on the price of our environment. Definitely, energy is essential for farming. We are trending to mechanize the farming system. In this way we are using our resources at tremendous level which leads to environmental deterioration. To make agriculture more developed we have to focus to use the renewable energy at our farms. This study is focus on reviewing the renewable sources used for agriculture practices, their limitation and future scope in India. The world energy forum had predicted that coal, gas and fossil based oil will be end in next 100 years completely. Renewable energy supplies 18% of the world final energy consumption (ogunlade 2018). Renewable source includes biomass, geothermal, solar, wind, hydropower and fuelwood. Population in India is growing at very fast rate of 1.58% annually. This leads to the more need of energy by which insecurity in future increases. A way to tackle this problem is to increase the use of renewable energy in our farms. Engineers, inventors, companies should developed the farm machine that works on renewable energy. There is need to modify or replace the machine that works on nonrenewable energy. If the mechanization on farm increases with the use of renewable energy then we are putting one step towards to save our environment. It automatically leads to save us from climate change. There are many studies shows that use of machine works on renewable energy at farm has excellent result and good for our environment.

Keyword: renewable energy, mechanization, climate change, environment.

ESCC: 81.

SNDTWU: TOWARDS A CLEAN AND GREEN FUTURE

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The research paper proposed the initial steps to deal with solid waste (food waste and garden waste) generated in the campus of SNDT university. To deal with the leftover food waste ,produced on daily basis in the canteen and hostel mess of the campus researcher started an awareness program followed by practical session of demonstration of composting process in the campus with the help of stakeholders of university .There are two campus of SNDTWU in Mumbai .one is situated in the juhu and one is situated in churchgate. Both the campus is big enough to host 4000 to 5000 visitors per day. The experiment was carried out in the campus of juhu as a pilot project.

This project makes an attempt to draw the attention of stakeholders of campus towards the steps that can be helpful in conservation and protecting the campus environment and converting the existed conventional campus into a sustainable campus. The experiment took four months to show a positive result of minimizing solid waste. Till now approximately 2000kgs of food waste and 1000 kgs of garden waste has been used in composting. After successful completion of pilot project of composting, now it has taken a full-term project in campus to deal with the solid waste management. With the help of awareness program now the staff of canteen and mess are fully aware about how to segregate the dry and wet waste and self-encouraged to protect the in-house environment.

Keywords: Sustainable campuses, Sustainability, Solid waste management, waste segregation.

ESCC: 82.

SITE-SPECIFIC NUTRIENT MANAGEMENT IN SOYBEAN UNDER MID-HILL CONDITIONS OF HIMACHAL PRADESH

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A field experiment was conducted during the rainy season of 2018 at CSK Himachal Pradesh Krishi Vishyavidyalaya, Palampur, to study the effect of site-specific nutrient management on growth, yield and profitability of soybean (*Glycine max* L). The experiment was laid out in randomized block design comprising of seven treatments [T₁ - N₄₃P₄₃K₅₀ (SSNM), T₂ - N₄₃P₄₃K₀ (T₁-K omission), T₃ - N₄₃P₀K₅₀ (T₁-P omission), T₄ - N₀P₄₃K₅₀ (T₁-N omission), T₅ - N₂₀P₆₀K₄₀ (RDF), T₆ - FYM@5t/ha (Farmer's Practice) and T₇ - N₀P₀K₀ (control)]. Fertilizers were applied as per the treatments in each experimental plot at the time of sowing. Nitrogen, phosphorus and potassium were applied through urea, single super phosphate and muriate of potash, respectively. Experimental site was silty clay loam in texture, acidic in reaction, low in available nitrogen, and medium in available phosphorus and potassium. Significantly higher plant height, dry matter accumulation, absolute growth rate, relative growth rate, crop growth rate and dry matter efficiency were recorded in T₁ (SSNM) which was at par with RDF (Recommended dose of fertilizer) and Farmer's Practice. The highest seed yield (1988kg/ha), gross return (Rs 82661/ha) and net return (Rs 45864/ha), benefit cost ratio (2.25) and profitability (Rs 367/ha/day) was recorded in SSNM. Omission of nutrients significantly reduced yield and profitability of soybean. The treatment, N₄₃P₄₃K₅₀ proved to be the best treatment for enhancing yield and profitability of soybean under mid-hill conditions of Himachal Pradesh.

ESCC: 83.

INTREGATED NUTRIENT MANAGEMENT IN OAT AND ITS EFFECT ON SUCCEEDING FODDER MAIZE CROP

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The different varieties of oat gave different response towards the growth parameters of oat crop like plant height, tillers m⁻¹ row length, number of joints and leaves plant⁻¹, leaf area index, root dry weight and dry matter accumulation plant⁻¹ with the successive growth stages. The results indicate that the variety JHO 822 of oat resulted significantly maximum in most of the growth parameters at 50% flowering stage but it was at par with variety JHO 851. The lowest growth parameters were found with variety Kent during both the years.

Number of plants m⁻², plant height, 1000-grain weight and grain yield of maize affected significantly by different nutrient management treatments given to previous oat crop. More number of maize plants m⁻², plant height, 1000-grain weight were noted in plots previously treated with 75 % of RDF + Vermi Compost + *Azotobactor* which was statistically equal to that of 50 % of RDF + Vermi Compost + *Azotobactor* followed by 75 % of RDF + Vermi Compost. Thus, it can be concluded that the application of 75 % of RDF + Vermi Compost + *Azotobactor* along with variety JHO 822 not only enhanced the fodder yield, its quality and net returns but also improved the soil health.

ESCC: 84.

ACHIEVING SUSTAINABLE AND HOLISTIC PRODUCTION IN HORTICULTURE THROUGH ORGANIC FARMING

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After green revolution, the agriculture production has increased to many fold but the fertilizer and pesticide consumption has also increased substantially. Pesticide and fertilizer residues persist in the soil which is harmful to the beneficial soil micro-organisms and earthworms and thereby resulting in degradation of soil health. Therefore the time has come to switch over towards organic methods for sustainable and holistic production. Organic horticulture is the science and art of growing fruits, vegetables, flowers, or ornamental plants by following the essential principles of organic agriculture in soil building and conservation by use of organic wastes along with beneficial microbes (bio-fertilizers) to release nutrients to crops for sustainable production. It often takes place over extended periods of time with sustainable and holistic approach. Principally, animal manures, compost, green manures, bio-fertilizers, mixed organic fertilizers are used in organic farming. VAM (Vesicular Arbuscular Mycorrhiza) solubilises phosphorus for greater availability to the plants. Potassium is provided by wood ash, sea weeds and tobacco stem. Besides, the permanent mulching layer reduces the potassium leaching. Lime is applied 2-3 months before planting to correct soil acidity. Organic pest control includes encouraging predatory beneficial insects to flourish and eat pests, encouraging beneficial microorganisms, crop rotations, trap crops and using insect traps. Disease management includes use of *Trichoderma* for seed treatment, use of resistant varieties, use of disease free planting materials. Organic farming helps in rejuvenating the degraded soil and ensures sustainability of crop production.

Keywords: Horticulture, Organic Methods, Sustainable, Production.

ESCC: 85.

IDENTIFICATION OF CONTINGENT CROPS FOR DELAYED SOWING UNDER CHANGED CLIMATE IN DRYLAND AGRICULTURE

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A field experiment was conducted during *kharif* 2018 on “Identification of contingent crops for delayed sowing under changed climate in dryland agriculture” at Dryland Agriculture Project Unit, All India Coordinated Research Project (AICRP) on Dryland Agriculture, University of Agricultural Sciences, GKVK, Bengaluru, Karnataka. The experiment comprised of two factors laid out in Factorial Randomized Complete Block Design (FRCBD) with three replications. Treatments consisted of two factors. *i.e.*, sowing windows and crops. Sowing window consists of August 2nd fortnight, September 1st fortnight and September 2nd fortnight and the crops were foxtail millet, finger millet, field bean, french bean and quiona. Date of sowing decides the availability of weather conditions mainly temperature, light and humidity to the plants which have great influence on expression of growth characteristics in plants. Delayed dates of sowing caused drop in growth parameters which may be due to unfavorable weather conditions to the plants as well as high temperature which might have caused in lower rate of photosynthesis and reduced accumulation of food materials. Among the contingent crops and delayed sowings in *kharif* season under dryland condition, french bean is the most efficient contingent crop suitable for delayed sowings during August 2nd

fortnight, September 1st fortnight and September 2nd fortnight for obtaining higher vegetable yield (2394, 1822 and 1150 kg ha⁻¹, respectively) and rain water use efficiency (14.08, 10.98 and 8.16 kg ha-mm⁻¹, respectively). French bean is the best contingent crop suitable to dryland condition to obtain higher finger millet equivalent yield (1789 kg ha⁻¹), net returns (₹ 33191 ha⁻¹) and B C ratio (2.62) compared to field bean, finger millet, foxtail millet and quinoa.

ESCC: 86.

SUSTAINABLE AGRICULTURAL DEVELOPMENT IN CHANGING GLOBAL SCENARIO

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Sustainable development is the pathway to the future we want for all. In order to give a new direction to agriculture, education provides perspective to farming entrepreneur who transforms food, farming into tools for equitable food system. Market extension is a way of fulfilling needs of poor marginalised farmer and women. This research includes options for providing and financing agricultural advisory services, along with extension services. These extension methods are used as a means of using agriculture as engine of pro-poor growth, environmental degradation, climate change etc. This research focuses on an ideal model which is economically remunerative for farmers while ensuring social sustainability and climate resilient environment for the operation. For the purpose of promotion of sustainability in agribusiness green supply chain is presented which reduces cost and generates investor's interest. The concept of 'triple bottom line' is also covered which emphasis on people and planet. The above research is headed towards the idea of prosperous, unique, and smart sustainable development which occurs as a result of newly invented technologies, effective government policies, and balanced economic scenario.

ESCC: 87.

SOIL AND WATER MANAGEMENT FOR CLIMATE SMART AGRICULTURE

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Climate smart agriculture is an integrated approach for managing landscapes, cropland, livestock, forests and fisheries that address the interlinked challenges of food security and climate change. It is a type of agriculture that sustainably increases productivity, enhances resilience (adaptation), reduces or removes GHG's (mitigation) where possible and enhances achievement of national food security and developing goals. With the degradation of our natural resources, soil and water have become a matter of serious concern for the farmers, researchers, academicians, scientists and policymakers as these in turn affect issues like upliftment of rural people, food, security, and livelihood. The high level of pressure on water resources has had serious repercussions for water users and the environment. Competition over water use is growing in river basins where there are no measures in place for arbitrating conflicts. Consequently, aquifers are being depleted in countries with key agricultural production system including China, India and USA. Knowing the status and the potential of soil resources is fundamental for making decisions about sustainable soil management practices that can contribute to climate smart land use. Nuclear techniques are making significant contributions to climate smart agriculture by helping to combat soil erosion, improve soil fertility and crop yield. Healthy soils provide global community with the space to increase the awareness and understanding of the importance of soil for food security and essential ecosystem functions. Managing soils is key to addressing climate change. Advanced water irrigation techniques have improved the lives of

pastoral communities. Nuclear techniques that measure will water and fertilizer use efficiency, enabling farmers to work out exactly how much water and nutrients to use and when. Isotopic techniques allow us to recongrhut past climate and environmental conditions in order to better project the future climate patterns against agriculture.

Keywords: Green House Gases, United States of America

ESCC: 88.

***Klebsiella. aerogenes* AS AN PROMISING BIOFERTILIZER FOR GROWTH PROMOTION OF OAT CROPS (*Avena sativa* L) EXPOSED TO DROUGHT STRESS**

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Climate change along with increasing global population has become a worldwide challenge not only to feed the increasing population but also to maintain the soil health. There is a need to intensify agricultural production in a sustainable way and to find solutions to combat abiotic and biotic stress situations. The application of plant growth promoting rhizobacteria (PGPR) in agro ecosystems has emerged as an opportunity to get better crops yields under limited resources with higher efficiency. PGPR's are group of useful microorganism that colonize plant rhizosphere and increase growth by their various direct and indirect effects on plants. In the present study, 30 bacterial strains were isolated from rhizospheric soil of black gram, rice and wheat crops growing in Uttar Pradesh and Madhya Pradesh. Plant growth promoting traits selected for screening bacteria were phosphate solubilization, indole acetic acid (IAA) production, ammonia production, HCN production and extra cellular enzyme production like amylase and catalase. PGPR isolates was optimized under different temperature and pH. Out of the 30 isolates, 3 isolates viz *Klebsiella aerogenes*, *Serratia marcescens* and *Enterobacter cloacae* were found to be promising for the plant growth promoting attributes. The isolates were then tested on *Avena sativa* (Haritika RO-19) exposed to drought stress. The effects of PGPR inoculation was observed for seed germination, vigor index, leaf area and relative water content (RWC) respectively. Among all the three bacterial strains tested *K. aerogenes* showed promising results augmenting the seed germination by 60%, vigour index by 226% and leaf area by 148%. The RWC was found highest to be 18% in *K. aerogenes* treated plants as compared to untreated plant. PGPR treated plants had significantly high chlorophyll content and proline content. Maximum chlorophyll content was observed in *K. aerogenes* (5.34 mg/ml) followed by *E. cloacae* (4.19 mg/ml) and *S. marcescens* (3.89 mg/ml) while lowest was recorded in control (2.69 mg/ml). Maximum proline content was observed by *K. aerogenes* (11.54 mg/ml) followed by *S. marcescens* (9.89 mg/ml) and *E. cloacae* (10.46 mg/ml) while untreated plant it was 7.89 mg/ml. *K. aerogenes* can be used as a potential biofertilizers in crop management and protect crops under water stress.

ESCC: 89.

AN OUTLINE OF THE CURRENT STATUS OF CARBON DIOXIDE CAPTURE AND STORAGE TECHNOLOGIES

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Global warming and climate change concerns have triggered global efforts to reduce the concentration of atmospheric carbon dioxide (CO₂). Carbon dioxide capture and storage (CCS) is considered a crucial strategy for meeting CO₂ emission reduction targets. In this paper, various aspects of CCS are reviewed and discussed including

the state of the art technologies for CO₂ capture, separation, transport, storage, leakage, monitoring, and life cycle analysis. The selection of specific CO₂ capture technology heavily depends on the type of CO₂ generating plant and fuel used. Among those CO₂ separation processes, absorption is the most mature and commonly adopted due to its higher efficiency and lower cost. Pipeline is considered to be the most viable solution for large volume of CO₂ transport. Among those geological formations for CO₂ storage, enhanced oil recovery is mature and has been practiced for many years but its economical viability for anthropogenic sources needs to be demonstrated. There are growing interests in CO₂ storage in saline aquifers due to their enormous potential storage capacity and several projects are in the pipeline for demonstration of its viability. There are multiple hurdles to CCS deployment including the absence of a clear business case for CCS investment and the absence of robust economic incentives to support the additional high capital and operating costs of the whole CCS process.

Keywords: Post Combustion, Pre Combustion, Oxyfuel Combustion, Geological storage, Leakage and monitoring

ESCC: 90.

COMPARATIVE PRODUCTION POTENTIAL OF FORAGE BASED CROPPING SEQUENCES AND THEIR ECONOMIC FEASIBILITY IN WESTERN PLAIN ZONE OF U.P.

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The field experiments was conducted during 2016-17 at Crop Research Centre (Chirauri) of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (U.P.) to evaluate the comparative production potential of forage based cropping sequences and their economic feasibility in western plain zone of U.P. and chemical properties of soil. The experiment was conducted in randomized block design with replicated four times with 06 forage based cropping sequences viz., Sorghum(F) –Berseem - Maize(F) + Cowpea(F), Sorghum(F) + Guar(F) - Oat(F) - Maize(F) + Cowpea(F), Sorghum(F) + Cowpea(F) - Barley(F) - Maize (F) + Cowpea(F), Rice - Wheat - Maize(F) + Cowpea(F), Rice – Berseem - Sorghum(F), Sorghum (F) + Cowpea(F) – Wheat - Sorghum(F) + Cowpea(F). Among six crop sequences tested Sorghum (F) – Berseem - Maize(F) + Cowpea(F) cropping sequence led to record the maximum productivity (2019.57 q/ha/year) in terms of berseem equivalent yield as well as production efficiency of (8.20 q/ha/day). Rice – Wheat – Maize (F) + Cowpea(F) obtained minimum berseem equivalent yield (1136.71 q/ha/year) and production efficiency of (3.64 q/ha/year), but it recorded maximum (85.479%) land use efficiency. Sorghum (F) + Cowpea (F) - Barley(F) - Maize(F) + Cowpea(F) crop sequence registered minimum (58.082%) land use efficiency. Total dry matter yield was found maximum under Sorghum (F) – Berseem – Maize (F) + Cowpea (F) (420.60 q/ha) and minimum in crop sequence Sorghum (F) + Cowpea (F) – Wheat – Sorghum (F) + Cowpea(F) (250.66 q/ha). Total protein yield was recorded highest in crop sequence of Sorghum (F) - Berseem - Maize(F) + Cowpea(F) (38.40 q/ha) where as lowest in Sorghum(F) + Cowpea(F) – Barley(F) - Maize(F) + Cowpea(F) (19.40 q/ha) crop sequence. Crop sequence Sorghum (F) – Berseem - Maize(F) + Cowpea(F) recorded the maximum uptake of N (620.55 kg/ha) where as minimum uptake of N was noted with Sorghum(F) + Cowpea(F) - Wheat - Sorghum(F) + Cowpea(F) (283.68 kg/ha). Total uptake of P was noticed maximum in Rice – Berseem – Sorghum (F) (144.24 kg/ha) and minimum in Sorghum (F) + Guar(F) – Oat(F) – Maize(F) + Cowpea(F) crop sequence (52.12 kg/ha). Uptake of K was highest in Sorghum (F) – Berseem – Maize (F) + Cowpea(F) (608.68 kg/ha) and lowest in Sorghum(F) + Cowpea(F) – Wheat – Sorghum(F) + Cowpea(F) (253.50 kg/ha).

Based on data pertaining to changes in soil properties after completion of crop cycle of various crop sequences were safe to maintain the soil properties. But continuous sorghum cropping gave an indication for depletion of organic carbon in the soil after completion of cycle of the rotation. The enhancement in fertility status of soils may be attributed to inclusion of legumes in all crop sequences.

ESCC: 91.

GROWTH, PRODUCTIVITY AND ECONOMICS OF MAIZE VARIETIES (*ZEA MAYS* L.) AS INFLUENCED BY NITROGEN SCHEDULING AND METHODS OF APPLICATION UNDER RAINFED CONDITION

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A field experiment was conducted at research farm of IFSR Project, College of Agriculture, Indore, (M.P.) during *Kharif*-2018 has two factors, laid out in factorial randomized block design and replicated thrice. The first factor was variety which consist two levels i.e. V_1 (JM 216) and V_2 (JM 218) and the second factor was N scheduling and application methods which consist six levels namely N_1 - 33.3% N at sowing (S) + 33.3% N at knee high stage (KN) + 33.3% N at tasseling stage (T), N_2 - 50% N at S + 25% N at KN + 25% N at T, N_3 - 25% N at S + 50% N at KN + 25% N at T, N_4 - 25% N at S + 25% N at KN + 25% N at T + 25% N at silking stage (Si), N_5 - 33.3% N at S + 33.3% N at KN + 1% N foliar spray (FS) at 40 DAS + 32.3% N at T and N_6 - 25% N at S + 25% N at KN + 1% N FS at 40 DAS + 25% N at T + 24% N at Si. The results indicated that, the maize variety JM 218 was found promising since it recorded maximum value of growth parameters (plant height, dry matter, LAI and CGR), yield attributes (cob length, number of grain rows cob⁻¹ and test weight), grain yield (6139 kg ha⁻¹), stover yield (11107 kg ha⁻¹), economic nitrogen use efficiency (ENUE), net returns (Rs 90662 ha⁻¹) and B:C (3.52). Among the different N scheduling and application methods, N_5 achieved higher values of growth parameters, yield attributes, ENUE and produced maximum grain yield (6197 kg ha⁻¹), stover yield (11207 kg ha⁻¹) and fetched more net income (Rs 91553 ha⁻¹) and B:C ratio (3.52) followed by N_6 . It could be concluded that the maize variety JM 218 grown with N_5 N scheduling and application methods would be more profitable compared to others combinations under rainfed condition.

Keywords: N scheduling, economic N use efficiency, profitable, rainfed

ESCC: 92.

STRATEGIES FOR EFFICIENT WATER USE AND CONSERVATION AGRICULTURE

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Water is a grower's second most important resource. It makes sense to exchange management and labor for water use efficiency. Because irrigation districts must keep their systems charged with water, these practices have a greater impact as more growers use them. There are some of the approaches for efficient water use like avoid over irrigation i.e., eliminate deep watering of shallow-rooted crops such as onions and beans. Frequent, light irrigations help keep water and mobile nutrients in the root zone where plants can use them. Schedule irrigations based on evapotranspiration (ET), Use ET charts from the Bureau of Reclamation AgriMet system. Schedule irrigations based on soil water content, Use soil-moisture monitoring equipment to measure how much moisture is in the soil. Use deficit irrigation It means the irrigation that applies less water than the crop needs for full development. Practice conservation tillage, like minimum tillage, no till helps to conserve soil water. Use surge irrigation during the first annual furrow irrigation. Use alternate-row irrigation; irrigate one side of a bed on one irrigation and the other row or side on the next. Consider switching to sprinkler irrigation or drip irrigation. Both allow you to manage water more efficiently and apply it to the depth needed.

In many countries, intensive crop production has depleted the soil, thus jeopardizing our ability to maintain

future production. Conservation Agriculture can enhance productivity of farmland. Conservation Agriculture is based on three main principles. I) Continuous minimum mechanical soil disturbance with direct seeding (i.e. no-tillage). The disturbed area must be less than 15 cm wide or less than 25% of the cropped area (whichever is lower). Mechanical disturbance should be limited to the purpose of placing seed or fertilizer. This fights against soil erosion and preserves soil organisms. ii) Permanent soil organic cover with crop residues and/or cover crops to the extent allowed by water availability. Ground cover is measured immediately after the direct seeding operation, and the area should have over 30% cover. This allows the retention of a protective layer of vegetation on the soil surface to suppress weeds, protect the soil from the impact of weather and avoid soil compaction. iii) Species diversification through varied crop sequences and associations involving at least three different crops. A well-designed crop rotation promotes good soil structure, fosters a diverse range of soil flora and fauna that contribute to nutrient cycling and plant nutrition.

ESCC: 93.

IMPACT OF CLIMATE RESILIENT TECHNOLOGIES ON INDIAN AGRICULTURE – A REVIEW

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Change in climate is likely to aggravate the problems of future food security by exerting pressure on agriculture. India is more vulnerable in view of the high population depending on agriculture, excessive pressure on natural resources and poor coping mechanisms. In India, significant negative impacts have been implied with medium-term (2010-2039) climate change, predicted to reduce yield by 4.5 to 9 per cent, which is roughly up to 1.5 per cent of GDP per year (Venkateswarlu et al, 2013). Rainfed agriculture which constitutes nearly 58 per cent of net cultivated area will be the most impacted. Therefore, it is of utmost importance to enhance resilience of agriculture to climate change through planned adaptation. With this background, ICAR has launched a major network project, National Initiative on Climate Resilient Agriculture (NICRA), during 2010-11 in 100 vulnerable districts to undertake strategic research on adaptation and mitigation, fill critical research gaps, demonstrate technologies on farmers' fields to cope with current climate variability and capacity building of different stakeholders.

Keywords: Climate resilient technologies, Climate change

ESCC: 94.

ADOPTION OF SALINE SOIL MANAGEMENT PRACTICES BY THE FARMERS: A WAY TOWARDS SUSTAINABLE AGRICULTURE

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The present study was conducted in Belagavi district of Karnataka state during 2017-18 to measure the adoption of saline soils management practices by the farmers. A sample of 150 respondents was purposively selected from Saundatti, Ramdurg and Athani taluks of Belagavi district by using random sampling method. The data was collected by personal interview method with help of structured schedule. The results revealed that more than two fifth of farmers (42.67 %) were belonged to medium adoption category with respect to saline soils management practices whereas 36.00 and 21.33 per cent of them were in low and high adoption category. Large majority (80.00 %) of the farmers have adopted surface drainage practice followed by 69.33 per cent of the farmers have adopted the practice of growing salt tolerant crops. More than half (60.00 %) of the farmers have followed construction of bunds for impounding water whereas 42.67 per cent of farmers have followed leveling of land. Due to adaptation of these

practices, it is possible to avoid the stagnation of water in the field. This leads to overcome the problem of salinity. Only 41.33 per cent of the farmers have adopted sub-surface drainage. The probable reasons might be that, high initial cost and requirement of specific technical knowledge inhibited them from adopting this method. Hence, awareness has to be created among the farming community through various extension tools like literature, magazines and demonstrations which are contributed in order to achieve sustainable agriculture.

Keywords: Salinity, Surface drainage, Sub-surface drainage, Adoption

ESCC: 95.

CLIMATE CHANGE AND ITS IMPACT ON INDIA

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Climate change is, in theory, the perfect topic for global discussion. It is a growing global problem and concern, calling for concerted efforts by the developed as well as developing countries. The chief factor that is responsible for the climate change is the "greenhouse effect". The extra greenhouse gases (GHG) – India ranking 4th in GHG emission – which we have released – are responsible for the strongest threat namely the "global warming". Global warming is projected to have far-reaching and intense impacts on conditions affecting agriculture, including temperature, carbon dioxide, glacial run-off, precipitation and the interaction of these elements. Already the effects are visible, making many people, especially those dependent on agriculture, vulnerable. Concerns about the impact of climate change on agriculture connected with environmental problems are among the major developmental issues in India today. The Gangotri glacier is already retreating at a rate of 30 metres a year. An increase in rainfall is simulated over the eastern region of India but the north-western deserts may see a small decrease in the absolute amount of rainfall. Diseases for human, crops and animals are on the rise. There is risk of continuous fall in productivity and production. Climate change and vulnerability have physical, financial and ethical implications. Sustainable development needs climate stabilisation. The objectives of this paper are – one to analyse the impact of climate change on Indian agriculture, and two, to suggest strategies and actions to mitigate the problem and the challenges ahead. Our emphasis is on civic response that combines international policy agreements with autonomous and local efforts in keeping with geo-political and economic conditions. It seeks to integrate knowledge (including research) and action for and by the people at the levels of farming as well as framing policies.

Keywords: Agriculture, civic response, climate change, global warming, vulnerability

ESCC: 96.

IMPACT OF CARBON SEQUESTRATION ON SOIL HEALTH

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Carbon in excess amount in atmosphere as a form of CO₂ is dangerous, Agricultural practices that remove carbon from the soil include tilling agricultural fields, leaving land fallow after harvest, and under fertilizing fields, than increase the concentration of CO₂ in to the environment may causes global warming and losses in agricultural productivity. Removing CO₂ from the atmosphere is only one significant benefit of enhanced carbon storage in soils. Carbon accumulation in agricultural soils can be accelerated by no till farming practices, planting cover crops, rotating crops, conservation tillage, crop planning also adopting the INM strategy is essential to SOC sequestration. The humification process can be severely constrained by the lack of N, P, S and other building blocks of soil humus and other conservation practices. Soil carbon sequestration refers to the process of transferring carbon from the

atmosphere into the soil through plant residues where it is retained for a substantial period of time. Carbon in excess amount in soil is beneficial mitigates global warming, contribute to increased biomass, improved soil health and function, including nutrient cycling, water infiltration, soil moisture retention as well as water filtration, improved soil and water quality, decreased nutrient loss, reduced soil erosion, increased water conservation, ultimately enhance agricultural productivity, hence carbon sequestration is important. So our main aim is to study the impacts of land use and land management on soil carbon sequestration and ways to increase the storage time of carbon in the soil.

Keywords: Global warming, carbon sequestration, soil quality. Soil health

ESCC: 97.

RESPONSES OF CROP PLANTS TO BIOTIC AND ABIOTIC STRESS

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Agricultural productivity depends on increasingly extreme weather phenomena and the use of germplasm that has to be continuously improved by plant breeders to become tolerant to various biotic and abiotic stresses. Molecular plant biologists try to understand the mechanisms associated with stress responses and provide knowledge that could be used in breeding programs. To provide a partial overview about our current understanding about molecular and physiological stress responses and how this knowledge can be used in agriculture, we have edited a special issue on “Biotic and Abiotic Stress Responses in Crop Plants”. Contributions are from different fields including heat stress responses, stress responses during drought and salinity, as well as during flooding, and resistance and susceptibility to pathogenetic stresses and about the role of plant functional metabolites in biotic stress responses. Future research demand in particular areas of crop stress physiology is discussed, as well as the importance of translational research and investigations directly in elite crop plants and in the genetic resources available for breeding. Stress-related metabolic alterations occur in plants in a genotype-specific manner. Therefore, metabolic changes can be used in targeted breeding for specific agronomic traits.

Keywords: Heat and Drought stress; Salinity; Flooding; Plant immunity; cereals; secondary metabolites; signaling; stress hormones

ESCC: 98.

NEED OF NATURAL RESOURCE MANAGEMENT AND CONSERVATION AGRICULTURE IN INDIA

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Fresh water, clean air, healthy soils, and a thriving ecosystems are a cornerstone of sustainable agriculture systems. Explore best practices to ensure conservation of natural resources. Natural resources (land, water, biodiversity and genetic resources, biomass resources, forests, livestock and fisheries)—the very foundation of human survival, progress and prosperity, have been degrading fast, and the unprecedented pace of their erosion is one of the root causes of the agrarian crisis that the country is facing. The demographic and socio-economic pressures notwithstanding, the unmindful agricultural intensification, over use of marginal lands, imbalanced use of fertilizers, organic matter depletion and deteriorating soil health, extensive diversion of prime agricultural lands to non-agricultural uses, misuse and inefficient use of irrigation water, depleting aquifers, salinization of fertile lands and water logging, deforestation, biodiversity loss and genetic erosion, and climate change are the main underlying causes. Of the country's total 142 m ha cultivated land, 57 m ha, 40 per cent of the total is irrigated and the remaining 85 m ha is rainfed. Of the total geographical area of 329 m ha, about 146 m ha is classified as degraded, although varying

estimates have been provided by different agencies. The soil health has been deteriorating, especially widespread micro-nutrient deficiencies like hidden hunger) and fast depleting carbon content, resulting in low and decelerated TFP growth rates.

Conservation agriculture (CA) technologies involve minimum soil disturbance, permanent soil cover through crop residues or cover crops, and crop rotations for achieving higher productivity. Conservation agriculture is very important practice to reduce the cost of cultivation and natural resources of any crop. It was observed that 25-30 % cost taken in land preparation than other operation that can be reduced only by using high conservation tillage practice like adopting of zero tillage, minimum tillage, happy seeder, laser leveler etc. Continuing using of heavy machine and improper agricultural practices caused of soil degradation and impact on environment losses can be rectified by only conservation agriculture practices. The objective is to leave as many residues as possible in order to increase soil organic matter and to spread them as evenly as possible. Especially in environments where decomposition is fast and where the amount of residues is low it is not recommended to chop the residues. Conservation agriculture crop can be increased climatic resilience, food security, soil nutrition, energy reduction and income. Presently farmers are facing the problem of labour shortage and drudgery of farming these are all can be reduced by conservation tillage practice.

Keyword: conservation, tillage, biodiversity, biomass

ESCC: 99.

BIODIESEL AS AN ALTERNATIVE FOR TRANSPORTATION FUEL

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The need of energy increases day by day. We know that the conventional sources of energy are limited, so we have to find different option. Biodiesel has become the substitution fuel and it is an alternative fuel for diesel engine. Biodiesel is the monoalkyl esters of vegetable oils or animal fats. Biodiesel is the best for diesel fuels in diesel engines. The environmental friendliness is the biggest advantage of biodiesel over gasoline and petroleum diesel. On the other hand, biodiesel most likely has better efficiency than gasoline. The fuel for compression-ignition engines that exhibit great potential is biodiesel. For minimizing the biofuel cost, in recent day waste cooking oil was used as feedstock. Biodiesel is now mainly being produced from different vegetable oils such as soybean, rapeseed and palm oils. The HHVs of biodiesel (39-41 MJ/kg) is slightly lower than that of gasoline (46 MJ/kg) and petroleum (42MJ/kg), but higher than coal (32-37MJ/kg). In this review we focus on the present status and future scope of the biodiesel. Feedstock is the major economic factor that consider for input costs of biodiesel production, which is about 80% of the total operating cost. There is need to promote the production and utilization of biodiesel through the agricultural policy of subsidizing the cultivation of non-food crops, due this implantation plan we can maintain better position in biodiesel production which can reduce the impact on conventional fuel.

Keywords: Biodiesel, environment, conventional.

ESCC: 100.

CUSTOM HIRING SERVICES OF FARM MACHINERY IN INDIA

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Average operational land holding size in the country is estimated at 1.08 ha. About 80% of the land holdings are operated by small and marginal farmers owning <1 and 1-2 ha holdings, respectively. These farmers cannot invest

in costly farm machinery and depend on hiring of implements to carryout agricultural operations in their fields. Farm Mechanization is the process of developing machines and substituting this machine power for human and animal power in agriculture and allied production practices. Proper utilization of farm machineries saves 20-30 per cent time, 15-20 per cent seeds and fertilizers, 20-30 per cent labour and increase in cropping intensity to about 5-20 per cent. Some of the schemes which promote farm mechanization are Macro Management of Agriculture, Rashtriya Krishi Vikas Yojana, National Mission on Agricultural Mechanization and Sub-Mission on Agricultural Mechanization. Custom hiring enables farmers to rent the appropriate equipment, often along with someone to operate it, for a defined period of time only, thus only paying for the services of the machine without having to own it. Fixing of hiring charges is done by Districts Implements committee. The extent of adoption of farm machinery depends upon several factors such as labor markets, cropping pattern, agrarian structure (land holding, rural infrastructure), level of farm intensification, access to market, etc.

Keywords: Farm Mechanization, Custom Hiring, Modernization of agriculture.

ESCC: 101.

A LAND DEGRADATION CONTROL AND MITIGATION APPROACH THROUGH AGROFORESTRY

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Land degradation is a major concern on matters relating to sustainable agriculture development and long term food productivity. Not with standing others, factors, and degradation in most countries has been driven disparities in land distribution. This has led to concentration of people on limited portions of land and the need to address their development needs and issues of food security. The degradation of soil has been further exacerbated by the subsequent increase in population. Soil degradation decline in its capacity to support functions and provides eco system service is caused by accelerated erosion, salinization, elemental imbalance, acidification depletion of soil organic carbon (SOC), reduction in soil biodiversity, and decline in soil structure and tilth . Direct causes of land degradation is deforestation, shifting cultivation, over grazing, excessive use of agrochemicals and also the under laying causes of land degradation is increasing population, urbanization, mining, etc. Various processes of land degradation are vegetation degradation, water erosion, wind erosion, water logging, salinity or alkalinity, man-made, etc. which leads to the loss of fertility of soil. Agroforestry which is an old practice, but new science helps to mitigate these land degradation problem by promoting more efficient cycling of nutrient because tree root extent in to portion of the soil profile (B and C horizons) and extract nutrient that may not be accessible to annual crop root system. Leguminous tree species have also potential for soil fertility improvement by nitrogen fixation.

Keywords: Land degradation, wind erosion, water erosion, water logging, salinity, Agroforestry.

ESCC: 102.

RENEWABLE ENERGY FOR SUSTAINABILITY OF INDUSTRIES AND ENVIRONMENT

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Achieving solutions to environmental problems that we face and meeting the demand for energy requirement to industries, due to growing world population which is rapid and as of World Population Prospects 2019, by the UN,

in just next three decades will see today's figure of 7.7 billion people rise to 9.7 billion by 2050. For such rapid change in figures in quick succession of time not just requires renewable energy but long-term potential actions for sustainable development. All energy sources have some impact on our environment and intensity of impacts varies depending on the specific technology used, the geographic location, and several other factors. Fossil fuels (coal, oil, and natural gas) reported substantially more harm than renewable energy sources by most measures while electricity that are more clean and green source of energy. It is common source of fuel for industries and households but the most commonly used source for electricity production today is coal. According to the World Coal Association, 41% of all electricity is produced from coal, due to its abundance as fuel source that is relatively inexpensive to produce and conversion into useful energy. However, both producing and using coal affects the environment. Several principal emissions viz. sulphur dioxide, nitrogen oxides, carbon dioxide, particulates and several heavy metal including fly ash and bottom ash are the results from coal combustion that has significant impacts on the global climate change. The current prospective on minimizing the impacts of rapid climate change considering the energy requirement of industries is towards sustainable fuel specifically electricity generated from solar, wind, hydro and biomass. Each of them is renewable, but that doesn't necessarily make them sustainable. Sustainability is a very complex word and entails many aspects and determined by three different parameters: environmental sustainability, social sustainability and economic sustainability. Considering the need of hour and decades of research for some alternative, renewable, and Eco-friendly fuels that is sustainable, biodiesel plants are no less than boon. *Jatropha* (*Jatropha curcas*) which extensive use and production is gap filled by imports from other countries, despite bio-fuel policy adopted by the government through its bio-fuel mission launched in 2003 and 2007 in two phases did not evoke much success. On the other hand, Indian beech (*Pongamia pinnata*), a sustainable feedstock for biodiesel production potentially support the demand supply gap of renewable and sustainable energy, should be given a horticultural importance crop.

Keywords: Eco-friendly, fossil fuels, electricity, principal emissions and biodiesel

ESCC: 103.

IMPACT OF CLIMATE CHANGE ON INSECT PESTS – A REVIEW

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Climate change refers to any significant change in the measures of climate lasting for an extended period of time. The occurrence of climate changes is evident from increase in global average temperature, changes in the rainfall pattern and extreme climatic events. Insects are cold-blooded organisms where the temperature of their body is approximately the same as that of the environment. Therefore, temperature is probably the most important environmental factor influencing insect behaviour, distribution, development, survival, and reproduction. During rainy season, delay in onset of monsoons by 45 days results in delayed plantings of pigeon pea that are prone to damage by *Helicoverpa armigera*. *Nilaparvata lugens* population increases with increase in precipitation up to 400 ppm and decreases with a precipitation of more than 500 ppm. Castor grown under elevated carbon dioxide is less nutritious to insect pests like *Achaea janata* and *Spodoptera litura*. Hence in order to mitigate the effects of less nutritious food, these herbivores often consume more. Natural enemy and host insect populations may respond differently to changes in temperature. Hosts may pass through vulnerable life stages more quickly at higher temperatures, reducing the window of opportunity for parasitism. Like temperature, humidity can also impact on insect pest predators, parasitoids and diseases resulting in a complex dynamic. Fungal pathogens of insects are favored by high humidity and their incidence would be increased by climate changes that lengthen periods of high humidity and reduced by those that result in drier conditions.

Keywords: Climate change, Insect behaviour, Natural enemy, Environment

ESCC: 104.

SUSTAINABLE AGRICULTURE THROUGH ORGANIC FARMING IN INDIA

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Agricultural Sector, world over, has experienced a phenomenal growth since the mid-twentieth century. The growth, driven by Green Revolution technology, has made a significant dent on aggregate supply of food grains, ensuring food security to the growing population. The next stage of growth however, faces a serious challenge in terms of sustainability. India can safely be characterized as an agricultural country despite the recent spurt in manufacturing and services and the declining share of agriculture in the national income, since majority of its workforce (65%) are still engaged in agriculture and allied activities. Policies for sustainable agriculture and organic farming and possible actions in India are discussed. Organic agriculture can contribute to meaningful socioeconomic and ecologically sustainable development, especially in developing countries. This is due to the application of organic principles, which advocates the application of local resources viz., indigenous seed varieties, manure, etc. and therefore cost effectiveness. Organic farming is one of the several approaches found to meet the objectives of sustainable agriculture. Ecological friendly Organic farming is the answer to the problems being faced by agriculture in India today. It will also keep agriculture more sustainable. This form of agriculture conserves our soil and water resources, protects our climate, improves agro-diversity, ensures biodiversity, meets the demand for food and safeguards livelihoods. In brief, it ensures that the environment blooms, the farm is productive, the farmers makes a net profit and society has adequate nutritious food.

ESCC: 105.

ORGANIC FARMING IN UTTAR PRADESH

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In present time several reports suggests that the agrochemical, especially the chemical fertilizers are resulting in environmental degradation and health problems. So we need to aware for reduce chemical fertilizers because of chemical fertilizers and pesticides harmful for environment as well as on the human being therefore it is an urgent need for the developing state like Uttar Pradesh to shift to the organic agriculture from the existing inorganic agriculture. Organic farming is a holistic system designed to sustain the productivity and fitness of diverse communities within the agro-ecosystem including soil organisms, plants, livestock and people. Almost all the households are maintaining livestock producing sufficient quantity of on-farm manures can say every house hold is a mini integrated farming system model. Dependence of mid and high altitude farmers were on within farm renewable resources and prevalent varied agro-ecological zones. In addition to this, the state with 6.86 per cent forest cover thus has a vast resource of weed biomass, green manure and litter falls through forest species. Developments in organic farming over recent decades have included increased attention to building soil fertility, fine-tuning methods of pest management and emergence of certification organizations. In recent years, the most important step to promote in the organic farming in state to take a firm decision to development in organic agriculture in relation to the availability of financial, technological and infrastructural support from the centre to the village level. Therefore Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles.

Keywords: Organic farming, renewable, health, resource, opportunities.

ESCC: 106.

ALLELOPATHY FOR SUSTAINABLE AGRICULTURE

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To fulfill the requirement of growing population farmers has to adopt intensive agriculture techniques which results in more weed infestations. Allelopathy can be integrated with sustainable agriculture to reduce the weed problems. Imbalances in agriculture production resulted from monoculturing should be replaced by more ecological and sustainable cropping system. Amount of pesticides and agrochemicals used in agriculture can be reduced by the exploitation plant biological characteristics including allelopathy. Exploitation of allelopathic potential of different crops/plant species can be effectively used for weed management. Under field condition, sorghum has been reported to contain several allelochemicals in its aerial as well as underground parts. Water leachate of aerial parts of sorghum applied at 30 and 60 days after sowing can reduce weed biomass by 49% with concomitant increase of wheat yield over 20%. Barely contain alkaloid (Gramine and Hordenine) which inhibits the growth of white mustard (*Sinapis alba*). In addition to that hordenine affects the growth of Armyworm (*Mythimna convecta*), a noxious pest of barley and a fungal pathogen *Drechslera teres*. Alfalfa pellets when applied to rice field @100kg/1000m reduced weed biomass like watergrass (*Echinochloa oryzicola*), monochorea (*Monochoria vaginalis*) and smallflower umbrella sedge (*Cyperus difformis*). Intercropping of sorghum (*Sorghum bicolor*), sesame (*Seasmum indicum*) and soybean (*Glycine max*) in cotton (*Gossypium hirsutum*) field produced greater net benefits and a significant inhibitor on purple nutsedge (*Cyperus rotundus*) in comparison with cotton alone. Rye residue releases phytochemicals 2, 4-dihydroxy 1, 4(2H) benzoxazine-3-one (DIBOA), hydroxamic acid and 2(3H)-Benzoxalin, inhibit germination of Broad leaf weed. Sunflower residue reduced the number of dicotyledonous weeds by 60%. Commercial allelochemical like mestriene, citronella, bialaphos oil etc. are also available now days. So the knowledge of allelopathy has a significant role in the modern era of agriculture since it is an eco-friendly method.

Keywords: allelopathy, intercropping, weed, allelochemicals.

ESCC: 107.

RENEWABLE ENERGY FOR SUSTAINABILITY OF INDUSTRIES AND ENVIRONMENT.

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Now, more than ever, the world needs to ensure that benefits of energy are available to all and that energy is provided as cleanly, safely and efficiently as possible. Renewable energy has been deeply linked to the history of mankind and tied to its development. It is also considered as a clean source of energy and favourable use of these resources minimize environmental impacts, produce minimum secondary wastes and are sustainable based on current and future economics and social societal needs. Today's, renewable energy supply 14% of the total world energy demand. Large scale hydro-power supplies 20% of global electricity likewise wind power in coastal and windy region is promising source of energy. Renewable source of energy allow sustainable industrialization which drives human development from job generation to economic competitiveness. UNIDOS global mandate on "Inclusive and sustainable industrial development" aims at promoting sustainable and resilient economic and industrial growth for poverty reduction that goes hand in hand with economic, social and environmental dimension of sustainable development. Renewable energy provides good opportunity for mitigation of emission of green house gas and reducing global warming through substituting conventional energy sources.

Keywords: Renewable energy, Environmental impacts, Sustainable industrial development, Global warming.

ESCC: 108.

IMPACT OF FOREST FIRE ON ENVIRONMENT: ITS AWARENESS AND MANAGEMENT

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Forest fire is a common and one of the dangerous phenomena in the world and it is as old as the forest itself. The forest fires destroyed considerable forest/natural resources and its biodiversity and profound impact on climate change. It is degrading environment and affecting flora and fauna, cause soil erosion, floods, natural vegetation loss, loss of animals and birds. The recent Amazon forest fire disaster is one of the best examples regarding this. Amazon forest is called as the lungs of world contributing 20% Oxygen to the world. Based on forest inventory records (Forest Survey of India), 54.40% of forest in India are exposed to occasional fires in total forest area of 21.54%. As per FSI analysis, more than 90% of the forest fires in the country are human made activities. Integration of fire and people into land use systems is significant for its management. One of the needs for developing an adaptive management strategy is Integrated Forest Fire Management (IFFM) in which community can incorporate fire usage into sustainable land use and vegetation management systems. So, bringing environmental awareness is one of the vital roles through active involvement of local people for successful implementation of forest fire management programmes as forest fire is also responsible for enormous implication of human health and on the socio-economic system.

Keywords: Forest fire, Climate change, IFFM, Human made activities, Environmental awareness.

ESCC: 109.

EFFECT OF INDUSTRIAL WASTE COMPOST, FERTILIZER LEVELS AND BIOINOCULANTS ON GRAIN YIELD OF WHEAT

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The field experiment was carried out during the 2018-19 in *Rabi* season at institute of agricultural science, BHU agriculture farm, Varanasi to evaluate the effect of industrial waste compost, fertilizer levels and bioinoculants on wheat yield. The treatments consisted four fertilizer levels (control, 75% RDF of NPK, 100% RDF of NPK and 100% RDF of NPK + 5 kg Fe + 5 kg Zn) in main plot and nine combinations of industrial waste compost and bioinoculants (Carpet waste + *Trichoderma viride*, Carpet waste + *Azotobacter chroococcum*, Carpet waste + *Pleurotus sajor-caju*, Pressmud + *Trichoderma viride*, Pressmud + *Azotobacter chroococcum*, Pressmud + *Pleurotus sajor-caju*, Bagasse + *Trichoderma viride*, Bagasse + *Azotobacter chroococcum* and Bagasse + *Pleurotus sajor-caju*) in sub plot. The result indicated that the interaction effect of fertilizer levels and combinations of industrial waste compost and bioinoculants was observed significant on grain yield of wheat. The highest grain yield (5.19 t ha⁻¹) was observed in the 100% RDF of NPK + 5 kg Fe + 5 kg Zn treatment applied plot over the control (3.09 t ha⁻¹) plot. The percentage of increased in grain yield of treatment 100% RDF of NPK + 5 kg Fe + 5 kg Zn was 67.96% over the control plot. The treatment combination of 100% RDF of NPK + 5 kg Fe + 5 kg Zn and Carpet waste + *Trichoderma viride* was recorded highest grain yield (5.93t ha⁻¹) over the other treatment combinations.

Keywords: Pressmud, Bagasse, Carpet waste, Wheat, Bioinoculants

ESCC: 110.

DEVELOPMENT OF INDIAN AGRICULTURE IN CHANGING SCENARIO

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Today Agriculture is Largest private sector in our country over 110 million farmers. It engage a large portion of our country as it workforce which provide employment to about one third of total population .It contribute about 26 per cent of GDP. Production and Productivity rate increasing due to many government policies which encourage farmer to do there best and also the scientist for new innovation which are very helpful in farming but same time chemical fertilizer consumption is increase to which is not good for our enviroment, productivity and health while addressing the main target to acheive is to reduce the use of chemical fertilizer and encourage farmer.

The rapid change in developing Agriculture sector it also contaminate the enviroment in various ways so to overcome this problem today government policies are encouraging farmer to gain sustainibilty in farming so that not in present but also in future the availibilty of resourses is for the farmer. It is very important concept of protecting our resourses in exhausting. The changing scenario has recorded Agriculture more as Business purpose rather than farming. While addressing the issue of productivity, it will be necessary to see the issue of enviroment due to changing methods of agriculture farming. So to overcome from this issues farmers are make aware of sustainable farming. Sustainibilty in development of agriculture is implemented with changing input resourses, irrigation method and new technologies to get more output and containination free enviroment.

ESCC: 111.

PSIDIUM GUAJAVA L.: A THERAPEUTIC TREE

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Guava is observed to be wealthy in tannins, phenols, triterpenes, flavonoids, essential oils, saponins, carotenoids, lectins, nutrients, fiber and unsaturated fats. Guava organic product shows to be higher in vitamin C than citrus and contains considerable measures of nutrient A. Guava organic products are rich wellspring of pectins. The natural product contains saponin joined with oleanolic corrosive. Morin-3-O- α -L lyxopyranoside and morin-3-O- α -L-arabopyranoside and flavonoids, guajavarinig and quercetin. The leaves of guava are wealthy in flavonoids specifically quercetin which shows against the runs movement. All pieces of this tree, including organic products, leaves, bark, and roots, have been utilized for treating stomachache and looseness of the bowels in numerous nations. Leaves, mash and seeds are utilized to treat respiratory and gastrointestinal issue, and as an antispasmodic, mitigating, as a hack soothing, against diarrheic, in the administration of hypertension, heftiness and in the control of diabetes mellitus. It additionally has anticancer properties. The seeds are utilized as antimicrobial, gastrointestinal, against hypersensitive and anticarcinogenic movement.

ESCC: 112.

CLASSIFICATION OF SOILS OF SOME SELECTED WATERSHED REGIONS OF HARYANA, NORTH-WEST INDIA

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Eight typical pedons representing micro watersheds viz., Motipura (P1), Sainiwas (P3), Jhumpa (P5), Budhsheli (P7), Motipura (P2), Sainiwas (P4), Jhumpa (P6) and Budhsheli (P8) in semi-arid ecosystem of Jhumpa Kalan watershed of Bhiwani district, Haryana were studied. Owing to variation in climate, geomorphic position, morphology, physico-chemical characteristics, the soils of the study area were classified into different units. On the basis of rainfall, evaporation and geomorphic position the soils of the area were grouped into two moisture regimes i.e., Ustic (rainfall 300-1000mm) and Aridic (rainfall <300mm). Based on soil temperature and mixed minerals the soils were placed under hyperthermic and mixed mineralogy family, respectively. Due to the presence of ustic/arid soil moisture regime, hyperthermic temperature regime and low organic matter content, the soils were classified into Typic Torripsamments (P4 and P8)/ Ustipsamments (P1, P2 and P3) and Typic Calciorchids (P7)/ Cambiorchids (P5). Soil classification revealed that sprinkler irrigation is the best suggestion for these soils. Growing of crops viz., guar, oilseeds, gram, pearl millet, cotton and forestry is suggested.

Keywords: Classification, pedon, typic, watershed

ESCC: 113.

CLIMATE SMART AGRICULTURE

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Climate smart agriculture (CSA) is defined as agricultural practices that sustainably increase productivity and system resilience while reducing greenhouse gas emission which helps ensure that climate change adaptation and mitigation are directly and indirectly incorporated into strategies of agricultural development planning and investment. Our perspective on this study is proposing and maintaining sustainable agriculture based upon integrated management of water, land and ecosystems at landscape scale. It has the potential to increase productivity and resilience while reducing the vulnerability of hundreds of millions of smallholder farmers. CSA can benefit the farmers having small and marginal land directly by increasing precious input efficiency such as labor, seeds and fertilizers, increasing food security, and opportunities for income generation. The climate related changes faced by small holder farmers are complex and require new and different types of partnerships and opportunities to bring together people with multiple perspectives, roles and responsibilities. Climate smart agriculture is a viable way forward for smallholder farmers, but it cannot be reached its potential without proper and significant investment in the enabling environment including engagement, partnerships, management and appropriate consideration of gender issues. Crops which can be included under CSA are tubers, pulses and millets which are important for the livelihoods and nutrition of poor farmers, especially in fragile regions. These crops are not only underutilized, but are also under researched. These crops adapt to a wide range of agroclimatic conditions and give good performance under marginal growing conditions. CSA is a necessary approach for coping with climate change.

Keywords: Adaptation, small holder farmers, opportunities, mitigation and partnerships.

ESCC: 114.

FOOD SECURITY & CLIMATE CHANGE – A PROPORTIONATE RELATIONSHIP IN MODERN AGRICULTURE

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Climate change has added to the enormity of food security. Other than this it also affect human health, livelihood, food production. Agriculture and its allied sectors like-fishery, animal husbandry, forestry are also under threat. It's a high time to take steps for managing risks. Along with this there is a strong need in strengthening resilience and managing changes. Most important approaches are reducing emission, sequestering carbon, promoting conservation agriculture to ensure food security. More research focus is therefore needed on more transformative adaptations in order to cope climate change. Transformative adaptations are significant changes in current scenario. These adaptations can be associated with difficulties if their effectiveness is not assessed and producers and policy makers are not well informed. This paperwork provides an overview of the impact of climate change on foods security, keeping it in mind various dimensions like-availability, access and adsorption. It finds that ensuring food security in the face of climate change will be a formidable challenge and recommends, among others, the adoption of sustainable agriculture practices, greater emphasis on urban food security and public health, provision of livelihood security, and long term relief measures in the event of natural disaster.

Keywords: Food security, Climate Change, Resilience & Conservation Agriculture

ESCC: 115.

CLIMATE SMART AGRICULTURE AND ITS IMPORTANCE

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Climate smart agriculture (CSA) is an approach for transforming and reorienting agricultural systems to support food security under the new realities of climate change. Climate Smart Agriculture (CSA) is defined as agricultural practices that sustainably increase productivity and system resilience while reducing greenhouse gas emissions. Our perspective on CSA is sustainable agriculture, based upon integrated management of water, land and ecosystems at landscape scale. Widespread changes in rainfall and temperature patterns threaten agricultural production and increase the vulnerability of people dependent on agriculture for their livelihoods, which includes most of the world's poor. Climate change disrupts food markets, posing population-wide risks to food supply. Threats can be reduced by increasing the adaptive capacity of farmers as well as increasing resilience and resource use efficiency in agricultural production systems. Improved in agronomic practices have in fact the potential to generate higher input of C residue, leading to increased soil C storage. Introducing rotation with N fixing crops will increase biomass production and improving land cover by avoiding use of bare fallow and using cover crops can avoid CO₂ release. Integrated nutrient management can decrease N₂O emission on-site by reducing leaching and volatile losses, improve N use efficiency. CSA is one of the 11 Corporate Areas for Resource Mobilization under the FAO's Strategic Objectives. It is in line with FAO's vision for Sustainable Food and Agriculture and supports FAO's goal to make agriculture, forestry and fisheries more productive and more sustainable.

Keywords: Climate smart agriculture, greenhouse gas, integrated management, FAO

ESCC: 116.

INTEGRATED FARMING SYSTEM- WAY TO BETTER HEALTH OF SOIL, ANIMALS AND HUMEN

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Agriculture has been the basic source of subsistence for mankind over thousands of years and it provides livelihood to half of the world's population. The Indian economy is predominantly rural and agricultural. The farming community in India accounts for 71.48 percent of marginal and small farmers. In view of the decline in per capita availability of land from 0.5 ha in 1950-51 to 0.15 ha by the turn of the century and a projected further decline to less than 0.1 ha by 2020. After the advent of green revolution in late-1960s and economic liberalization in early-1990s, the farmers gradually started focusing on few enterprises due to several imposing factors including shrinking farm sizes, fluctuating commodity prices, livelihood diversification and shortage of labour during peak agriculture season. Agroforestry, Silvopastoral, Agrisilviculture will help in augmentation and stabilization of production and productivity, meeting basic needs of tree based produce, minimize economic degradation and sustainable management of land, water and biodiversity. Eggs, milk, mushroom, silkworm, honey, it provide flow of money to farmer round the year. The leaves are rich in crude protein, ether extract and calcium hence said to augment milk production of goats and sheep. IFS components are known to control the weed and regarded as an important element of integrated pest management and thus minimizes the use of weed killers as well as pesticides and thus protects the environment. The water use efficiency and water quality of IFS was better than conventional system. IFS increases Productivity, Profitability, Farm income, Employment generation, Agro-industries etc.

Keywords : Integrated Farming System, Diversification, Agro forestry, water use efficiency, Productivity

ESCC: 117.

SUSTAINABLE AGRICULTURE FOR FUTURE GENERATION

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The way we adopt to stand in the globalized world, the challenges we face in the immediate future is going to be very challenging task for our future generation. All its about due to impacts of climate change to our environment and ecosystem which we people are always listening, seeing and facing with some extent now a days. Global warming has negative affects physical, biological and human system and climate change affects food and crop production, causes diseases and death, destruction of economic livelihood. Agriculture that is environmentally, economically and socially sustainable can only make a vital contribution in our response to the most urgent challenges, ensuring food security and reducing poverty. Sustainable agriculture is the practice of farming which is economically viable, socially supportive and ecologically sound which preserve the resource base that sustain the human. How on earth we going to feed 2 billion more people by 2050 as climate change deplete the land and water available? We will have to produce more food with fewer resources. To meet the growing food demand of the over 2 billion people who will exist by 2050 and the expected dietary changes, agriculture will need to produce 60% more food globally in the same period. Sustainable agriculture should be boosted especially in developing countries for overcoming the most serious challenges coming in the future. Agricultural system has been challenged worldwide by climate change and other threats, such as increased energy costs, droughts etc. Sustainable agriculture has a dual role in adopting and mitigating climate change. Sustainable agriculture helps farmers to adopt the modern approach of cultivation that is eco-friendly, economically sound and socially accepted which helps to increase the production and less negative impact on the environment. As demand for food increase and climate change and ecosystem degradation impose new constraints,

sustainable agriculture plays an important role in preserving natural resources, reducing greenhouse gas emission, halting biodiversity loss and caring for valued landscape. Therefore, sustainable agriculture is very important for present and future generations.

Keywords: Climate change, global warming, human system and sustainable agriculture.

ESCC: 118.

ROLE OF SENSORS IN AGRICULTURE

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Sensors used in smart farming are known as agriculture sensors. These sensors provide data which assist farmers to monitor and optimize crops by adapting to changes in the environmental conditions. These sensors are installed on weather stations, drones and robots used in the agriculture industry. They can be controlled using mobile apps specifically developed for the purpose. Based on wireless connectivity either they can be controlled directly using wi-fi or through cellular towers with cellular frequencies with the help of mobile phone app. The sensors measure different frequencies of light reflectance in near-infrared, mid-infrared, and polarized light spectrums. Sensors can be placed on vehicles or aerial platforms such as drones or even satellites. Soil reflectance and plant color data are just two variables from optical sensors that can be aggregated and processed. Optical sensors have been developed to determine clay, organic matter, and moisture content of the soil. Sensors is used in agriculture for different purpose such as:(1) Variable Rate Fertilizer application tools use yield maps and perhaps optical surveys of plant health determined by coloration to control granular, liquid, and gaseous fertilizer materials.(2) Weed Mapping currently uses operator interpretation and input to generate maps by quickly marking the location with a GPS receiver and datalogger. The weed occurrences can then be overlapped with yield maps, fertilizer maps, and spray maps.(3) Variable Spraying controllers turn herbicide spray booms on and off, and customize the amount (and blend) of the spray applied. Once weed locations are identified and mapped, the volume and mix of the spray can be determined. (4) Topography and Boundaries can be recorded using high-precision GPS, which allows for a very precise topographic representation to be made of any field. Field boundaries, existing roads, and wetlands can be accurately located to aid in farm planning. (5) Salinity Mapping is done with a salinity meter on a sled towed across fields affected by salinity. Salinity mapping interprets emergent issues as well as change in salinity over time.

ESCC: 119.

ASSESSMENT OF ALTERED RHIZOBACTERIAL MICROBES IN RESPONSE TO ELEVATED CO₂ AND TEMPERATURE

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Earth's average surface temperature is predicted to increase by 2.0-4.5°C due to increased concentration of carbon dioxide. Atmospheric CO₂ concentration has increased from approximately 280 to 370 ppm since 1750 and it is expected to reach 600-1000 ppm by the end of this century. Present study dealt with isolation and characterisation of microbes from different open top chambers with elevated temperature (e Temp), elevated carbon dioxide (e CO₂) and combined effects (e Temp+ e CO₂) to detect major plant growth-promoting rhizobacteria (PGPR) during stress conditions. Morphological and cellular characterisation as well as 16S rRNA sequencing revealed that region contains enormous and active microbial populations that may apply valuable or neutral effects on the growth of plants since maximum enzymatic and microbial activities occur in this region. Among them, Proteobacteria (in e Temp) are considered to be the most abundant bacterial group in the rhizosphere due to their ability to respond to labile C sources, showing fast growth and adaptation to the diverse plant rhizospheres than ambient condition. An important bacterial

group in the rhizosphere is defined as PGPR (e CO₂ and e Temp) which are able to promote the growth, nutrient uptake and pathogen biocontrol in plants. Also the presence of less dominant species of Sphingobacteria in elevated atmospheric carbon dioxide with specific metabolic capabilities and/or adapted to the characteristic of specific plant species rhizosphere require further investigation in role of microbe-plant communication during stress.

ESCC: 120.

CARBON SEQUESTRATION IN CONSERVATION AGRICULTURE

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The carbon (C) cycle is the basis for greenhouse gas emissions and global warming. Globally, agriculture is responsible for about 20% of the greenhouse gas emissions. Since soil organic carbon (SOC) concentration is a strong determinant of soil physicochemical and biological properties. Carbon (C) sequestration in agricultural soils needs changes to current management practices. Plowing causes loss of soil organic carbon (SOC) because of greater exposure of the soil particles which reduces microbial activity. Intensive Tillage-based systems increase the cost of crop production in the medium and long-term because greater amounts of fertilizer inputs, soil amendments and other inputs are needed. The soil has significant potential to store carbon and to mitigate the effects of climate change and Sequestering atmospheric carbon (CO₂) in the soil also helps to reduce greenhouse gas emissions. Carbon sequestration on agricultural lands is possible through a range of soil management practices. Conservation agriculture production systems (CAPS) have the potential to improve soil health. Conservation agriculture (CA), based on minimum tillage, need base crop residue retention and suitable crop rotations, has been proposed as an alternative system for the higher benefits to the farmer combining with advantages for the society. These principles of CA keep the soil together as a living ecosystem that enables food production and helps to mitigate climate change. The largest contribution of CA to reducing emissions from farming activities is made by the reduction of tillage operations. Cover crops and residue cover are an important soil carbon sequestration strategy. The roots and shoots of cover crops and residues feed bacteria, fungi, earthworms and other soil organisms, which increases soil carbon levels over time. Increases in SOC concentration (as opposed to stock) in near-surface soil from CA cause improvements in soil physical conditions.

Keywords: Conservation agriculture, carbon sequestration, minimum tillage, residue retention

ESCC: 121.

ORGANIC FARMING – A TOOL FOR SUSTAINABLE VEGETABLE PRODUCTION

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Organic farming practice which is popular in our country since ancient times (Rigveda I 161, 10, 2500-1500 BC, Atharva Veda II 8.3). Agriculture began organically, for many centuries, humans farmed without synthetic agrochemicals or inorganic fertilizers, relying on organic fertilizers derived from plants and animals, and protecting crops from pests and diseases using naturally occurring materials. Second half of the nineteenth century growers around the world successfully developed and refined farming systems that depends on synthetic agrochemicals or inorganic fertilizers. However, during the last two or three decades emphasized towards organic cultivation. Here we focused on the effects of organic cultivation practices for producing more quantity and good quality characteristics of vegetables. Recently, food and Agricultural organization of the united Nation (FAO) focused organic farming as

resource saving agricultural crop production. As per FAO definition, the organic farming is to achieve acceptable profit, high and sustained production levels, and conserves the environment. It further argues that conservation agriculture is based on enhancing natural biological processes occurring above and below the soil surface. They go beyond zero tillage and provide a range of technology and management options. Organic farming practices are applicable to virtually all the crops, including vegetables, fruit crops and plantation crops. These practices promise tremendous potential for different soils and agro-ecological systems. These are neutral to size of holding, but their adoption is most urgently required by small holder farmers to reduce their cost of production, increase profit, and save resources.

ESCC: 122.

IMPACT OF BIO-FERTILIZERS IN SUSTAINABLE SOIL HEALTH MANAGEMENT AND PRODUCTION OF GREEN GRAM (*VIGNARADIATA* L.)

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Pulses were recognized as an indispensable constituent of Indian diet or important source of protein for the poor as well as for the vegetarians. Continuous use of chemical fertilizers decline the yield as well as deteriorate the soil fertility. Thus, sole dependence on chemical based fertilizer was not useful for attaining sustainability. Integrated plant nutrient management involving a different type of bio-fertilizers to sustain crop production, manage the soil health and improve the soil biodiversity. Integrated use of bio-fertilizers not only improved the nutrient use efficiency but also the instrumental in productivity enhancement. An On-farm trial was conducted during *summer* season of 2013-14 and 2014-15 at pre-selected 10 locations of farmers field in Muzaffarpur district of Bihar. The results observed nutrient management of biofertilizer was statistically significant impact on yield, economics as well as soil fertility status. The highest yield (9.90 and 9.50 q ha⁻¹) was obtained significant in treatment N₂₀-P₄₀-K₀₀ along with *Rhizobium*+PSB as compared to N₂₀-P₄₀-K₀₀(RDF) as well as farmers practice. The maximum net return (Rs. 35630.00 ha⁻¹ and Rs. 33750.00 ha⁻¹) and B:Cratio (3.56 and 3.45) was found in N₂₀-P₄₀-K₀₀ along with *Rhizobium*+PSB over N₂₀-P₄₀-K₀₀(RDF) and farmers practice. However, the *Rhizobium* and PSB treated seed registered net positive balance of available nitrogen and phosphorus soil status over initial.

Keywords: Bio-fertilizer, INM, PSB, *Rhizobium*, Soil.

ESCC: 123.

ROLE OF NITROGEN IN SUSTAINABLE AGRICULTURE AND FOOD SECURITY: A REVIEW

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The impact of modern agriculture on natural resources has become a major global concern. Population growth and expanding demand for agricultural products constantly increase the pressure on land and water resources. A major point of concern for many intensively managed agricultural systems with high external inputs is the low resource-use efficiency, especially for nitrogen. A high input combined with a low efficiency ultimately results in environmental problems such as soil degradation, eutrophication, pollution of groundwater, and emission of ammonia and greenhouse gases. Evidently, there is a need for a transition of current agricultural systems into highly resource-use efficient systems that are profitable, but at the same time ecologically safe and socially acceptable. Here, opportunities to improve nitrogen-use efficiency in cropping and farming systems are analysed and discussed. In the past and present, increased productivity of the major plant production systems has been derived from genetic

improvement, and from greater use of external inputs such as energy, fertilizers, pesticides and irrigation water. Aiming at improving resource-use efficiencies, in high-input systems the focus should be on more yield with less fertilizer N. In low-input systems additional use of N fertilizer may be required to increase yield level and yield stability. Developing production systems that meet the goals of sustainable agriculture requires research on different scales, from single crops to diverse cropping and farming systems. It is concluded that N supply should match N demand in time and space, not only for single crops but for a crop rotation as an integrated system, in order to achieve a higher agronomic N-use efficiency. A combination of quantitative systems research, development of best practices and legislation will be needed to develop more environmentally-friendly agricultural systems. The growing complexity of managing N in sustainable agricultural systems calls for problem-oriented, interdisciplinary research.

Keywords: Biodiversity, Cropping system, Environment, Land use, Nitrogen-use efficiency

ESCC: 124.

CONSERVATION AGRICULTURE: A WAY TO INCREASE PRODUCTIVITY AND PROFITABILITY OF CROPS

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Indo-Gangetic Plains (IGP) is the home for almost 20 per cent of the world population. Green Revolution started during the early 1970s with wheat and rice and since then the rice wheat cropping system of the IGP has played a significant role in the food security of the region. However, recent years have witnessed a significant slowdown in the yield growth rate of this system mainly due to delayed monsoon or due to long duration rice cultivars. As a result the sowing of the next crop gets further delayed due to the conventional land preparation practices by the farmers. Intensive tillage which is done in conventional systems leads to gradual decline in soil organic carbon through accelerated oxidation, with a consequent reduction in the capacity of the soil to regulate water and nutrient supply to plants.

In contrast, conservation agriculture (CA) mainly refers to the crop establishment through minimal disturbance of soil, retaining crop residues on the surface of soil and spatial variability of crops to derive maximum input benefit and minimize the adverse footprint on soil health. CA based tillage practices such as zero tillage and permanent bed has been reported to reduce biological oxidation of soil organic carbon, increases water holding capacity, prevents land degradation by lowering the intensity of soil erosion. Resource-conserving technologies involving zero or minimum-tillage in wheat, dry direct seeding in rice, improved water and nutrient-use efficiency, innovations in residue management to avoid straw burning, and crop diversification should assist in achieving sustainable productivity and allow farmers to reduce inputs, maximize yields, increase profitability, conserve the natural resource base, and reduce risk due to both environmental and economic factors. Therefore, CA based crop management technologies have been intensified to overcome the aforesaid problems and increase profitability by reducing cost of cultivation.

ESCC: 125.

PROSPECTS OF ORGANIC FARMING, ENVIRONMENT SUSTAINABILITY AND NUTRITIONAL FOOD PRODUCTION

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Modern agriculture was practice use of artificial chemical (fertilizers, growth regulate and pesticides). This kind of agricultural practice was causing harm to the environment. Modern agriculture became a high investing and harmful to the ecosystem. Modern agriculture farming is capital intensive, which requires more manufactured inputs

and energy as compared to knowledge- and labor-intensive organic farming. To protect our ecosystem, increase nutritional quality food and more profitable crop production, Organic farming made use of environment friendly practices by avoiding harmful chemicals, they are replaced by bio-fertilizers, bio-pesticides, organic matter etc. this also maintains the soil fertility, use of chemical fertilizers kills the useful soil organisms but the organic farming environmentally friendly a very positive influence especially on birds, insects, weeds, wildlife, and soil flora and fauna. Organic food is beneficial to human health and the practice of organic farming keeps the environment clean. Organic farming produces free of synthetic fertilizers and pesticides. It also provides employment opportunities and economic benefits to local communities. Enough evidence is available to prove that organic crops are a better source of nutrients than their corresponding conventional forms. Organic foods have more plant secondary metabolites, higher micronutrient content, and more conjugated fatty acids for better human health, including lower incidences of non-communicable diseases.

Keyword: Modern agriculture, fertilizers, growth regulate, pesticides, organic farming, organic matter, environment, secondary metabolites, micronutrient content.

ESCC: 126.

IMPACT OF CLIMATE CHANGE ON AGRICULTURE AND MANAGEMENT THROUGH SUSTAINABLE PRACTICES

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Crop production is vulnerable to climate variability which is associated with the changes in the levels of pest and disease incidence, carbon dioxide levels, ground level ozone concentrations, ground water levels and also changes in the nutritional quality of food. Climate change probably increases the food insecurity as it declines the production levels of various food crops which in turn results in droughts, poverty and socio-economic imbalance among the countries. Climate change mainly aroused due to anthropogenic emissions of greenhouse gases and conversion of non-agricultural land into agricultural land. Intergovernmental Panel on Climate Change (IPCC) has reported that agriculture itself contributes over a quarter of total greenhouse gas emissions which alarms the need of sustainable practices in the agriculture for the management of climate change and its effects on agriculture. The Agricultural Model Intercomparison and Improvement Project (AgMIP) developed in 2010 to evaluate agricultural models and intercompare their ability to predict climate impact (including biophysical and economic impacts). Increasing forest cover and agroforestry, usage of improved agroforestry species, diversification of crop species, water harvesting practices, improved irrigation practices and capture and retention of rainfall are some of the practices which can improve the sustainability in crop production.

Keywords: Climate variability, Anthropogenic emissions, IPCC, Sustainable practices, AgMIP

ESCC: 127.

BIOFUEL FROM ALGAL BIOMASS: A BETTER ALTERNATIVE OF BIOFUEL THAN CONVENTIONAL PLANT SOURCES

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Today in the world we live in, energy is reflected as one of the basic need for daily lifestyle and for the progress of human civilization. However, inadequate energy supply, alarming alertness on emissions of greenhouse gas and global warming has necessitated search for the renewable and eco-friendly alternative energy sources

worldwide. One such eco-friendly and renewable source of energy is the liquid biofuel. Utilization of solar energy stored in micro-algal biomass is a promising source for anaerobic biofuel production. The requirements for liquid biofuels have been partially satisfied by mass production of first-generation corn or sugarcane ethanol and biodiesel from soy bean, sunflower or rapeseed. To avoid the food versus fuel debate in the production of agricultural commodities, next generation biofuels from algal biomass, organic wastes and lignocellulose-rich materials have to replace energy plants. Algal biomass cultivation has advantages against agricultural crops. This alternative biomass has fast growth rate, high contents of lipids, carbohydrates, and proteins, and do not contain recalcitrant lignin. Moreover, it can be cultivated on lands that are not suitable for traditional agriculture. Interest in gaseous fuels, such as hydrogen (H₂) and methane (CH₄), has increased in recent years due to their zero, or even carbon dioxide negative production-and-use cycle. Despite the technological challenges the interest in microalgae-based biofuels increases. In microalgae-based biogas production the goal is to maintain effective and balanced operation. An emerging and effective strategy to improve technical and economic feasibility is co-digestion with organic wastes or by-products to optimize process parameters. The coupling of biohydrogen and biogas production processes, using algal-bacterial co-cultures, is recommended. Biohydrogen and biogas production from algal biomass is therefore intensively studied renewable energy source with a goal of reducing the nutrients, energy requirements and increasing the production efficiency.

Keywords: Biofuel, Microalgae, Biohydrogen, Renewable energy.

ESCC: 128.

IMPACT OF CLIMATE CHANGE IN INDIAN HORTICULTURE - A REVIEW

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Climate change is the greatest concern of mankind in 21st century. The established commercial varieties of fruits, vegetables and flowers will perform poorly in an unpredictable manner due to aberration of climate. Melting of ice cap in the Himalayan regions will reduce chilling effect required for the flowering of many of the horticultural crops like Apple, Saffron, Rhododendron, Orchid, etc. Commercial production of horticultural plants particularly grown under open field conditions will be severely affected. Due to high temperature physiological disorder of horticultural crops will be more pronounced e.g. Spongy tissue of mango, fruit cracking of litchi, flower and fruit abscission in solanaceous fruit vegetables etc. Air pollution also significantly decreased the yield of several horticultural crops and increases the intensity of certain physiological disorder like black tip of mango. Hence there is a need to protect these valuable crops for sustainability against the climate change scenario. The most effective way is to adopt conservation agriculture, using renewable energy, forest and water conservation, reforestation etc. To sustain the productivity, modification of present horticultural practices and greater use of greenhouse technology are some of the solutions to minimize the effect of climate change. Development of new cultivars of horticultural crops tolerant to high temperature, resistant to pests and diseases, short duration and producing good yield under stress conditions, as well as adoption of hi-tech horticulture and judicious management of natural resources will be the main strategies to meet this challenge.

Keywords: Climate, Horticulture, Ice, Himalayan, Chilling etc.

ESCC: 129.

ORGANIC AGRICULTURE, AS AN ADAPTATION STRATEGY TO CLIMATE CHANGE

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Climate change mitigation is urgent and adaptation to it is crucial, particularly in agriculture, where food security is at stake. Agriculture solely responsible for 20-30% of global greenhouse gas emissions counting either direct and indirect agricultural emissions. The main mitigation potential lies in the capacity of agricultural soils to sequester CO₂ through building organic matter. This potential can be realized by employing sustainable agricultural practices, such as those commonly found within organic farming systems. Examples of these practices are the use of organic fertilizers and crop rotations including legumes leys and cover crops.

Organic agriculture (OA) is an alternative production system that avoids the use of synthetic pesticides and fertilizers, and relies on biological pest control and on crop rotation, green manure and composts to maintain soil fertility. OA has a greater potential for mitigating climate change, largely due to its greater ability in reducing emissions of greenhouse gases (GHGs) including carbon dioxide, nitrous oxide (N₂O) and methane (CH₄). Mitigation is also achieved in organic agriculture through the avoidance of open biomass burning and the avoidance of synthetic fertilizers and the related production emission from fossil fuels. Common organic practices also contribute to adaptation. Building soil organic matter increases water retention capacity, and creates more stable, fertile soils, thus reducing vulnerability to drought, extreme precipitation events, floods and water logging. Adaptation is further supported by increased agro-ecosystem diversity of organic farms, due to reduced nitrogen inputs and the absence of chemical pesticides. The high diversity together with the lower input costs of organic agriculture is key in reducing production risks associated with extreme weather events. All these advantageous practices are not exclusive to organic agriculture. However, they are core parts of the organic production system, in contrast to most non-organic agriculture, where they play a minor role only.

ESCC: 130.

NATURAL RESOURCES MANAGEMENT IN SUSTAINABLE AGRICULTURE

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As the human population raises and natural resources diminish, there is pressure to apply increasing levels of top-down, command and control management to natural resources. Natural resource management deals with managing the way in which people and natural landscapes interact. It brings together land use planning, water management, biodiversity conservation, and the future sustainability of industries like agriculture, mining, tourism, fisheries and forestry. It recognizes that people and their livelihoods rely on the health and productivity of our landscapes, and their actions as stewards of the land play a critical role in maintaining this health and productivity. This is manifested in attempts to control ecosystems and in socioeconomic institutions that respond to erratic or surprising ecosystem behavior with more control. Natural resource management specifically focuses on a scientific and technical understanding of resources and ecology and the life-supporting capacity of those resources. Environmental management is also similar to natural resource management. In academic contexts, the sociology of natural resources is closely related to, but distinct from, natural resource management.

Keywords: Top-down, command, natural resources.

ESCC: 131.

SOIL CARBON SEQUESTRATION: THE FRENETIC NEED OF THE HOUR

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The increase in atmospheric concentration of CO₂ by 31% since 1750 due to fossil fuel combustion and faulty land use pattern, necessitates identification of alternatives for mitigating the threat of global warming. On the other hand world soils have been a source of atmospheric CO₂ since the beginning of agricultural era, which began about 10 millennia ago. Most agricultural soils have lost 30% to 75% of the original soil organic carbon (SOC) pool or 30 to 40 t C/ha. The magnitude of loss is often more in soil prone to accelerated soil erosion under the degradative processes. On a global scale, CO₂-C emission since 1850 are estimated at 270±30 Giga tons (billion ton or Gt) from fossil fuel combustion compared with 7812 Gt from soil. Furthermore, depletion of the SOC pool also leads to degradation in soil quality and declining agronomic productivity of soil. So, change is a reality. Therefore, there is a need of suitable options to produce more with less fossil fuel input by restorative land uses (afforestation, improved pastures) and adoption of sensible crop and resource management practices (CRM) can enhance SOC and improve soil quality. Site specific innovative/ appropriate CRM for enhancing SOC includes conservation tillage, mulch farming, cover crops, conservation agriculture, sustainable agriculture, integrated nutrient management involving use of manures and compost, and agroforestry etc. The rate of SOC sequestration, ranging from 100 to 1000 kg/ha/year, it depends on climate, soil type, and site specific CRM. SOC sequestration will be helpful for mitigating global warming and improves agronomic productivity of soil, by minimising fossil fuel emission through the adoption virtual agronomic/ crop management practices.

“Climate change is a real deal.so, hey deniers – cut it out, and let's get to work”

Bill Nye

Keywords: Global warming, soil organic carbon (SOC), conservation agriculture, accelerated soil erosion, crop and resource management (CRM), afforestation, and agroforestry.

ESCC: 132.

PERFORMANCE EVALUATION AND VIBRATION ANALYSIS OF A MODIFIED SELF-PROPELLED BOOM SPRAYER FOR INTRA CANOPY SPRAYING

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India has made impressive improvement on the agricultural front since independence. Plant protection is an essential operation in the basic practices of crop production. Data shows that diseases, insects and weed put together 34 to 42 % damage to the crops produced worldwide. Annually Indian agriculture suffers a loss of about 30-40% crop yield of 3,600 crores due to insect and pests. Most of the sprayers spray the solution from the top of the plant and the underside of the leaves also go unnoticed during spraying. It is difficult to achieve under leaf coverage with normal spraying operations. The pest and insects present inside the canopy and under the leaves are not affected by this spray which leads to infestation and damage even after spraying. The modified self-propelled intra canopy boom sprayer had an improved boom section with flat fan nozzles mounted on the top of the boom to spray chemical from the top of the row and hollow cone nozzles mounted in U-types body were placed in between rows with the help of hose drops, the nozzles would spray chemical in the unidirectional area. For supplying the spray from delivery pipe it was

connected to T socket and it delivered the liquid in two directions (top and bottom). The provision of gate valve was provided for controlling the supply of the bottom section. The nozzles were tested in the laboratory to find its volumetric distribution, swath and spray angle at different pressure and height combinations. The independent parameters for patternator test were operating pressure (1.5, 2, 2.5, 3 and 3.5 kg/cm²), nozzle heights (200, 300, 400, 500, 545 and 600 mm). The flat fan nozzle gave its best volumetric distribution at 2.5 kg/cm² and 300 mm nozzle height while the hollow cone nozzles at 3 kg/cm² and 545 mm nozzle height. The swath and angle of spray of the nozzles were found that with increase in pressure and height the swath was increased while the spray angle increased with pressure. The vibration acceleration increased significantly with increase in forward speed from 1.50 to 3.00 km/h corresponding to engine speed low to high of the sprayer.

ESCC: 133.

COMPARATIVE QUANTIFICATION OF CARBON SEQUESTRATION IN SOLE CROPS AND BAEL BASED AGRI-HORTI SYSTEM

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In present scenario of enhanced atmospheric carbon dioxide (CO₂) coupled with the rise in temperature, it becomes essential to have accurate and realistic estimates of carbon stock in trees for determining their role in mitigating global warming and climate change. A field investigation was conducted during rainy (*khariif*) season of 2018 at Agricultural Research Farm in Rajiv Gandhi South Campus, Banaras Hindu University, Barkachha, Mirzapur under two systems, viz., in open system and in bael based agri-horti system. Black gram, sesame, green gram, soybean, and pearl millet were sown solely in open system and also grown in interspaces between the rows of bael trees in 12 year-old agroforestry system. The result showed that in bael based agri-horti system, the bael + black gram observed significantly higher aboveground biomass (4,045.82 kg/m²) and belowground biomass (1,051.91 kg/m²) over other treatments. Similar trend was observed in case of aboveground carbon sequestration (1,820.62 kg/m²) and belowground carbon sequestration (473.36 kg/m²). However, in the sole system, the highest aboveground biomass (4.43 kg/m³) and belowground biomass (1.15 kg/m³) was observed in pearl millet variety 'PHB-2168' which was at par with pearl millet variety 'NANDI-52'. Similarly, in sole crop, maximum aboveground carbon sequestration (2.00 kg/m²) and belowground carbon sequestration (0.52 kg/m²) was recorded in pearl millet variety 'PHB-2168'. Thus, it may be concluded that in bael based agri-horti system, bael + black gram was superior in the accumulation and sequestration of biomass and carbon, respectively. Interestingly, bael + black gram system sequestered more carbon than sole crop.

Keywords: Agroforestry, Agri-horti system, Biomass, Carbon sequestration.

ESCC: 134.

THE PARTIAL MITIGATION OF OZONE (O₃) STRESS THROUGH NUTRIENT AMENDMENTS ON *ZEAMAYS* PLANTS

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The present concentration of Tropospheric ozone (O₃) is now recognized as a sever threat to agriculture production and can act as major threat to food security in near future. As such the demand of the time is the immediate

adoption of certain mitigative features. Studies have shown that Nitrogen (N) phosphorus (P) and potassium (K) treatment at different doses can be used effectively in annihilation of ozone injury to some extent by repairing the damage caused by ozone's generated ROS. In the present study, plants exposed to ambient O₃ stress were treated with different NPK doses and their interactive effects were studied. The varieties of maize (*Zea mays*) (Malviya hybrid 2 and HIM-1) were used. The seeds of "maize" were hand sown in fields. Four types of treatments, each having three replicates were maintained. The treatments were designated as control(C) (no NPK treatment), N1 (recommended NPK treatment), N2 (1.5 recommended NPK treatment) and N3 (2.0 recommended treatment). Continuous O₃ monitoring was done at the experimental site showed that 8 hourly ozone concentrations varied from 48.4 ppb to 62.4 ppb during the experimental period. Results showed that NPK treated plants responded positively as compared to control. Morphological characteristics like total length, number of leaves and leaf area increased significantly in N1, N2 and N3 treatment plant as compared to control during both sampling stages (vegetative and reproductive). Number of cobs per plant, number of kernels per cob and test weight increased significantly in both the varieties Malviya hybrid M2 and HIM 1 at N1, N2 and N3 treatments, respectively, as compared to control. The results of the present experiment suggest that NPK amendments are effective in partially mitigating ozone injury in plants.

Keywords: Mitigation, Maize, Morphology, Tropospheric Ozone

ESCC: 135.

EFFECTS OF CLIMATE CHANGE ON AGRICULTURE

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Climate-smart agriculture (CSA) is an approach for transforming and re-orienting agriculture systems to support food security under the new realities of climate change. Climate change is a global phenomenon. Livestock production contributes to 40% of the global value of agricultural output and supports the livelihood and food security of almost one billion people and is expanding rapidly. Climate induced water scarcity varies with spatial and temporal distribution. Monsoons play a key role in the productivity that result in the competition among agriculture and its allied sectors. It was evident that there is a pressing need to provide adequate and effective training on climate change issues to agricultural extension workers so that they acquire expertise to impart CSA to rural farmers. Most farmers lack adequate knowledge of climate-smart agriculture and sustainable environmental practices, which further increases their vulnerability, as well as the risks to agriculture and the environment. Many smallholders continue to follow environmentally harmful practices, i.e., cutting down trees, slash and burn, flood irrigation and forest degradation. There is also widespread use of synthetic fertilizers and hazardous chemicals in crops and soils, which hinders the soil's capacity to retain moisture and nutrients. Livestock production system are considered to be a subset of farming system. It (from animal digestion, feed production, manure management, and forest cover loss) contributes about 14.5% of global greenhouse gas emissions and roughly 25% is attributed to methane emissions from ruminant digestion. Building climate smart farming systems through integrated water storage and crop-livestock interventions (IWSLIs) will help to overcome the above issues. Livestock make necessary and important contribution to global calories and protein supplies though chemical products, including disinfectants used in livestock production contain caustic or corrosive materials which may be hazardous to health as well as environment.

Keywords: Climate-smart agriculture; Livestock productivity; Dairy farming.

ESCC: 136.

CONSERVATION AGRICULTURE FOR SMALLHOLDERS IN RAINFED SYSTEMS

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Global Climate Change, judging from the debate on the subject is one of the major concerns of the world today and posing a great threat to agriculture and food security especially in agriculture oriented countries where food crops are adversely affected by maximum temperature and decrease in rainfall. Although the agricultural sector is able to withstand the adverse impact of Climate Change till now, but in near future this situation can become reversed. Presently, India is facing a situation which is called as the triple affliction of malnutrition. This necessitates the implementation of appropriate adaptation and mitigation measures to deal with problems of Climate Change and to ensure food security and food safety along in long run. Sustainability and Conservation agriculture appears to be best available option for meeting the future food security as there should be an 100 percent increase in food production by 2050. Sustainability is the one in which human needs are met equitably without harm to the environment and ecosystem function. Conservation agriculture mitigates Climate Change and achieves to a high degree environmental Sustainability of farming and non-farming population through three major principles 1.minimal soil disturbance.2.maintaining a permanent soil organic cover.3.maintaining biodiversity in crop production. Proper policy, technological, institutional, machinery support like providing seeders, planters and seed cum fertilizer drillers should be given so that farmers would be motivated for conservation agriculture. Nowadays, the world advanced manufactures have incorporated environmental aspects into the production system, to promote the green production system which associates with the objective of 3R achievement (Reduce, Recycle, and Reuse).

Keywords: Agriculture, Climate Change, Adaptation, Mitigation, Conservation Agriculture, Reduce, Recycle, Reuse, Sustainability, Food Security, Triple affliction of Malnutrition

ESCC: 137.

NATURAL RESOURCE MANAGEMENT, CONSERVATION AGRICULTURE AND ORGANIC FARMING

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Our resources like forest, wildlife, water, coal and petroleum need to be in a sustainable manner. We can reduce pressure on the environment by sincerely applying by maximum of 'reduce, reuse, recycle in our lives. The management of forest resources has to take into account the interests of various stakeholders. The harnessing of water resources by building dams has social, economic and environmental implications. Alternatives to large dams exist. These are local specifics and may be developed so as to give local people control over their local resources. The fossils fuels, coal and petroleum will ultimately be exhausted, because of this and their combustion pollutes our environment, we need to use their resources judiciously. The interest of organic farmers in adopting conservation agricultural principles, including minimal soil disturbance, permanent soil cover and crop rotation has been growing since the early 2000's. However, currently there is no network for organic farmers practicing conservation agriculture because lack of knowledge. Consequently, few technical references are available for organic farmers when they start applying conservation agriculture practices, in particular on controlling weeds without the use of herbicide. To explore the diversity of conservation agriculture techniques that is reduced tillage, zero tillage and green manures. To identify farmer main strategies for implementing conservation agriculture and the agronomic and environmental factors that determines these strategies. Organic farmers to experiment with innovative practices based on conservation

agricultural principles and also benefit conventional farmers who use conservation agriculture practices and would like to reduce or eliminate the use of herbicides.

Keywords: Stakeholders, Zero tillage.

ESCC: 138.

ENHANCEMENT OF ZERO TILL WHEAT (*TRITICUM AESTIVUM* L.) PRODUCTIVITY, PROFITABILITY AND NITROGEN UPTAKE EFFICIENCY (NUPE) THROUGH NUTRIENT EXPERT, N SPLITTING AND LEAF COLOUR CHART (LCC) IN SANDY LOAM SOIL OF WEST BENGAL

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The adoption of zero tillage (ZT) technology in West Bengal has been significantly increased after the introduction of Zero till ferti-cum-seed drill. N management needs to be significantly improved under ZT to address the challenge of food security. In addition to site specific nutrient management based nutrient expert recommendation (SSNM-NE), N splitting especially foliage colour based precise N management (FC-PNM) is also important for satisfying crop N demand at proper time. An experiment was conducted at the instructional farm, Uttar Banga Krishi Viswavidyalaya during *rabi*, 2016-17 and 2017-18 with the objective to compare different N splitting including FC-PNM strategy under SSNM-NE and state recommendation of West Bengal in terms of agronomic impacts on zero till wheat cultivation. The highest grain yield and benefit-cost ratio (B:C) were found in SSNM-NE with 60% N top-dressing at crown root initiation (CRI) and 20% N top-dressing at late tillering (LT) (5.07 t/ha and 2.57, respectively for target yield 5.50 t/ha). SSNM-NE with 48% N top-dressing at CRI and wheat LCC reading based N top-dressing at LT (4.36 t/ha and 2.24, respectively for target yield 5.50 t/ha) also resulted good yield and profit and the lowest values were obtained in state recommendation with 37.5% N top-dressing at CRI and 37.5% N top-dressing at LT (3.80 t/ha and 2.05, respectively). In all the treatments, 25 kg N/ha was furrow placed at planting and N top-dressing was done always just before irrigation. Similar results were recorded for all the growth and yield attributes. NUPE was calculated highest in SSNM-NE with 60% N at CRI and 20% N at LT (0.52 and 0.59 for target yield 5.50 and 6.00 t/ha, respectively). Results showed that SSNM-NE with 25 kg N/ha basal application + 60% of recommended N top-dressing at CRI just before irrigation is beneficial for zero till wheat.

Keywords: Zero tillage, Nutrient expert, Nitrogen splitting, Leaf colour chart

ESCC: 139.

INTEGRATED WEED MANAGEMENT AS POTENTIAL STRATEGY FOR MANAGING WEEDS

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Weeds are unwanted plants playing a very important role in different eco-systems and many of them cause enormous direct and indirect losses. Weed management is an ever-present challenge to crop production. Weeds cause 10-80% crop yield losses and have the potential to usurp resources that would otherwise provide nourishment to growing crops or interfere with planting or agricultural operations act as alternate hosts for several insect-pests, disease, affect aesthetic look of the ecosystem as well as affect human and cattle health and environmental hazards. Many common weeds such as *Pathenium* Weed, Ragweed, and Rye Grass cause asthma and other respiratory problems, especially in children. Some weeds can also cause skin irritation and some are poisonous. Many weeds are

poisonous to animals when ingested. *Lantana camara* induce hypersensitivity to light, *Rhododendron sp.*, *Sorghum halepense* at it tillering stage cause diarrhea in milch animal and blood strain in their milk. Some aquatic weeds such as Water Hyacinth (*Eichhornia crassipes*) and Cabomba (*Cabomba caroliniana*) can render water unfit for drinking purpose. they markedly reduce the flow of water irrigation and drainage channels. *Typhas sp.* (cattails) and *Carex aquatilis* (water sedge) are menace to fisheries. Land infested by perennial weeds such as *Cyperus rotundus*, *Cynodon dactylon*, etc. makes the land unsuitable for economic crop production. To overcome these problems there are several agronomic, mechanical, biological and chemical methods for weed control. Innumerable and practical experience shows that no single method will give a continuous and effective control of weeds in all situations. The way out of the situation appears to be Integrated Weed Management (IWM) aimed at bringing down the intensity of weed growth to economically insignificant levels with minimum influence on environmental pollution. Agronomic measures, necessary for higher yields, are at the same time are directed at preventing mass multiplication of weeds. Creative application of agronomic, mechanical, biological and chemical methods usually, referred to as IWM is one of the potential leavers of phytosanitation aimed at optimum condition for crop growth and adverse environment for weed growth.

Keywords: weeds, IWM, environment, chemical, physical, biological

ESCC: 140.

EFFECT OF CHEMICAL AND BAGGING ON QUALITY OF RAINY SEASON GUAVA (*Psidium guajava* Linn.)

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The study was started from June 2017 to assess the “Effect of chemical and bagging on quality of rainy season guava (*Psidium guajava* Linn.) CV. Lucknow-49” at the Main Experiment Station and Post Harvest Technology Laboratory of Horticulture, Narendra Deva University of Agriculture and Technology, Faizabad (U.P.). The fruits of rainy season or Ambe bahar guava crop are very poor in quality, having poor shelf life and numbers of fruits are infested with insect pests and diseases particularly fruit flies and anthracnose respectively. These problems occur due to prevalence of warm and humid condition in rainy season. To overcome these problems, the present investigation was formulated with nine pre-harvest treatments viz. T₁ (CaCl₂@ 2%), T₂(salicylic acid @ 3%), T₃(polythene + CaCl₂ @ 2%), T₄(polythene + salicylic acid @ 3%), T₅ (blue polythene + CaCl₂@ 2%), T₆ (blue polythene + salicylic acid @ 3%), T₇ (violet polythene + CaCl₂@ 2%), T₈ (violet polythene + salicylic acid @ 3%) and T₉ (Control). The treated fruits were harvested at ripe stage and stored at ambient condition. The result revealed that all pre harvest treatments found superior than control and the pre harvest treatment of polythene + salicylic acid @ 3 % proved the most efficient in improving fruit size and weight (length 5.37 cm and width 5.23 cm), weight (133 g), and treatment violet polythene + CaCl₂@ 2% improve the bio-chemical quality, TSS (12.68 %), acidity (0.48 mg/100g), TSS: acid ratio (30.19 %), ascorbic acid (164.67 mg/100g), reducing sugar (5.20%), non reducing sugar (4.46%), total sugar (9.66%). violet polythene + salicylic acid, @ 3% proved the best in producing fruits having minimum spots (0.82%) and very less infestation along with more fruit firmness increased (9.51 kg/cm²). Application of violet polythene + CaCl₂@ 2% followed by violet polythene + salicylic acid @ 3% give a better quality and economics return therefore, this pre-harvest treatment may be the option of crop regulation of guava crop.

ESCC: 141.

EFFECT OF IRRIGATION LEVELS ON PERFORMANCE OF TIMELY SOWN WHEAT VARIETIES

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A field experiment was conducted to study the “effect of irrigation levels on performance of timely sown wheat varieties” at Crop Research Station Masodha, Narendra Deva University of Agriculture and Technology Kumarganj, Faizabad 224229 (U.P.) during *Rabi* 2016-17. The experiment was laid out in split plot design with three replications. The treatment consisted of three irrigation levels (I₁- no irrigation, I₂- one irrigation at CRI, I₃- two irrigations, first at CRI and second at boot leaf stage) and six varieties (HI 1612, HD 2888, C 306, K8027, HD 3171 and K 1317), respectively. There were 18 treatment combinations in the present experiment. The soil of experimental field was silty loam texture with low organic carbon (0.40%) and nitrogen (185 kg ha⁻¹), medium in phosphorus (22 kg ha⁻¹) and potassium (262 kg ha⁻¹). The wheat varieties were sown on 10 November 2016. All the growth parameters *viz.* plant height (cm), number of tillers (m⁻²), dry matter accumulation (g m⁻²) leaf area index, days taken to maturity and yield attributes like number of effective tillers m⁻², length of ear (cm), number of grains ear⁻¹, grains weight ear⁻¹, grain and straw yield (q ha⁻¹) were maximum under I₃ (two irrigation, first at CRI and second at Boot leaf stage) was significantly superior than I₂ (one irrigation at CRI) and I₁ (no irrigation) while I₃ and I₂ found at par for growth parameters at 30 days after sowing. Days taken to 50% of ear emergence, test weight (g) were at par for all irrigation levels. In case of various varieties, all growth parameters, yield attributes and yields were maximum under variety K 1317 which was at par with HI 1612 and was significantly superior over rest of varieties, while the days taken to 50% flowering, maturity were non significant. The maximum gross return and net return were noted under two irrigation with variety K 1317. The highest benefit cost ratio (2.38) was recorded with variety K 1317 followed by two irrigation with variety HI 1612, proved remunerative than other treatment combinations tested during the investigation.

ESCC: 142.

ORGANIC PRODUCTION MANAGEMENT: APPROACHES, PRACTICES AND THEIR IMPACT ON BIODIVERSITY

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The use of artificial chemicals such as fertilizers and pesticides came into picture during the mid-19th century. This kind of agricultural practice has been causing harm to the environment. Though by virtue of chemical fertilizers the production and productivity of crops has increased but the use of pesticides has posed many environmental and health problems. Excessive use of synthetic fertilizers and pesticides has caused tremendous harm to the environment as well as it affects human population indirectly. The use of synthetic chemical fertilizers leads to imperfect synthesis of protein in leaves, which is responsible for poor crops (Talukdaret *al*, 2003). The greatest challenge of today's agriculture is to feed the growing population and restore the natural resources. Organic farming may play an important role to make this goal a successful dream.

Organic agriculture is a production system that aims at sustaining healthy soils, ecosystems and people by prohibiting the application of synthetic pesticides and fertilizers in crop production and by emphasizing animal welfare in livestock breeding. It aims at promoting and enhancing agro-ecosystem health, biodiversity, biological cycle as well as soil biological activities. According to IFOAM 2010, “Organic farming should sustain the health of soil, plant, animal, human and planet”. Food crops grown using organic inputs having less or no chemicals are being preferred over conventionally produced food by the end users. Therefore, organic farming may be a suitable option for

enhancing the income of the producers by fetching a premium price of their produce.

Organic agriculture can be a more environment friendly alternative, but individual farming practices need improvement to meet the demands of a growing human population. Further growth of the organic farming sector will contribute to reduce the negative environmental impacts on agriculture. Yield reduction under organic farming during conversion period, resulting into more land requirement to produce the same amount, could offset some of the biodiversity benefits of organic farming. Organic farming results in around 30% higher biodiversity compared to conventional farming. The effects of organic farming vary between organisms groups owing to their ecological traits. The effect of organic farming on biodiversity can be modified by landscape heterogeneity, land use intensity and time since conversion to organic farming. Some gaps are still remaining in the knowledge about how to combine agricultural production and biodiversity conservation for fulfilling the demand of food of ever growing population.

ESCC: 143.

EFFECT OF INTEGRATED USE OF FERTILIZERS AND ORGANIC MANURES ON SOIL PROPERTIES

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In the present scenario, there is a rapid increase in world's population, it has reached five and a half thousand million from less than two thousand million. This clearly indicates higher food demand which ultimately forces for intensive agriculture leading to deterioration of soil with time. This alarms us for proper use of land. The land must produce on a secure basis, the natural resources must be protected, and the management system must be economically viable and socially acceptable. This requires maintaining and improving soil productivity, avoiding and rectifying soil degradation, and avoiding environmental damage. Incorporation of organic manures helps to improve soil productivity, reduce soil degradation and avoid environmental damage.

A field experiment was conducted at Agronomy farm, S.K.N. College of Agriculture Jobner (Rajasthan) during kharif season 2018 on loamy sand soil to study effect of integrated use of fertilizer and organic manures on soil properties.. The experiment comprised of four treatments of fertility levels (Control, 50 per cent RDF, 75 per cent RDF and 100 per cent RDF) and five treatments of organic manures (Control, vermicompost @ 2.5 t ha⁻¹, vermicompost @ 5 t ha⁻¹, FYM @ 5 t ha⁻¹ and FYM @ 10 t ha⁻¹) were applied to the pearl millet. Results showed that organic carbon, available nitrogen, phosphorus, potassium, dehydrogenase activity, alkaline phosphatase activity and soil microbial biomass C, N and P in soil after harvest were observed significantly higher with application of 100 per cent RDF and vermicompost @ 5 t ha⁻¹. Whereas, application of FYM @ 10 t ha⁻¹ significantly increased the bulk density and saturated hydraulic conductivity of soil at harvest. Water retention was also found to be improved on addition of organic manure. Finding indicates that incorporation of organic manures significantly improves physical, chemical and biological properties of soil.

Keywords: Dehydrogenase activity, Alkaline phosphatase activity, Soil microbial biomass

ESCC: 144.

PLANT BREEDING AND ITS IMPORTANCE IN ORGANIC AGRICULTURE

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Plant breeding is the science of changing and improving the traits of plant in series to produced desired characters. Plant breeding ensures the food security by developing new varieties that are high yielding, disease and

insect resistant, drought tolerant and adopted to different environments. Organic agriculture is considered an alternative to conventional agriculture. It is low yielding and its poor performance is due to results of growing poorly adapted varieties. It is estimated that over 95 percent of organic agriculture is based on conventionally adopted varieties. Breeding varieties significantly adapted to unique conditions of organic agriculture is required to realize its full potential. This requires selection for characters viz. Biotic and abiotic stress, early maturity, tolerance to different types of weed, nutrient use efficiency and water use efficiency etc. There are modern and classical breeding techniques that can be utilized for crop improvement in organic agriculture such as controlled crosses between individuals allow desirable genetic variation for recombination and transfer to the seed plant by natural process. Marker assisted selection can also be employed to facilitate selection of progeny who have desired characters. Introgression of resistance genes into new progeny, efficient selection of many resistance genes pyramid in to a single individual is also effective.

ESCC: 145.

PLANT GROWTH PROMOTING RHIZOBACTERIA AND ITS IMPACT IN NITROGEN MANAGEMENT IN SOIL AS A TOOL FOR NATURAL RESOURCE MANAGEMENT

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Soil biodiversity plays a major role in availability and non-availability of major nutrients essential to plant growth and development. Out of all the nutrients, Nitrogen is the most exhaustive and required in a huge amount, generally maximum. Availability of the nutrients are affected depending on the conditions prevailing and also the rhizospheric community going in and out through a variety of processes viz. nitrification, mineralization, denitrification, immobilization, volatilization etc. PGPR help in the above stated processes in a favorable manner to the flora including symbiotic nitrogen fixation, asymbiotic and associative nitrogen fixation and many more. Plant growth-promoting rhizobacteria (PGPR) are the rhizobacteria that can enhance plant growth by a wide variety of mechanisms. PGPR have the ability to produce phytohormones such as indole acetic acid, gibberellic acid, cytokinins, ethylene etc. PGPR are involved in these processes are able to do so due to their peculiar characteristic of producing plant growth promoting substances and enzymes crucial to the mineralization and immobilization of the nutrient. Considering these all, PGPR can be used as a proven mechanism to act as a beneficial nitrogen nutrient resource management and help us combat the situation of excess and harmful vs. insufficient and useless to create and maintain a healthy balance between plant growth and yield production.

Keywords: PGPR, Nitrogen, nitrogen fixation, nutrient management

ESCC: 146.

SOLUTE TRANSPORT IN A VEGETATION FILTER SYSTEM AT KANPUR-A REVIEW

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Simulation of vegetation filter system has two main tasks: to obtain the better understanding of the processes in vegetation filter systems, and to check and optimize design criteria. Numerical models are a mean to increase the understanding of the processes involved in it. This study will mainly focus on simulation results for vegetation filter system at Kanpur where greywater will be used as irrigation water. For simulation of vegetation filter system we will

use HYDRUS- 1D software package. The result will focus on the transport of different solutes in the soil. This study will focus on two nutrients present in the greywater used for irrigation which are nitrogen, phosphorous (N, P). The aim of the work is to determine the surface and bottom flux into the soil, Evapotranspiration, changes in water content of soil and concentration on two nutrients at different depth in the soil due to use of grey water for irrigation. The simulation is to be done for a period of 400 days and the depth of a soil column has to be taken as 50 cm. The result of the simulation will provide the concentration of nitrogen, phosphorous after 400 days. After completion of research, the comparison between measured value and simulated value of concentration will be presented and a match between measured value of concentration and simulated value of concentration will be obtain.

Keywords: Hydrus-1D, Simulation, Evapotraspiration, Irrigation, Greywater.

ESCC: 147.

ORGANIC FARMING IN INDIA AND PROBLEMS FACED BY INDIAN ORGANIC FARMERS

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Organic farming is a system which largely excludes the use of synthetic inputs (fertilizers, pesticides, hormones, feed additives etc) to the maximum extent feasible, relying upon crop rotations, crop residues, animal manures, off-farm organic waste, biological system of nutrient mobilization and plant protection. According to the World of Organic Agriculture 2018 report, India is home to 30 percent of the total organic producers in world, but accounts for just 2.59 per cent (1.5 million hectares) of the total organic cultivation area of 57.8 million hectares. India has the highest number of organic farmers globally, but most of them are struggling. The organic farmers complained of low productivity during the transition from chemical to organic farming. They suggested that government needs to develop a plan in order to support the farmers during the transition stage. They also cited pest attack as another reason for low productivity and demanded education and training to deal with it. Availability of certified organic seeds is a major issue in organic farming. While the government provides subsidy for chemical fertilizers and pesticides, there is no such provision for organic inputs. 98 percent farmers in Rajasthan are aware of the hazards caused due to chemical conventional farming, but they don't switch to organic farming due to fear of low productivity and unavailability of organic inputs. Marketing of organic produce requires connecting farmers with domestic and global supply chain. But the supply chain is underdeveloped. As a result, the small, mid-sized farmers located in hilly regions and tribal belts find it extremely difficult to access the market. The certification systems are not only cumbersome and dime-consuming, but also expensive. It is important to eliminate confusion over multiple certification systems and multiple ministries regulating organic production and sales.

Keywords: Organic farming, conventional chemical farming, organic farmer, certified organic seed

ESCC: 148.

MODELLING SOIL ORGANIC C DYNAMICS UNDER DIFFERENT AGRO-MANAGEMENT PRACTICES IN TROPICAL SOILS

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Soil organic carbon (SOC) stored in croplands constitutes approximately 10% of the global soil carbon stock. The complex interactions between the local soil environmental and climatic conditions as well as the current agronomic management regimes regulate the SOC dynamics. It influences the processes involved with soil C production and decomposition which is strongly linked to environmental conditions such as air temperature, precipitation, soil pH, texture; and agronomic management practices such as crop rotation, stubble retention, tillage regimes; and application of chemical fertilizers and animal manure. Our ability to accurately predict the regional

cropland SOC change and identify the factors that control the SOC dynamics is hindered due to the complex interaction between management practices and environmental factors as well as the lack of spatiotemporal continuity in SOC monitoring data over large areas. Modeling can be used as a powerful tool to examine the potential impacts of management in agricultural soils of the tropical region. Over the past several decades, a number of models have been developed and used to capture the SOC changes under different environmental and management conditions, thereby providing an opportunity for quantifying the SOC dynamics at larger spatial and temporal scales. Based on the process-based models, efforts have already been taken to quantify the SOC dynamics in croplands at the national and continental scales. However, role of the management practices on SOC dynamics modelling has often been ignored. Thus, by using a more systematic approach we can model the complex interactions of soil, climate, and agricultural management practices on SOC dynamics. These models can be an important tool for investigating the behaviour of SOC under current and future management practices, land use, land-use change and climatic condition and help in supporting the policy decisions.

Keywords: SOC dynamics, croplands, agronomic management, process-based models.

ESCC: 149.

DEVELOPMENT AND PERFORMANCE EVALUATION OF SUB SURFACE MANURE APPLICATOR

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Agriculture is a production oriented sector in which farmers apply various crop inputs. The farmers are over applying the chemical fertilizers to fulfil global food demand. The over utilization of chemical fertilizers such as Urea and DAP has undermine the quality of soil. Moreover, the over use of these chemical fertilizers have drastic effect on the human health as well as on the environment. The subsurface application of manure can avoid the volatisation of Nitrogen in the form of Ammonia and can enhance the properties of soil. Therefore an animal drawn subsurface manure applicator was developed and its performance was evaluated in laboratory as well as in field conditions. The study shows that a screw type metering mechanism is appropriate for the developed machine. The metering mechanism had deliver 7 t/ha at 400 rpm. The study shows that there is insignificant effect of hopper height and travel speed on the uniformity of manure distribution. The theoretical manure rate, actual manure rate and efficiency of screw conveyer were observed to be 11.62, 7.01 and 60.32%. The draft requirement for untilled field conditions was observed as 0.63, 0.68, 0.68 and 0.77 kN for the speed of 1.5, 2, 2.5 and 3 km/h at the 50 mm depth of operation. Similarly, the draft was observed as 0.72, 0.77, 0.82 and 0.86 kN for the speed of 1.5, 2, 2.5 and 3 km/h at the 100 mm depth of operation. Also, the draft was observed as 1.20, 1.30, 1.34 and 1.39 kN respectively for the speed of 1.5, 2, 2.5 and 3 km/h at the 150 mm depth of operation. The draft requirement for tilled field conditions was observed as 0.53, 0.63, 0.68 and 0.68 kN for the speed of 1.5, 2, 2.5 and 3 km/h at the 50 mm depth of operation. Also, the draft requirement was observed as 0.73, 0.78, 0.87 and 0.87 kN for the speed of 1.5, 2, 2.5 and 3 km/h at the 100 mm depth of operation. Also, the draft requirement was observed as 0.92, 1.01, 1.06 and 1.10 kN for the speed of 1.5, 2, 2.5 and 3 km/h at the 150 mm depth of operation.

ESCC: 150.

NITROGEN AND WATER MANAGEMENT UNDER CONSERVATION AGRICULTURE BASED MAIZE-WHEAT SYSTEM

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Conservation agriculture (CA) technologies involve minimum soil disturbance, permanent soil cover through crop residues or cover crops, and crop rotations for achieving higher productivity. But, the blanket recommendations of nutrients in general and N in particular exist for maize-wheat system under CA and there is no protocol has been developed till now for water and nutrient management under CA for maize and wheat. Keeping these fact in view a field experiments was conducted during 2017-18 with two crop establishment methods i.e. CA and conventional tillage, four water management (Irrigation at critical crop growth stages, application of water at 25% available soil moisture depletion (ASMD), 50% ASMD and as per SBI indicator) and five N management options in split-split plot design to know the interactive effect of N and water under CA and CT condition. Result revealed that nitrogen requirement under conservation agriculture was less as compare to conventional tillage. Moisture absorption and retention capacity was also higher under CA plot as compare to CT. Application of water as per recommendation of SBI moisture indicator was not appropriate as it made only 2 recommendation for the irrigation in the whole life cycle of the wheat and 1 for maize. As far as interaction of water and N on yield of maize and wheat was concerned, the higher yield of both the crop were noticed under the treatment viz. irrigation at 25 ASMD+ application of 75 N as basal along with one split based on the recommendation of greenseeker which was remained at par with irrigation at critical crop growth stage and 50 ASMD.

ESCC: 151.

DIFFERENTIAL RESPONSES OF C₃ AND C₄ CROP UNDER PRESENT AND FUTURE SCENARIO OF CLIMATE CHANGE: PHYSIOLOGY, TRANSCRIPTOMICS AND METABOLOMICS

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The present study was conducted to assess impact of elevated CO₂ and O₃ on growth, physiology and yield of pearl millet (*Pennisetum glaucum* L.) as C₄ crop and wheat (*Triticum aestivum* L.) as C₃ crop to understand mechanism of action of C₃ and C₄ crop under changing climate. Treatment consist of ambient CO₂+ambient O₃ (ACO₂ + AO₃) as a control, elevated O₃ (EO₃), elevated CO₂ +ambient O₃ (ECO₂), and elevated CO₂ + elevated O₃ (ECO₂ + EO₃). The elevated concentration of O₃ (ambient (46.13) + 20 ± 5 ppb) and CO₂ (570 ± 25 ppm) were selected to match with the predicted concentration in the end of the century under A1B Scenario AR4 of IPCC. Photosynthesis rate decreased in EO₃ and increased in ECO₂ and ECO₂+EO₃ in C₃ crop and in C₄ crop Ps rate decreased in EO₃ and no variation was recorded in ECO₂ and increase in ECO₂+EO₃. Stomatal conductance was higher in EO₃ followed by ECO₂ and lower in ECO₂+EO₃ compared to control in both the crops. SDS-PAGE result showed more degradation of large subunit of RUBISCO under EO₃. In C₃ crop higher ABA content was observed while in C₄ crop higher SA content was recorded. Higher superoxide and H₂O₂ content was recorded in C₃ crop compared to C₄ crop and among treatment trend was EO₃>ACO₂>ECO₂+EO₃>ECO₂. Results of gene expression of antioxidative enzymes showed greater expression in C₄ crop than C₃ crop under different treatments. Results of amino acid profiling showed higher amino acid in ECO₂+EO₃ in C₄ crop and reduction in ECO₂ treatment in C₃ crop. Characterization of polyphenol showed presence of Apigenin derivatives, Chysoeriol derivative, Tricetin derivatives and Luteolin derivative in C₃ and C₄ crops and many unknown compounds of C₄ crop. These compounds were higher in EO₃ treatment in C₃ crop and ECO₂ treatment in C₄ crop. Yield

of C₃ crop increased more than C₄ crop in ECO₂, C₃ crop showed more benefit under ECO₂+EO₃ treatment and more reductions in C₃ crop was recorded than C₄ crop under EO₃ compared to control. The present study concludes that pearl millet is a highly tolerant C₄ crop under EO₃ and C₃ crop will be more benefitted under elevated CO₂ and has more potential to ameliorate the deleterious effects of present and future levels of O₃.

ESCC: 152.

EFFECT OF CROP ESTABLISHMENT METHODS AND NUTRIENT MANAGEMENT OPTIONS ON YIELD OF MAIZE

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A field experiment was conducted at the experimental Farm of ICAR- Indian Agricultural Research Institute, New Delhi during Kharif 2016 to know the effect of crop establishment (with and without residue) and nutrient management options on grain yield of maize under maize-wheat cropping system. The experiment was laid out in split plot design with 3 replications. The soil of the experimental field was sandy loam in texture, slightly alkaline reaction (pH 7.8), low in organic carbon (0.18 %), available N (171.2 kg ha⁻¹), medium in available P (18.1 kg ha⁻¹) and available K (144.0 kg ha⁻¹). Treatments consisted of three crop establishment options (conventional tillage with and without residue incorporation, zero tillage with and without residue retention and permanent raised bed with and without residue retention) in main-plots and 4 nutrient management options i.e. soil test based crop response (STCR), Nutrient expert® (NE), soil test based crop response + GreenSeeker (GS) and Nutrient expert® (NE) + GreenSeeker (GS) in sub-plot. Recommended dose of fertilizer for N, P₂O₅ and K₂O (150, 80, 60 kg/ha) was applied through urea, diammonium phosphate and MOP, respectively. Results revealed that growing maize on raised bed along with residue retention on surface had significantly higher grain yield as compared to zero tillage and conventional tillage with or without residue management options. Fertilizer applications as per Nutrient expert® (NE) enhanced grain yield by 17.7% over soil test based crop response (STCR) with economizing the nitrogen and phosphorus use. Further, combined use of NE and GS resulted in higher grain yield (16.2%) with higher nitrogen use efficiency (NUE) over GreenSeeker (GS) alone. Further, study infer that raised bed planting of maize along with residue retention on surface and fertilizer application using Nutrient Expert® combined with N scheduling through GreenSeeker can bring sustainable high yield crop and nutrient use productivity.

ESCC: 153.

SUSTAINABILITY, FOOD SECURITY AND CLIMATE CHANGE IN AGRICULTURE

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Agricultural production systems are facing increasing competition from other sectors for limited natural resources. The availability of these resources and their quality are also being affected by unsustainable management practices and changing climatic and weather conditions. To respond to this situation, the agriculture sectors must improve their sustainability performance and adapt to the impacts of climate change in ways that do not compromise global efforts to ensure food security for all. These challenges are intimately and inextricably related, and need to be addressed simultaneously. The concept of sustainability has three dimensions: economic, environmental and social. A sustainable farming system should be a profitable business that creates mutually beneficial relationships among

workers and the surrounding community, and contributes to the sound management of the land and other natural resources. SDG 2, 'End hunger, achieve food security and improved nutrition and promote sustainable agriculture', makes it clear how important the promotion of sustainable agriculture is to the 2030 Agenda for Sustainable Development. As their name suggests, the SDGs have a strong focus on all the dimensions of sustainability. This involves an examination of the food system as a whole and promoting integrated and harmonized development strategies across the different agricultural sectors and along all the stages of the food value chain in ways that take into account the synergies and the trade-off among the different dimensions of sustainability (FAO 2016b). Climate change will affect the agricultural sectors in many ways, and these impacts will vary from region to region. For example, climate change is expected to increase temperature and precipitation variability, reduce the predictability of seasonal weather patterns and increase the frequency and intensity of severe weather events, such as floods, cyclones and hurricanes. Some regions are expected to face prolonged drought and water shortages. The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (IPCC, 2014) also points out that changes in climate and carbon dioxide concentrations will enhance the distribution and increase the competitiveness of important invasive weeds.

Keywords: Sustainable Agriculture, Food.

ESCC: 154.

AGRICULTURAL MECHANIZATION FOR SUSTAINABLE AGRICULTURAL AND RURAL DEVELOPMENT

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Agricultural mechanization is an important input to agriculture for performing timely farm operations reducing the cost of operation; maximizing the utilization efficiency of costly inputs (seeds, fertilizer, plant protection chemicals, water and agricultural machinery); improving the quality of produce reducing drudgery in farm operations; improving the productivity of land & labour and for improving the dignity of labour. The strategy for mechanization in different regions will be different depending on the conditions and resources of that region. The agricultural mechanization strategy for eastern U.P. region is suggested keeping in view the land holding pattern, the available resources in the region, the population depending on agriculture, the important cropping systems being followed in this region, farm power availability and the infrastructural facilities available for promotion of agricultural mechanization and agro-processing programmes. Farm Mechanization in the country is set to enter a new phase. It is felt that there is need to 're-look' and 're-engineer' the process of farm mechanization so that it effectively includes small and marginal farmers (Agrawal, 1983). Farm mechanization programmes in the country have been guided by the ICAR system with the aim of optimum utilization of available farm power resources and augmenting the farm power availability (Singh, 1999).

Keywords: Agricultural mechanization, Sustainable Agricultural.

ESCC: 155.

AGRICULTURE ENGINEERING AND SUSTAINABLE ENVIRONMENT

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India is one of the promising universal business giant with a second fastest fiscal escalation rate (8.9%) and a fourth largest GDP in terms of Purchasing Power Parity (US\$ 3.6 trillion). Every industry faces the threat of failure in business. Construction companies are predominantly susceptible to fiscal risk owing to the nature of the industry,

intense rivalry, reasonably low access barrier, soaring uncertainty and risk involved, and fanciful rise and falls in construction volume. We need to encompass a closer perceptible of the correlation involving the two inter-related matters of risk management and funding on construction projects. It is becoming progressively more essential to attain the goals of the patron, the proprietor and the constructor and its supply chain, particularly when the interest in PFI and PPP arrangements are incessantly budding all around globally. Engineers carry on their shoulders the responsibility of endorsing the principles of sustainable growth. Sustainable development deals with meeting existing individual needs from naturally accessible reserves, while preserving and enhancing the surrounding environmental quality. This paper deals with the various issues involved in the process of engineering while taking in view the environmental considerations for future generations, the prospective responsibility industrial engineers.

Keywords: Environment, Sustainability, Pollution, Growth, Development, Economy

ESCC: 156.

SUSTAINABLE ENGINEERING AN INTRODUCTION TO SUSTAINABILITY

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Environmental and natural resource issues have gained increasing prominence in the latter half of the 20th century and the beginning of the 21st century. Growing populations and affluence, around the globe, have put increasing pressure on air and water, arable land, and raw materials. Concern over the ability of natural resources and environmental systems to support the needs and wants of global populations, now and in the future, is part of an emerging awareness of the concept of sustainability. Sustainability is a powerful, yet abstract, concept. The most commonly employed definition of sustainability is that of the Brundtland Commission report—meeting the needs of the present generation without compromising the ability of future generations to meet their needs (World Commission on Environment and Development, 1987). However, a search on the definition of sustainability will return many variations on this basic concept. In engineering, incorporating sustainability into products, processes, technology systems, and services generally means integrating environmental, economic, and social factors in the evaluation of designs. While the concepts of engineering for sustainability may seem simple in the abstract, converting the concepts into the quantitative design tools and performance metrics that can be applied in engineering design is a challenge.

Keywords: Environmental, sustainable agriculture.

ESCC: 157.

RENEWABLE ENERGY, SUSTAINABLE DEVELOPMENT AND ENVIRONMENTAL PROTECTION

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Environment” means treating a multidisciplinary and interdisciplinary theme which revives a simultaneous consideration of multiple data social, economic, natural. To date, the protection of the environment as a whole becomes a challenge for many countries, policies for the preservation, education and scientific research strategies are aimed at the environment and sustainable development. It remains an idea of its young problem, still current. It is development that meets present needs without compromising the ability of future generations to meet their own needs. In the field of architecture and urban planning, environmental protection is an important place. With the growth experienced by this area, several environmental procedures have been invented to improve the quality of construction and use of buildings, a view mainly environmental but without neglecting the economic and social aspects. The environmental protection has long existed, it is found in the experiences of ancient cities such as Ksours. This legacy is

an inspiration and an asset for the sustainable development of our cities today. According to Hassan Fathy only in the tradition, we respect and we continue the work of previous generation that new generation can really move and solve the problem. The materials used the distribution of space, protection of natural resources such as water and palm trees, recycling, are the strategies of the company of Ksours to live in a healthy and comfortable space.

Keywords: Renewable Energy, Environment, sustainable agriculture.

ESCC: 158.

SUSTAINABLE DEVELOPMENT OF ENERGY, WATER AND ENVIRONMENT SYSTEMS

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Sustainability is a new, important discourse aimed at promoting a new strategy in the development of energy, water and environmental (EWE) systems — the key components that affect the quality of life on our planet. It is becoming increasingly clear that the quest for sustainable development requires integrating economic, social, cultural, political and ecological factors. The behaviour and properties of a EWE system arise not merely from the properties of its component elements, but also to a large degree also from the nature and intensity of their dynamic interlink ages. This volume helps clarify the complexity of these problems by providing a deeper understanding of the implications of the different aspects of sustainability. This work contains a collection of selected, peer-reviewed and state-of-the-art reflecting papers that were presented at the Third Dubrovnik Conference on Sustainable Development of Energy, Water and Environment Systems that was held in June 5-10, 2005 in Dubrovnik, Croatia. It was therefore considered desirable to reduce energy consumption and decrease the rate of depletion of world energy reserves and pollution of the environment. One way of reducing building energy consumption is to design buildings, which are more economical in their use of energy for heating, lighting, cooling, ventilation and hot water supply.

Keywords: Water and environmental, sustainable agriculture.

ESCC: 159.

ENERGY AND ENVIRONMENT, APPLICATIONS AND SUSTAINABLE DEVELOPMENT

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Globally, buildings are responsible for approximately 40% of the total world annual energy consumption. Most of this energy is for the provision of lighting, heating, cooling, and air conditioning. Increasing awareness of the environmental impact of CO₂, NO_x and CFCs emissions triggered a renewed interest in environmentally friendly cooling, and heating technologies. Under the 1997 Montreal Protocol, governments agreed to phase out chemicals used as refrigerants that have the potential to destroy stratospheric ozone. It was therefore considered desirable to reduce energy consumption and decrease the rate of depletion of world energy reserves and pollution of the environment. One way of reducing building energy consumption is to design buildings, which are more economical in their use of energy for heating, lighting, cooling, ventilation and hot water supply. Passive measures, particularly natural or hybrid ventilation rather than air-conditioning, can dramatically reduce primary energy consumption (Omer, 2009a). However, exploitation of renewable energy in buildings and agricultural greenhouses can, also, significantly contribute towards reducing dependency on fossil fuels. Therefore, promoting innovative renewable applications and reinforcing the renewable energy market will contribute to preservation of the ecosystem by

reducing emissions at local and global levels. This will also contribute to the amelioration of environmental conditions by replacing conventional fuels with renewable energies that produce no air pollution or greenhouse gases (during their use).

Keywords: Greenhouse gases, Environment, sustainable agriculture.

ESCC: 160.

THE ROLE OF TECHNOLOGY IN SUSTAINABLE DEVELOPMENT

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The inability of governments represented at the 1992 Earth Summit to reach a consensus on reducing either population growth or consumption, and the political need for the concept of sustainable development to accommodate economic growth, mean that the achievement of sustainable development will depend on our ability to reduce the environmental impact of resource use through technological change. This will require the redesign of our technological systems and not merely the application of technological fixes that are seldom satisfactory in the long term. Past attempts by the appropriate technology movement to affect such a redesign neglected the social dimensions of technological change. Modern advocates of sustainable development will similarly fail unless they recognize the need for fundamental social change and a shift in priorities. India is one of the promising universal business giant with a second fastest fiscal escalation rate (8.9%) and a fourth largest GDP in terms of Purchasing Power Parity (US\$ 3.6 trillion). Every industry faces the threat of failure in business. Construction companies are predominantly susceptible to fiscal risk owing to the nature of the industry, intense rivalry, reasonably low access barrier, soaring uncertainty and risk involved, and fanciful rise and falls in construction volume. We need to encompass a closer perceptive of the correlation involving the two inter-related matters of risk management and funding on construction projects.

Keywords: Environmental, sustainable agriculture.

ESCC: 161.

CLIMATE CHANGE, SUSTAINABLE DEVELOPMENT AND INDIA: GLOBAL AND NATIONAL CONCERNS

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Climate change is one of the most important global environmental challenges, with implications for food production, water supply, health, energy, etc. Addressing climate change requires a good scientific understanding as well as coordinated action at national and global level. This paper addresses these challenges. Historically, the responsibility for greenhouse gas emissions' increase lies largely with the industrialized world, though the developing countries are likely to be the source of an increasing proportion of future emissions. The projected climate change under various scenarios is likely to have implications on food production, water supply, coastal settlements, forest ecosystems, health, energy security, etc. The adaptive capacity of communities likely to be impacted by climate change is low in developing countries. The efforts made by the UNFCCC and the Kyoto Protocol provisions are clearly inadequate to address the climate change challenge. The most effective way to address climate change is to adopt a sustainable development pathway by shifting to environmentally sustainable technologies and promotion of energy efficiency, renewable energy, forest conservation, reforestation, water conservation, etc. The issue of highest importance to developing countries is reducing the vulnerability of their natural and socio-economic systems to the

projected climate change. India and other developing countries will face the challenge of promoting mitigation and adaptation strategies, bearing the cost of such an effort, and its implications for economic development.

Keywords: Water and environmental, sustainable agriculture, Climate change.

ESCC: 162.

RESPONDING TO GLOBAL CLIMATE CHANGE IN FRAGILE RESOURCE ZONES

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Global climate change, judging from the debate on the subject, is one of the major concerns of the world today. However, the concern of those closely following the debate is that it has created more panic than concrete strategies to abate and adapt to the global change. The situation seems to present a crisis where the uncertainties of predicted global change scenarios combine with the risk averse nature of decision makers to obstruct concrete action and encourage the "wait and see" approach. However, the cumulative nature of warming may not permit the luxury of "wait and see". Hence, there is a need for action, despite the uncertainties of predicted changes; but action requires concrete contexts to facilitate anticipatory measures by the decision makers. In order to resolve the problem, one should look for certainty components in the complex of uncertainties that characterize the whole problem. This paper argues that such certainty components can be projected by altering the current skewed perspectives on the problem. Taking the lead from recent conceptual work on "cumulative change," as against "systemic change," to properly understand global environmental change, the paper presents an approach to identify and use the "certainty components." The paper illustrates this approach with reference to the semi-arid tropical region of India and, to a limited extent, the Himalayan mountain region.

Keywords: Global climate change, sustainable agriculture.

ESCC: 163.

SUSTAINABLE DEVELOPMENT AND CLIMATE CHANGE IN AGRICULTURE

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Sustainability is defined in terms of four overlapping positions, ranging from very weak to very strong sustainability. The core idea is of a non-declining capital stock (including natural capital) over generational time. Weak sustainability positions emphasize capital substitution possibilities and the power of technical process to mitigate resource depletion and pollution problems. Climate change and its associated risks and strong uncertainty are characterised by features which favour a strong sustainability approach incorporating the precautionary principle. Strong sustainability positions recognise constraints on substitution processes and incorporate ethical concerns such as intergenerational equity as a moral duty. Cost-benefit analysis is moderated via safe minimum standards which set GHGs concentrations and emissions abatement targets. Our goal in this article is the analysis of the state of affairs, regarding the phenomenon of climate change and its impact in different areas. We synthesize the various approaches available in the scientific debate on this subject, mainly the one that affirms the existence of global warming and the current approach, which denies it. Beyond the controversy, what seems to be evident is that there is a multifactorial causality in a phenomenon that affects anthropogenic factors a well.

Keywords: Water and environmental, sustainable agriculture.

ESCC: 164.

ARTIFICIAL DRAINAGE SYSTEM: TYPES AND IMPORTANCE

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In the current scenario drainage system is one of the most important topics in crop production and it is also known as river systems, are the patterns formed by the streams, rivers, and lakes in a particular drainage basin. They are operated by the topography of the land. An agricultural drainage system is a system by which water is drained on or in the soil to enhance agricultural crops production. It is very useful to control soil erosion, water table, and storm water control, Drainage system can be used for irrigation it increases the soil moisture in minimum water supply and completes the main objective of irrigation (supply water to the root zone) There are two types of artificial drainage named surface drainage and subsurface drainage and both are being used in agriculture. Artificial subsurface drainage increases the productivity of land where high water table or soil moisture conditions prevent the gravitational water movement from the root zone. Artificial drainage systems employ the help of wells, pipes and other constructed materials to achieve a successful drainage system. A dry well system executes the use of an underground storage container with downspouts and drains connected to it.

Keywords: Artificial surface drainage, artificial sub-surface control soil erosion.

ESCC: 165.

EVALUATION OF PLANT GROWTH PROMOTING TRAITS OF RHIZOBACTERIA FOR THE BETTERMENT OF PLANT GROWTH UNDER SOIL SALINITY STRESS

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Salinity of soil is one of the major factor reducing agricultural productivity and stands as a challenge for capacity of agriculture to sustain the rapid increasing human population. Salinity is considered as a serious threat global because 1 to 2% of agricultural soil is getting reduced per year due to salinisation of soil. Salinity tolerant plant growth promoting rhizobacteria (PGPR), is an important alternative to some of the traditional agricultural techniques for handling soil salinisation problem. Many species of PGPR have tendency to impart tolerance to plants towards lower and higher salt concentrations in soils while enhancing plant growth, as they live by making association with plant root hairs and mobilize nutrients to the plant in a synergic way. The present study was done with an objective to evaluate the plant growth promoting traits of some salt tolerant rhizobacteria. There were 5 salinity tolerant rhizobacterial isolates used in this study namely ST1, ST2, ST3, ST4, and ST5. These rhizobacterial isolates were studied for their growth behaviour and level of tolerance against salinity on 4 levels of salinity amended Nutrient agar (250 mM, 500 mM, 750 mM and 1000 mM). All the 5 rhizobacterial isolates were also evaluated for their plant growth promoting traits like Indole production (IAA) and phosphate solubilization individually as well as various combinations. The amount of IAA production by the rhizobacterial isolates were ranged from 1.82mg/l to 13.46mg/l individually, while in case of combination it was ranged from 1.57mg/l to 20.78 mg/l. The maximum production of IAA was shown by rhizobacterial strain ST5 while the combination of rhizobacterial isolates ST3 and ST5 produced the highest amount of IAA. In case of phosphate solubilization the best solubilization was exhibited by ST5 which was followed by ST1.

Keywords: Soil salinity, Rhizobacteria, Indole Acetic Acid (IAA), Phosphate Solubilization.

ESCC: 166.

RESPONSE OF PERIPHYTIC ALGAL COMMUNITY TO ARSENIC STRESS

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In situ effect of arsenic (As) stress on periphytic algal community of the river Ganga was studied using chemical diffusing substrates. Arsenic stress induced significant reduction in periphytic biomass and a maximum inhibition in growth was recorded at highest arsenic concentration. Various periphytic groups responded differentially to metal stress. The diatoms exhibited tolerance against As treatment whereas cyanobacteria showed sensitivity. The relative abundance of Chlorophyta increased in all the tested concentrations of arsenic. Arsenic treatment caused significant reduction in species richness and diversity of periphytic algae. Periphytic algae that were tolerant to arsenic treatment included *Aulacoseira granulata*, *Aulacoseira pusilla*, *Nitzschia palea* and *Navicula racens*.

Keywords: Heavy metal, Periphyton, Arsenic, Biomass, Metal stress

ESCC: 167.

PREVENTIVE INNOVATION: THE EMPHASIS SHOULD BE ON NATURAL FARMING AND ORGANIC FARMING

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Despite of cereals being the major crops grown in our J and K state, pulses also hold the significant area in our selected study area Samba and Kathua. To study the potential in our state, to meet the nutritional requirement of pulses at state and national level, the study has been conducted on blackgram to assess certain objectives. The farmers should be empowered with latest crop production technologies as per behaviour of monsoon during kharif. Already evolved / notified varieties of pulses suitable for different weather conditions / tolerant to all eco system changes including biotic and abiotic stresses are available but perception of the farmers regarding its advantage should be perceived. Perception of the framers is built on the attributes (traits) of the innovation. For farmers relative advantage should be more and complexity should be less to adopt appropriate technologies in pulses as complex technologies requires complementary adoption, requires consistent training and communication support for the clientele, for their adoption. Farmers' hold good inherited knowledge about the selected pulse i.e. blackgram along with other pulses that it possess nodules which improves soil fertility so it requires less fertilizer dose and requires less or no irrigation during kharif season which makes it less complex than other crops and also for the same reasons it holds relative advantage economically. The emphasis should be on natural farming, organic farming by using evolved varieties or by adequate training programmes which can give exact guidance of optimal/minimal/adequate or no usage of chemical herbicide, insecticide, fungicide as because the crop is on one hand improving soil fertility but over usage of chemicals will make soil health degradation and it will lower the quality of pulses in future and in fact pulses need to be grown to meet nutritional sufficiency. In our study, organic cultivation was the one of the main suggestion given by the farmers and ranked second in which 86 farmers out of 150 i.e. 57 percent suggested organic cultivation of mash crop should be promoted whereas proper guidance regarding mash cultivation should be provided was ranked first with 96 farmers i.e. 64 percent. According to Rogers, a PREVENTIVE INNOVATION is an idea that an individual adopts at one point in time in order to lower the probability that some future unwanted event will occur. Moreover, the government of India is giving required attention to enhance pulse production for various reasons like to improve nutritional sufficiency, to increase export, to enhance farmers income and the study will further benefit them to plan their policies.

Keywords : Blackgram, legume crop, nutritional sufficiency, soil fertility, organic and natural farming

ESCC: 168.

A STUDY ON PRECISION SEEDING WITH A ROBOTIC PLANTER

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Equidistant and uniform seed placement is an important requirement in crop production. Traditional seeding methods are labor intensive, requires more time and energy. To improve accuracy in seed placement, another viable option is robot, which can plant, water and also control weeds and pests more precisely and ensures less labor requirement in production of quality products economically. Robotic systems are highly complex, their design requires integration of various subsystems and correct synchronization to work as single unit. Intelligent systems help in controlling operations performed by the robot as required. An attempt is being made in the study to obtain a precision planting with least deviation for desired crop geometry. Laboratory and field evaluation were done as per the experimental plan. **Maize crop has wider adaptability characteristics over varied agro-climatic conditions and various soil types ranging from loamy sand to clay loam.** The planter performed the intended function of planting seeds and has versatility of planting crops with difficult crop geometry at different operational speeds.

Precise working of robotic planter can be achieved with the medium speed of operation 200 mm/sec in both field and laboratory condition. Increased or decreased operational speeds above or below the medium speed causes missing of steps/pulses in the motor, which results decreased precision of the robotic planter. Among the selected crop geometries, larger one gives best results with smaller standard deviation values than smaller crop geometries. In precision point of view statistical analysis shows that 20cm×20cm crop geometry has given the best results with least variation in field and lab condition. Statistical analysis shows that smaller crop geometry (10cm ×10cm) having higher accuracy with less mean value in lab and field condition. At medium speed of operation with the selected crop geometries less variation in crop planting was observed. As the speed increases from medium to high, variation in planting was also changes to higher values with change in crop geometries. Missing seed dropping percentage in field was about 0 to 5.71% due to inability of the dibbler to get sufficient force to open in the soil. Multiple seed dropping percentage was found as 5 to 9% due to soil condition, it sticks to the dibbling unit and controls dropping of seed at a point may places seed in next point. For 60cm*20cm crop geometry at slow speed operation of robotic planter takes more time (110 sec) than manual sowing (80 sec) but medium speed (80 sec) taken approximately same time as manual sowing. High speed of operation takes less time (60 sec) than manual sowing with more deviation. Observed germination percentage of maize crop was found as 89 to 91%.

Keywords: Robotic planter, crop geometry, precision, accuracy, deviation

ESCC: 169.

SUSTENANCE OF SOIL QUALITY UNDER CHANGING CLIMATE THROUGH CARBON SEQUESTRATION

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Soil organic carbon content is one of the chief indicators of soil quality under this era of climate change. Under changing climate soil sustainability maintained by storing carbon through carbon sequestration and decreasing greenhouse gas emissions in the atmosphere. Carbon sequestration is defined as the process of capture and long-term storage of atmospheric carbon dioxide (CO₂) in a stable state. This process can be direct or indirect and can be biological, chemical, geological, or physical. Human activities, especially the burning of fossil fuels have caused a significant increase in the concentration of carbon dioxide (CO₂) in the atmosphere. This increase in atmospheric CO₂ from about 280 to more 400 parts per million (ppm) over the last 250 year is causing global warming. Recommended

Management practices which help to fix this atmospheric CO₂ along with enhancing soil quality include adoption of conservation tillage, crop residue recycling, application of manure and other organic amendments, minimized soil and water losses, integrated nutrient management (INM), etc. The objective of these management practices is to create a positive C budget and improve the quality and sustainability of the soil. There are many co-benefits related to enhancing the quantity and quality of the soil C pool, which includes, reduced plant water stress, increased nutrient (N, P, S, Zn, etc.) retention capacity of soil, enriched soil biota, better plant growth, increased water infiltration and reduction in surface runoff, reduced soil erosion, increased nutrient and water use efficiency.

ESCC: 170.

PURPOSE OF USING GREEN MANURES IN VARIOUS CROPS IN AGRICULTURE

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Organic manures were considered as the cheap and chief source of plant nutrients and soil amendment. Using excess chemical fertilizers disturbing soil properties and reduce the production of crops and its quality. Among the different organic manures, green manuring is the most important. Green manuring called as a ploughing or incorporating into the soil un decomposed green plants or their residue for the purpose of improving physical properties and fertility of the soil. The using of green manure provides many betterment in chemical, physical and biological properties, through addition in organic matter content and microbial activity, nutrient cycling, disruptions of compacted layers, decline erosion, incidence of pests and diseases, and suppression of weed plants for sustainable crop production system. There are different types of leguminous green manures crops in India like dhaincha, glyricida, etc. Here also non leguminous crops like Neem, Buck wheat, wheat, maize, sun flower etc. leguminous crops are comprise different microorganisms which can fix nitrogen from the atmosphere to enhance nutrient in soil. Green manure are increasing soil properties and decreasing environmental pollution.

Keywords: Organic, fertilizers, microorganism, nutrient etc.

ESCC: 171.

BIOFERTILIZER AND BIOPESTICIDES APPLICATION IN AGRICULTURE FOR ENHANCING MULTIPLE CROPS PRODUCTION

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During the green revolution, the excessive use of chemical fertilizer and pesticides in agriculture field causes soil salinity, heavy metals, radionuclides, and nitrate pollution in the soil. The excessive use of nitrogen fertilizer also leads to the contamination of nearby water bodies with nitrates, which leads to many toxic effects on humans. The contamination of the soil and water bodies by these contaminants leads to many diseases and adverse effects on human and animal life. Major effects include Blue Baby Syndrome by nitrate accumulation in water streams. Other harmful effects arising from the use of pesticides like skin rashes, vomiting, stomach pain, heart and cancer diseases in human being. The solution of minimization of impact of green revolution, the use of biofertilizers, biopesticides, bio-composting, green manuring and crop rotation under sustainable agriculture are the alternative agricultural practices for boosting productivity, soil health and fertility. To use more of efficient green source of energy and lower the risk chemical input for agriculture production, government of India introduced a number of schemes (Paramparagat Krishi Vikas Yojana, Rashtriya Krishi Vikas Yojana, National Mission on Oilseeds and Oil Palm, and Indian Council

of Agricultural Sciences) for promoting productivity. These entire organizations are working in a different field to reduce the risk of chemical input in the environment and development of an efficient source of energy for sustainable agriculture production. For more sustainable agriculture, production there is a need for the development of an efficient technology, which helps for more production that is cost-effective and easy to use for the farmers. Microbial consortia as environment friendly practices can be effective for enhancing sustainable and healthy agricultural productivity. This approach will be a good step towards encouraging agriculture and food industries as it increases plant produce with less chemical and pesticides input. Such an approach would definitely boost up the agriculture sector, and will also help in the proper maintenance of the soil.

Keywords: Biofertilizer, Biopesticides, Sustainable agriculture, Microbial consortia.

ESCC: 172.

TRANSNATIONAL ENVIRONMENTAL HARM IMPACTS ON AGRICULTURE

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Pollution is linked to three main human activities: fossil-fuel combustion, primarily by industry and transport; the application of synthetic fertilizers and pesticides in agriculture; and the growing use and complexity of chemicals. Transnational pollution is the pollution that originates in one country but is able to cause damage in another country's environment, by crossing borders through pathways like water or air. Pollution can be transported across hundreds and even thousands of kilometers. One of the problems with transnational pollution is that can carry pollution away from a heavy emitter and deposit it onto a nation whose emissions are relatively low. Another problem with transnational pollution relates to the quote above. Due to the fact that 'All things connect', the heavy pollution that is evident in the developed world also becomes evident in remote areas. Because acidic pollution is transnational, there is no clear relationship between how much pollution a country emits and how much is deposited there. The development of modern environmental law has been linked to the economic development of society. The Chernobyl nuclear disaster in 1986, whose radiation fallout contaminated many European countries, graphically illustrated this interconnectedness. In 2002, the World Summit on Sustainable Development was held in Johannesburg. It produced the Johannesburg Declaration¹, which was a political statement of a continued commitment to sustainable development. Four main substances are cause for concern: nitrogen, sulphur, ozone and particulate matter. Atmospheric nitrogen pollution primarily consists of emissions of nitrogen oxides from industry and transport, and emissions of ammonia from agriculture.

ESCC: 173.

FEASIBILITY STUDY ON SPIROGYRA ALGAE FOR BIODIESEL PRODUCTION

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Algae were reported to be a promising feed for biodiesel production. Algae *Spirogyra* was found in abundance in water bodies of central India. *Spirogyra* species was selected due to their availability and may be easily grown in ponds and lakes. Algal species growths were reported fast and have a tendency to accumulate large amount of lipid (20-50% of dry weight). Lipid (oil) and biodiesel production from *Spirogyra* species was extracted and measured. The results showed that 7.58% Lipid (oil) produced from dry weight of *Spirogyra* species by Soxhlet-

extraction method. Results indicate the biodiesel production from *Spirogyra* species was 58-60%. Algal oil and biodiesel (FAME) production were found higher in other algae species than *Spirogyra* species.

Keywords: Spirogyra; nutrient; lipid; transesterification; biodiesel

ESCC: 174.

BIOETHANOL PRODUCTION POTENTIAL FROM CROP BIOMASS WASTE

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Agricultural waste production is directly proportional to the crop production. The increasing population in turn has led to an increase in the production of the more and more crops and hence the production of agricultural waste has increased accordingly. At 7.5 billion mark the present human population prompts for efficient and renewable sources of energy. Energy from biomass is considered to be carbon emission neutral. The generation of agricultural biomass increases in accordance with the growing population. The global anthropogenic GHG emissions' share of the waste sector in 2005 was recorded 3-5%. Asia alone contributes with roughly 27% of the global waste emissions. The amount of waste generated by the developed countries is far more than the developing countries. The use of agricultural biomass for the production of bioethanol is practiced in USA, Brazil and many other countries. In Asia, China and Indonesia lead the bioethanol production charts. The wasted amount of dry corn can alone account for the production of almost 9.3 Gigaliters (GL) of bioethanol. Corn stover, the residue produced after dry corn harvesting, amounts to 203.6 Tg annually has the potential of producing 58.6 GL bioethanol. Similarly, barley waste, oat waste, rice waste, wheat waste, sorghum waste and sugarcane waste have production potential of 20.6 GL, 3.16 GL, 221 GL, 115 GL, 4.9 GL and 53 GL of bioethanol production respectively. On a combined note, total agricultural waste can produce 485.56 GL of bioethanol replacing approximately 348.13 GL of gasoline (if used in E85 fuel blend vehicle).

Keywords: Bioethanol, Agriculture, Biomass, Renewable, Energy, Emissions

ESCC: 175.

CLIMATE SMART CROPPING FOR ENVIRONMENTAL SUSTAINABILITY

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One of the major challenges faced by humanity today is to provide nutritious food to the everincreasing population. Numerous researches during the past few decades indicate that global agriculture is facing high vulnerability due to changing climate. Since food security and agricultural production are closely linked with climate variability, attainment of environmental sustainability through adoption of climate smart agricultural practices is crucial for maintaining key ecosystem functions such as global water and nutrient cycling. High chemical inputs adversely affect the agricultural production in many ways resulting in land degradation and soil erosion besides affecting the social component resulting in malnutrition. According to the Food and Agriculture Organization nearly 800 million people still remain undernourished worldwide while the world would have approximately 10 billion mouths to feed by the end of 21st century. As a result, No poverty, Zero hunger and Good health and well-being form the top three agendas of the UN Sustainable Development Goals (UN-SDGs) clearly highlighting the importance of these issues for attaining sustainable development. Adoption and promotion of sustainable agricultural production mechanisms such as climate smart agriculture (CSA), conservation agriculture (CA), sustainable agriculture intensification (SAI), sustainable agriculture extensification (SAE), and system of crop intensification (SCI) would positively affect land resources, agro biodiversity and enhance grain yield at the global, national and local level.

Besides, promotion of indigenous plant varieties and adaptive agricultural practices would directly benefit targets of SDG 2 leading to nutritional security especially in developing countries.

Keywords: Overpopulation; Climate change; Food security; Sustainable agriculture

ESCC: 176.

कृषि में जल संरक्षण का महत्व

अभिषेक कुमार सिंह, ए.के. साह, वी.के. सिंह, ए.डी. पाठक, अखिलेश कुमार सिंह एवं
ब्रह्म प्रकाश

भाकृअनुप – भारतीय गन्ना अनुसंधान संस्थान, लखनऊ

रामचरित मानस की इन पंक्तियों को विज्ञान ने भी प्रमाणित किया है—
क्षिति जल पावक गगन समीरा। पंच रचित अति अधम शरीरा ।।

शरीर निर्माण में इन पाँचों प्राकृतिक तत्वों की मात्रा एक संतुलित मात्रा में रहती है। कितना कमाल है न पाँचों का अद्भुत मिश्रण, जो मेरे और आपके रूप से संसार को सुशोभित करता है यह, लेकिन इन्हीं तत्वों में से किसी एक या अधिक तत्व/तत्वों के क्षय से हमें एक दिन जीवन के अंतिम पड़ाव पर ले जायेगा। यदि पानी न होता तो शायद सृष्टि का निर्माण सम्भव न होता। प्राणवायु के बाद जीवन में सर्वाधिक महत्त्व प्रकृति प्रदत्त वरदानों में जल को ही दिया गया है। जल द्रव रूप में होने के कारण मानव एवं पशु-पक्षी के शरीर तथा पेड़-पौधों में इसकी बड़ी मात्रा पाई जाती है। हमारी पृथ्वी प्रायः तीन ओर से जल से घिरी है, अतः अन्तरिक्ष से देखने पर इसका रंग नीला दिखाई देता है। यह नीला भाग सागर और महासागरों के रूप में अवस्थित जल है। धरती पर एक अरब 40, घन किलो लीटर पानी है, 97.5: पानी समुद्र में है जो खारा है। बाकी 1.5: पानी बर्फ के रूप में ध्रुव प्रदेशों में है। इसमें से बचा 1: पानी नदी, सरोवर, कुओं, झरनों और झीलों में है, जो पीने के लिए उपयुक्त है। इस 1: पानी का 60वां हिस्सा खेती और उद्योग कारखानों में खपत होता है, बाकी का 40वां हिस्सा पीने, भोजन बनाने, नहाने, कपड़े धोने एवं साफ-सफाई में खर्च करते हैं। आज विश्व में प्रति 10 व्यक्तियों में से 2 व्यक्तियों को पीने का शुद्ध पानी नहीं मिल पाता है। पानी को लेकर संयुक्त राष्ट्र ने चेतावनी दी है कि वर्ष 2040 तक दुनिया में पानी की इतनी किल्लहत होगी कि हर 4 में से 1 बच्चा प्यासा रहेगा। भारत का वार्षिक अवक्षेपण लगभग 4000 घन कि.ली. है। भारत में होने वाली वर्षा स्थानिक एवं कालिक आधार पर वृहद रूप से परिवर्तनीय है। 78 डिग्री पूर्वी देशान्तर के क्षेत्रों में इसका मान 1000 से अधिक पाया जाता है। सम्पूर्ण पश्चिमी तटों एवं पश्चिमी घाट के क्षेत्रों और असम एवं पश्चिम बंगाल उप-हिमालयी क्षेत्रों में वर्षा लगभग 2500 मि.मी. के करीब होती है। प्रायद्वीप के विशाल क्षेत्रों में वर्षा 600 मि.मी. से कम तथा प्रायद्वीप के कुछ क्षेत्रों में 500 मि.मी. तक होती है। भारत को प्रकृति ने अनेकों नदियाँ प्रदान की हैं। जिनमें से बारह नदियों को प्रमुख नदियों के रूप में वर्गीकृत किया गया है, जिनका कुल आवाह क्षेत्रफल 252.8 लाख, हेक्टेयर है। आबादी के लिहाज से विश्व का दूसरा सबसे बड़ा देश भारत भी जल संकट से जूझ रहा है। यहाँ जल संकट की समस्या विकराल हो चुकी है। केंद्रीय जल मंत्री, गजेंद्र शेखावत ने हाल ही में कहा, है कि "भारत में कृषि के लिए पानी की आवश्यकता काफी अधिक है। हमारी कुल भूजल उपलब्धता में से, हम घरेलू उपयोग के लिए 6: और औद्योगिक उद्देश्य के लिए 5: का उपयोग करते हैं। शेष 89: कृषि के लिए कार्य किया जाता है। "शोध अध्ययनों में पाया गया है कि एक किलोग्राम धान उगाने के लिए, हम 5,600 लीटर पानी का उपभोग होता हैं जबकि चीन केवल 330-340 लीटर पानी के साथ ही एक कि. ग्रा. धान का उत्पादन करता है।" निकाले गए लगभग 89 प्रतिशत भूजल का उपयोग सिंचाई के लिए किया जाता है और धान और गन्ना जैसी फसलें 60 प्रतिशत से अधिक सिंचाई के पानी का उपभोग करती हैं।

THEME 4: BIODIVERSITY AND IPRs: ISSUES AND CHALLENGES (BIIC)

BIIC: 1.

LEGISLATIVE LAWS AND IPRS FOR THE MEDICINAL PLANTS AND TRADITIONAL HEALTH PRACTITIONERS

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This work focuses on prevailing legislations in favour of the indigenous knowledge and folk medicines. On relooking at various existing legislative acts and policies in hand, our research revealed that the provisions and policies concerning traditional knowledge and folk medicine are only one aspect in existing acts and no single act or policy fully devoted for it. The objective of the study is to identify the efficacy of existing intellectual property rights in favour of those who cultivated and preserved biological resources and associated traditional knowledge. The traditional knowledge is at alarming stage and now limited to very few ethnic groups and individuals due to urbanization. In lack of existing Legislative protections, the 13th February 2019 Supreme Court (SC) order addressing the eviction of ~ 11 lakh of tribes and other forest dwellers under the Forest rights act (FRA) 2006 spread threat to the lives and health of these communities. This order may detriment the traditional knowledge of folk medicine and may disrupt well-established socio-cultural-ecological bonding. In this work, we have also given a statistical overview of total forest land, rural tribal population, and claim rejections under FRA-2006 along with quantitative descriptions of traditional medicinal knowledge hold by indigenous people in different sectors of India. Looking on variant agro-climatic condition, demography and tribal culture of India, it is an important to frame regional basis programs and schemes to ascertain the efficacy of the traditional medicinal knowledge.

Keywords: Traditional medical knowledge (TMK); Folk Medicine; Intellectual Property Right (IPR); Traditional Health Practitioners (THP)

BIIC: 2.

PROTECTION OF PLANT VARIETIES AND FARMER'S RIGHT ACT

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The Protection of Plant Varieties and Farmers Rights Act (PPVFRA), 2001 was enacted to introduce intellectual property protection in Indian agriculture. The Act aims to provide for the establishment of an effective system for protection of plant varieties, the rights of farmers and plant breeders, and to encourage the development of new varieties of plants. Registerable plant varieties in India includes new varieties, farmer's varieties, extant varieties of such genera or species that are notified in Official Gazette at the time of filing application as well as essentially derived varieties (EDV). The criteria for registration of new varieties are novelty, distinctiveness, uniformity and stability. Compulsory license may be granted after 3 years of registration of a variety if the seed of the protected variety is not under public domain. The period of protection of varieties will be 15 years for extant varieties, 18 years for trees and vines and 15 years for new varieties of other crops. The protection is not limited to seed or propagules but extends to all materials of the protected variety. Although PPVFRA dispenses many benefits but at the same time it will encourage monopolies in use and exchange of genetic material and confine the benefits from new varieties to a small segment of rich farmers.

Keywords: Intellectual property, New varieties, Farmer's varieties, Extant varieties, EDV

BIODIVERSITY AND LANDRACES MANAGEMENT

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Biodiversity refers to the variety of all forms of life on earth, including the different plants, animals, the genes they contain and the ecosystem they form. It is considered at three main levels including species, genetic and ecosystem diversity. Biodiversity is vital in a number of ways including promoting the aesthetic value of the natural environment, maintaining the integrity of the environment through; maintaining CO₂/O₂ balance, absorption and breakdown of pollutants, determination and regulation of the natural world climate, e.g. by acting as wind breaks. Despite the benefits from biodiversity, today's threats to species and ecosystems are the greatest recorded in recent history and virtually all of them are caused by human mismanagement of biological resources, pollution and faulty institutions in-addition to climate change.

To ensure intra and intergenerational equity, it is important to conserve biodiversity. Some of the existing measures of biodiversity conservation include; Ex-situ conservation, It refers to conservation of components of biodiversity outside their natural habitats, e.g. zoos, museums, gene banks, botanical gardens and by In-situ conservation, It refers to conservation of ecosystems and natural habitats including maintenance and recovery of viable populations of species in their natural habitats, e.g. seed banks and national parks and game Reserves and the opening of the Convention on Biological Diversity in 1992; Rio de Janeiro under the United Nations Conference on Environment and Development (UNCED)/ Earth Summit. The convention objectives were: i) Conservation of the biological diversity ii) Sustainable use of its components iii) A fair and equitable sharing of its benefits.

A landrace of a seed-propagated crop can be defined as a variable population. It lacks "formal" crop improvement, is characterized by a specific adaptation to the environmental conditions of the area of cultivation and is closely associated with the traditional uses, knowledge, habits and celebrations of the people who developed and continue to grow it. Genetic erosion is the main threat to land race. The main factors that contribute to the genetic erosion of LR diversity include: changes in agricultural practices; replacement of traditional varieties with modern, uniform cultivars; once LR have been replaced by modern cultivars, unless the LR is conserved ex situ, the unique combination of genetic diversity is unavailable to breeders; as a consequence, the total number of different varieties grown is reduced and/or cultivars grown by farmers become increasingly similar to each other; perverse incentives given by, for instance, government agricultural advisory services, such as the free distribution of modern cultivars. Landraces are unique resources for food security but are becoming more threatened and suffering from genetic erosion. The systematic, coordinated and integrated in situ and ex situ conservation of LR diversity is thus fundamental and best implemented via a national management plan. This plan aims at the long-term active conservation of the country's LR diversity, while at the same time promoting its use.

BIIC: 4.

TRADITIONAL FARMERS' VARIETIES OF KIDNEY BEAN, BUCKWHEAT AND BLACKGRAM IN HIMACHAL PRADESH – AN EFFORT TO COLLECT, MULTIPLY AND CONSERVE THE RICH BIODIVERSITY RESOURCE

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Himachal Pradesh lying in North-western Himalayan region is one of the rich biodiversity hotspots. Indigenous farmer's varieties, which are the result of thousands of years of interaction between nature and farmers, form an important component of the rich biodiversity. The farmers of the State are still cultivating traditional varieties of various nutritionally important crops like kidney bean, blackgram and buckwheat. Kidney bean and blackgram are rich sources of protein, minerals, vitamins and dietary fibers and have low carbohydrates levels. Buckwheat, a protein and nutrient powerhouse, is a naturally gluten-free and low-glycemic superfood. During the present study, the collection of farmers' varieties of kidney bean, blackgram and buckwheat was done from the remote interior villages of various districts of Himachal Pradesh, namely, Bilaspur, Chamba, Kangra, Kinnaur, Kullu, Mandi and Shimla. The villages in these districts were selected on the basis of consultation with the officials of Department of Agriculture (Deputy Directors, Agriculture Development Officers, Agriculture Extension Officers and Subject Matter Specialists) and Krishi Vigyan Kendras of the respective districts. Participatory Rural Appraisal approach was adopted to gather the information and indigenous traditional knowledge about the farmers' varieties in the selected villages. Efforts were made to make the farmers aware of the values and importance of farmers' varieties and the necessity of their conservation, management and sustainable utilization. They were made aware of the importance of the seed banks for storing and distribution of the seed samples in different villages. Multiplication of genetically pure seeds of each farmers' variety of kidney bean, buckwheat and blackgram was carried out by blending traditional skills, knowledge and practices with new scientific practices during Kharif 2019. Unique farmers' varieties of various crops will be registered with the PPVFRA which will lead to the protection of Farmers' Rights in the form of IPRs and the developmental Rights.

BIIC: 5.

PROTECTION OF INTELLECTUAL PROPERTY RIGHTS

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Intellectual property rights squares measure the rights given to persons over the creations of their minds. They usually provide the creator associate in nursing prerogative over the utilization of his/her creation for a definite amount of your time. Intellectual property may be a class of property that features intangible creations of the human intellect. Intellectual property encompasses two types of rights; industrial property rights (patent, trademarks industrial design and geographic indications) copyright (literacy and artistic works). Intellectual property law covers the protection of copyrights, patents, trademarks, and trade secrets, as well as other legal areas, such as unfair competition. In effect, intellectual property laws provide the creator of a new and distinctive product or idea a short-lived monopoly on its use. The value of intellectual property to a personal or company isn't supported physical properties, such as size and structure. Instead, intellectual property is valuable because it represents ownership and an exclusive right to use, manufacture, reproduce, or promote a unique creation or idea. In this means, it has the potential to be one of the most valuable assets a person or small business can own. The World Intellectual Property Organization (WIPO) was established, in 1967, as an agency of the United Nations.

The basic purpose of the IPRs is to provide incentive to the individual for new creations, recognition to the creators and inventors, ensuring the material reward for intellectual property, for economic process and advancement in technology sector protection of Intellectual property protection is important. They are benefited for the growth of the business in the field of technology.

Keywords: Copyright, Geographical Indications, Industrial Designs, Intellectual Property Rights, Patent, Trademarks, WIPO

BIIC: 6.

BIODIVERSITY AND INTELLECTUAL PROPERTY RIGHTS: EMERGING CONSEQUENCES AND ITS MANAGEMENT

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Biological diversity is the hallmark of life on earth. It is backbone of sustainable development. Biological Diversity means the variability among living organisms from all sources and the ecological complexes of which they are part and includes diversity within species or between species and of eco-systems. India is classified among the 12 mega-diversity centres' of the world. India's record in agro-biodiversity is equally impressive. There are 167 crop species and 320 species of wild crop relatives and several species of domesticated animals. The current Intellectual Property Rights (IPR) regime is encouraging commercialization of seed development, monoculture, and protection of new plant varieties, microorganisms, and genetically modified organisms. As a consequence, our rich biogenetic diversity is being battered irreversibly. We must find out a path to make an alternative approach that will bring a balance in between formal Intellectual Property (IP) system and sustainable aspects of biodiversity. The successful development of biological diversity will depend upon creative relationship that can be nurtured between two opposite poles –formal innovative and community systems. For this to work, policymakers must implement technology transfer with a strong inclination towards active participatory approaches to research and extension.

Keywords: Biodiversity, IPR, consequences and management

BIIC: 7.

COMBINING SCIENCE AND COMMUNITY LORE FOR THE PRESERVATION OF BIODIVERSITY AND LANDRACES

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This notional paper synchronizes some concepts related to the role of awareness among not only farmers but also the customers of their agricultural products to promote biodiversity, preserve and restore landraces through science-led socio-cultural education and consciousness. The paper posits that without scientific outlook and activity neither the findings of science and technology can flourish, nor can the society accept the sustainable need of the time; people should not remain unaware of the value they can add to the overall development of sustainable agricultural practices, biodiversity and green economy. The process is not unidimensional, i.e. it is not that the findings of science and technology will be dictated to the farmers; the indigenous farmers have also observed-experimented-observed and come to conclusions on various aspects of agriculture through generations

in their informal but practical laboratory, i.e. the agricultural fields; so the findings of the farmers should also be interpreted and experimented by the technologically advanced laboratories. The experiences of the indigenous and other farming communities have been attracting growing attentions even in the so called developed world; the act of preservation of biodiversity and particularly agricultural biodiversity cannot be developed by negating the people who actually inhabit the places; the movement called bioregionalism that has been developing since the 1970s practically try to assemble and synthesize the findings of science with that of the communities living in a bioregion. There may be many other platforms for the union of the scientific findings with the knowledge gathered by the communities connected to soil; there should be more focused research on the findings of the farming communities too to produce poison-free food. The paper also concentrates on the role of socio-cultural media like myths, literature, films, folklores to promote a science-led campaign to promote biodiversity, preserve landraces and grow a sustainable lifestyle for a better informed, aware and sympathetically active world.

Keywords: Science and lore, bioregionalism, biodiversity, landraces, socio-cultural

BIIC: 8.

DIVERSITY AND ABUNDANCE OF AMPHIBIA IN AND AROUND DABUR VILLAGE POND (GAYA) BIHAR

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The current study has been conducted in and around the pond of Dabur village in Gaya district (Bihar) during the period July 18 to Aug 19. Amphibians are diverse group of vertebrates regarded as intermediate life between fish and reptiles. The earliest amphibians evolved in the Devonian period that has diversified and become dominant during Carboniferous and Permian period. Modern amphibians achieved a variety of modification during their successful radiation. The survey was undertaken monthly and 189 anuran amphibian specimens were collected belonging to 5 species, 4 genera and 3 families. Anuran amphibians are distributed widely in and around the pond of Dabur village (Gaya). Among the anurans *Duttaphrynus melanostictus* (Schneider, 1799) under genus *Duttaphrynus* (Frost et al 2006) and *Bufostomatus* (Lutken 1864) of family Bufonidae (Gray 1825) dominant (48.9%). Some other species of anuran such as *Hyla* of family Microhylidae and *Rana tigerina* (Daudin 1803) of family Ranidae was also found in this area. Order Apoda and Urodela were not found here. No endangered species was found during the study period. This study showed that the western region of Gaya district (Bihar) is very rich in amphibian species. This was brief and preliminary studies of amphibian diversity in and around the pond of Dabur village (Gaya) but further study may explore the new species and their ecological niche.

Keywords: Amphibian diversity, Dabur pond (Gaya), Anurans, *Duttaphrynus melanostictus*, Hyllidae

BIIC: 9.

PROTECTION OF PLANT VARIETY AND FARMER'S RIGHTS

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The Plant variety protection has been brought into sharp focus by Agreement on Trade Related Aspects of Intellectual Property Rights which is a part of the agreement establishing WTO. The patent laws in India do not provide IPR on living organisms including Plant Varieties. Plant Breeders Right are a form of Intellectual Property Rights designed specifically to protect new Varieties of plants. PBR is a Right granted by the state to a Breeders to exclude others from producing, offering for sale, marketing, distributing, exporting or importing the

propagating material of the Varieties for a specified period in lieu of the registration of variety. India has implemented the protection of Plant Varieties and Farmers Right act 2001, and its rule in 2003. This act has provided opportunities for protection of Plant Varieties and provided the Rights of Farmers and Plant Breeders and to encourage the development of new Varieties of Plant. The protection of Plant Varieties & Farmers Right authority was established in the year 2005. Under this authority ,any one can register his/her variety. The *sui generis* system for protection of plant varieties was developed integrating the right of breeders ,farmers and taking care of the concerns of equitable sharing of benefits. In order to implement the *sui generis* system for protection for granting PBR a DUS testing is compulsory, new varieties shall be registered if it follows the criteria of Novelty, Distinctness, Uniformity and Stability. There are total 105 DUS centre in all over India. The central government has notified the 79 different crop species which is eligible for registration as new Varieties.

Keywords: IPR, PBR, Lieu, DUS, Varieties, sui generis

BIIC: 10.

PROTECTION OF INTELLECTUAL PROPERTY RIGHTS

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Intellectual Property Protection is protection for inventions, literary and creative works, symbols, names, designs and images created by the mind. Intellectual property includes distinctive items that you have created and ones that give you an economic benefit. Unlike, physical property, intellectual property is an intangible asset of a person. Intellectual property rights (IPR) are generally said to be a bundle of exclusive rights granted to the lawful owner. These rights are mentioned in Article 27 of the Universal Declaration of Human Rights, which provides for the right to benefit from the protection of moral and material interests resulting from authorship of scientific, literary or artistic productions. The main forms of IPR protection are trade secrets, patents, plant breeder's rights and copyright, trademarks, industrial deigns and geographical indications. Intellectual property rights provide an incentive to the inventor for his invention and share it with other people for the development of the society. The basic aim of the IPRs is to help in meeting the challenges in the development like reducing poverty, stimulating economic growth, improving the health status by providing medicines to the poor, improving access to education and contributing the overall sustainable development. Though IPRs give incentive to the inventor or the creator and results a competition in the field of invention however it is also an intellectual protectionism or a form of a temporary monopoly enforced by the state.

Keywords: Intellectual Property, Intellectual Property Rights, patents, trade secrets, copyrights, trademarks, geographical indications.

BIIC: 11.

INTELLECTUAL PROPERTY RIGHTS — NEED FOR INNOVATION IN AGRICULTURE

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Intellectual property rights are the legal rights that cover the privileges given to individuals who are the owners and inventors of a work, and have created something with their intellectual creativity. The creator/inventor gets exclusive rights against any misuse or use of work without his/her prior information.

However, the rights are granted for a limited period of time to maintain equilibrium. To protect the intellectual property rights in the Indian territory, India has defined the formation of constitutional, administrative and jurisdictional outline whether they imply the copyright, patent, trademark, industrial designs, or any other parts of the intellectual property rights. Patents are probably the most important IPR today for agricultural goods and services as they provide, wherever these are available, the strongest protection for patentable plants and animals and biotechnological processes for their production. Patentable products have to meet the criteria of patentability, viz., novelty, non-obviousness and usefulness. Biotechnology is the sector that holds the most potential for advances in agriculture to improve productivity. Trademarks are used to market seeds or spraying services. Such protection prevents the wrongful use of commercial marks and is not limited in time, although registration may have to be renewed from time to time.

Keywords: IPR, Patents, Trademarks, Agricultural goods and services, Biotechnology

BIIC: 12.

CHARACTERIZATION OF RICE BEAN [*Vigna umbellata* (Thumb.) Ohwi & Ohashi] LANDRACES FROM NORTHEAST INDIA

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Rice bean [*Vigna umbellata* (Thumb.) Ohwi & Ohashi] is an important legume crop of Northeast India. Being a rich source of protein the tribal communities use the seeds of rice bean for preparing various dishes. The agro-climatic heterogeneity of this region offers a great deal of diversity in agro-morphology of rice bean. A total of 102 rice bean accessions, collected from various exploration and collection trips of different parts of Northeast India. The collected landraces were grown in experimental field of the ICAR-NBPGR Regional Station, Umiam, Meghalaya in Augmented Block Design (ABD) and observation on 18 agro-morphological traits were recorded. Considerable variation was observed for plant growth habit, early plant vigour, leaf shape, leaf size and seed colour, whereas variation was less for flower colour and flowering behaviour. Among the quantitative traits, yield plant⁻¹, 100-seed weight, number of pods plant⁻¹, number of branches plant⁻¹ and plant height had recorded high coefficients of variation. Characterization of rice bean accessions from Northeast India will facilitate in selecting morphologically diverse parents for breeding programmes particularly adapted to Northeast cropping system.

Keywords: Collection and Characterization, Rice bean and North Eastern India

BIIC: 13.

TRADITIONAL HOME GARDEN SYSTEM: AN INTERMEDIARY APPROACH FOR BIODIVERSITY CONSERVATION AND FOOD SECURITY

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Population induced poverty and malnutrition are the greatest challenges of the 21st century. Expansion of intensive agriculture is insufficient to fulfill the rising food demand of global population. Home gardening is the traditional agricultural practice that provided additional food supply with diverse food system. It is a small patch

of cultivated land adjacent to the home, where important annual, biennial/perennial crop/plant species are cultivated. These species play a significant role in the maintenance of economic and nutritional requirement of local community with global biodiversity conservation. It harbors a great depository of genetic resources of wild and domestic species with integration of livestock. In the prospects of ecosystem services, it covers four services: provisioning, supportive, regulating and cultural. Home gardens provide essential food resources for whole year and mostly based on the organic input. Though, it has multidimensional significance for locals, it remains relatively unexplored ecosystem. We have evaluated the potential of home gardens for biodiversity conservation. The policy makers and scientific communities are reevaluating the potential of these practices, which fully depend on the biological and energy efficient inputs. The aim of this study is to explore the ecological, economical and societal potential of home gardens for human well-being.

Keywords: Home-gardens, conservation, ecosystem services, food security

BIIC: 14.

GENOME-WIDE ASSOCIATION MAPPING OF REPRODUCTIVE STAGE SALT TOLERANCE IN WHEAT

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Salinity stress is an important cause of crop yield loss in many parts of the world. We applied GWAS approach to identify genomic regions/candidate genes associated with agronomical and yield associated traits in wheat. An association panel of 153 diverse wheat accessions including previously identified salt tolerant lines identified from evaluation of thousands of wheat accessions of Indian National Gene Bank, New Delhi was used. The associational panel was evaluated in microplots (salt stress) and in the field conditions (control) at ICAR-CSSRI, Karnal. Salt tolerance index (STI) was calculated for all the evaluated trait. The wheat association panel showed large variation for all the analyzed traits. Genotyped of the association panel was done using 35K SNP array. A total of 15,495 SNPs used for marker trait association analysis. GWAS revealed 114 significant marker trait associations (MTAs) for 12 salt tolerance traits including days to heading (10), days to maturity (10), normalized difference vegetation index (4), chlorophyll (5), plant height (5), spike length (12), spikelets per spike (14), number of effective tillers (20), biomass (5), grain yield (8), 1000 grain weight (14) and grain number (7). This study provides significant insight into genetic and molecular basis of salt tolerance in wheat

Keywords: Salinity, Quantitative trait loci, GWAS, Linkage disequilibrium. MTA

GENETIC DIVERSITY STUDIES OF *Abelmoschus* spp (WILD OKRA) AND ITS EVALUATION FOR HORTICULTURAL TRAITS AND VIRAL RESISTANCE

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As source of new genetic diversity, crop wild relatives the wild cousin of cultivated plant species has been used for many decades for plant breeding, contributing a wide range of beneficial agronomic and nutritional traits. It is realized that plant genetic diversity captured and stored in the form of genetic resources in gene banks and field banks etc., must be utilized for crop improvement in order to meet the future global challenges in relation to food and nutritional security. India is bestowed with very rich diversity of wild as well as cultivated okra (*Abelmoschus* sp.) and ranks first in the world with a production of 6.1 million tonnes (73% of the total world production) of okra from over 5.2 lakh ha land with 11.6 t/ha productivity (NHB 2017). It is well documented that the cultivated okra lacks stable source of resistance against the deadly viral diseases i.e. yellow vein mosaic of okra and enation leaf curl of okra. The resistance available in the wild cultivars against these diseases are stable and broad spectrum in nature. ICAR-IIVR maintains 94 accessions of wild okra species of viz., *Abelmoschus* *caillei*, *A. tuberculatus*, *A. ficulneus*, *A. tetraphyllus*, *A. moschatus*, *A. enbeepeegearense*, *A. crinitus*, *A. angulosus*, *A. manihot* and *A. moschatus* subsp. *tuberosus*. These were evaluated for horticultural traits and screened for their response to viral diseases during 2016-17 and 2017-18. All the species except *A. tuberculatus* and *A. ficulneus* showed resistance towards both the viral diseases. It was also interesting to note that the *A. tuberculatus* contains resistance against the shoot and fruit borer of okra. Even though these wild species have several agronomically undesirable characters, which pose a challenge in the transfer of disease resistance. However, through use of continuous backcross breeding these demerits can be improved and simultaneously desirable characters will be retained.

THEME 5: TRENDS AND FUTURE PROSPECTS OF INDUSTRY, ENTREPRENEURSHIP AND DEVELOPMENT (TIED)

TIED: 1.

ROLE OF ICT IN AGRICULTURAL MARKETING

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The use of information and communication technologies (ICTs) is one approach to linking farmers to markets. ICTs link farmers to markets and provide them with current marketing information. Based on the information, farmers can perform informed decision-making during farming and selling their agricultural produce. ICTs help farmers to increase their income. It plays a key role in improving agricultural production and marketing. It promotes confidence amongst farmers. ICTs link farmers to markets and keep them updated with current marketing information. ICT-enhanced marketing and certification also strengthens the capacity of farmers increase revenue by improving their position on Global markets. It is useful to make an assessment of awareness of ICT among farmers regarding agricultural marketing. Further, an effort has been made to workout difference in income between ICT users Non- ICT user farmers. The present study has been under taken in MHOW block of Indore district, Madhya Pradesh, India. Total 100 farmers were selected by the convenient sampling method. Out of them 67 percent farmers were ICT user and rest of them Non-ICT user. The outcomes of the study reflect that mostly ICT user farmers have smart mobile and they use to gather agricultural information. 32.8 percent ICT user farmers use their mobile occasionally for keeping themselves updated from latest agricultural services. There is significant change has been observed in their income between ICT user and Non-ICT user farmers. Both ICT user and Non-ICT user farmers faced several problems. 35.8 percent ICT user farmers reported that they were not in position to avail agricultural services due to power cut. Non-ICT user farmers had no knowledge to access agricultural services from various devices. Government should launch a campaign to educate all the farmers who are not friendly to use apps and internet services. The best thing may be done if government and NGOs come forward with documentary film.

TIED: 2.

ROLE OF SELF HELP GROUPS (SHGS) FOR IMPROVING LIVELIHOOD SECURITY OF RURAL WOMEN: A REVIEW FROM J&K

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In recent years, Self Help Groups (SHGs) have become a significant movement in India for the empowerment of the rural women. It is a group of 10-20 persons belonging to same socio- economic background taking joint actions to solve their common problems that cannot be solved at individual level so as to improve their livelihood by setting up their own savings and loan fund. Its approach differs from traditional micro-finance as it does not exclusively focus on credit or savings but also includes an emphasis on social empowerment, outreach and capacity building. A famously known 'Rehmat self-help group' in Jammu and Kashmir with 14 members contributing Rs. 10 initially on monthly basis from their domestic savings, later rose to Rs.80 and presently Rs. 100/month mainly relating to agriculture related work and carpet weaving. The other social activities include giving loans to members for schooling of children, marriage ceremonies, and health care and minor contribution

work (Khurshid, 2015). Another study from J&K reported that SHGs have been working effectively with very low attrition rate, high attendance in the meetings. Housewives and laborers have been major constituent of SHGs members. There has been increase of 46.53% in number of SHGs members in terms of confidence- buildings factor and the difference is significant (Singh and Mehta, 2012). Thus, it can be concluded that there is a positive impact of SHGs on empowerment and enhancing the livelihood of rural women. SHGs also serve as an alternative instrument of financial intermediation for uplifting the social and economic status of farmers, increased women's mobility, participation in social activities, increased awareness and knowledge, increased income level, self employment and improvement in decision making skills.

Keywords: Self-Help Group, Empowerment, Livelihood

TIED: 3.

DRY FLOWER: A PROSPECTIVE AVENUE IN HORTICULTURE

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Dried flowers have attained prime importance in the floriculture industry. Our country's economy is contributed a lot by dry flower industry than that fresh cut flowers and other live plants. Dry flowers and dried plant parts can be maintained for a few months to years without any damage. Any of the plant parts like flowers, petals, buds, stems, roots, fruits and leaves in a dried form can be used. Processing of dry flower mainly goes through three phases namely drying, bleaching and colouring. The primary step is drying and there are various techniques which are used for drying are air-drying, embedded-drying, press-drying, freeze-drying and glycerine addition. Selection of suitable crop for drying purpose plays important role for the success of the industry. Dehydrated flower and foliage are generally used for interior landscaping like wall hanging, ceiling hanging, table arrangement, mirror frame, potpourri etc. Dry flowers and their dried products look fresh and appealing. A number of flowers are used for drying viz. Anemone, zinnia, allium, carnation, stock, freesia, narcissus, chrysanthemum, pansy, daffodils, marigold, rose, lilies, etc. and foliage like ferns, eucalyptus, ivy, magnolia etc. More research on dehydration of flower can be carried out for boosting the floriculture industry and to earn more foreign exchange. Dry flowers are hygroscopic in nature and tend to absorb moisture from atmosphere. So, there is a need to investigate and work on chemical treatments of dried flowers to enhance the hardening of dried flowers and to avoid absorption of moisture. Dry flowers are generally less flexible in nature and need to be handled with care. So, proper packaging techniques should be used for long lasting use of dry flower. Thus, a complete package is needed for long lasting use of dry flowers. Dry flower industry in India can increase by exploiting the nation's rich and varied biodiversity.

Keywords- Air-drying, embedded-drying, press-drying, freeze-drying and potpourri.

TIED: 4.

VALIDATION AND PROMOTION OF FARMERS PARTICIPATORY IPM TECHNOLOGY IN TOMATO (*Solanum lycopersicon*)

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IPM technology in Tomato has been successfully implemented in Ayar village of Varanasi District by participation of farmers. Integration of refined IPM Modules effectively reduced the pest menace in the tomato

crop, thus increasing the crop yields significantly. Farmer Participatory IPM implementation includes replacement of Traditional techniques by formulated IPM modules resulted 11.63 percent more yield in tomato. Significant reduction was observed in average number of synthetic pesticide application from 15 to 2. Number of natural enemies is increased in IPM practices than non-IPM practices. Restoring the natural enemy's populations through eco-friendly approaches further strengthened the crop ecosystem in maintaining the pest populations below economic threshold levels. Increased population of natural enemies also observed 5-6/m². Validation of IPM technology minimizes the application and reliability of the toxic chemical pesticides, farmers learn about the ill effects of chemical pesticides on their agro-ecosystem. The technology may reduce the Cost of cultivation nearly by 30 percent.

TIED: 5.

INCOME GENERATION FOR SUSTAINABLE DEVELOPMENT OF WOMEN EMPOWERMENT

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Women constitute about 50% of total population, yet their status in the society pitiable. They put in 15 hours of work daily but their wages are less than men. The income generation activities undertaken by women are yet to prove its impact on them or it is more a self employment activity rather than a substantial source of income. Therefore there is a need to study if these micro income generating activities provide empowerment to rural women. The objective of this study is to find out if income generating activities under taken by rural women have increased their participation in decision making process. In this study income generating activity has been treated as independent variable and women empowerment as dependent variable. The study was conducted in sultanpur district of Uttar Pradesh (U.P.) and both income generating and non income generating 150 women from each group were selected as sample. The pace of empowerment may be due to small amount of income generated. As a result of this, U.P. (Uttar Pradesh) government initiated several projects. Under this scheme women are encouraged to undertake some income generating programmes to raise their income which will their self confidence, bargaining power, promote stronger household food security and investment in children's schooling. From review past researchers and personal experiences the following model is designed to show how women empowerment takes place. A similar model was tested by Estudillo and Esutka 1988, but model differs in measuring empowerment in terms of women participation in decision making. The study revealed that income earned by women has improved their status and empowerment is taken place but the speed of empowerment is slow.

Keywords: Conceptual model, decision making, government initiation programmes, dependent and independent variable.

TIED: 6.

AGRIPRENEURSHIP AND SUSTAINABILITY DEVELOPMENT THROUGH NO-TILL ORGANIC VEGETABLE PEA CULTIVATION IN RICE-FALLOW

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In Sikkim plenty of rainfall is received during pre-rainy and rainy seasons (February to mid-October).

Due to change in the climate, the rainfall pattern has been changed drastically and acute deficit rainfall especially during *winter* season. Hence, it is merely possible to grow winter season crops in the state resulting in low cropping intensity (118%). However, after rice harvests plenty of soil moisture remains in the soil which can be utilized by some suitable resource conservation techniques. Timpyem village in East district of Sikkim is climatically vulnerable. During 2017-18 and 2018-19, the total rainfall was 2524.8 mm and 2865.4 mm, respectively in the district. While the rainfall was only mm during October to January total precipitation was 130.2 mm and 86.08 mm only. In the village mostly people are dependent on agriculture and allied activities. Most of the farmers in the village practice mono-cropping system of rice cultivation and their field remained fallow during *Rabi* season. Cultivating the second crop was not an option due to uncertainty of rain and lack of irrigation. Therefore, in order to enhance the farm income and livelihood status of the farming community, ICAR-NOFRI made interventions for cultivation of vegetable pea under no-till technology in rice-fallow at Timpyem and Thanka-Martam village under NICRA (Technology Demonstration Component) project to enhance the cropping intensity and sustainability. No-till cultivation enhances the soil organic carbon 5.9% after two crop cycles in the village. The cost of cultivation was Rs. 43,800 for vegetable pea cultivation under no-till condition. During second years it was Rs. 40,600. The benefit:cost ratio of vegetable pea during both the year was 2.38 and 2.49, respectively. The system B:C ratio was 2.08 and 2.18. Overall B:C ratio was 2.14. The technology has potential to develop entrepreneurship among the rural youths and progressive small and marginal women farmers. After successful implementation of the technology, farmers in both the village were highly impressed and motivated by the no-till cultivation practice due to its cost effectiveness, less labour requirement, high energy saving and higher net income with efficient utilization of available resources.

TIED: 7.

IMPACT OF WOMEN - LED FARMING INITIATIVES ON INDIA'S AGRICULTURE INDUSTRY: A PERSPECTIVE ANALYSIS OF SOME SUCCESS STORIES

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Women comprise over 40 percent of the agricultural labor force worldwide and play a significant and crucial role in agricultural development and allied fields. The nature and extent of women's involvement in agriculture varies greatly from region to region. But regardless of these variations, women are actively involved in various agricultural activities. As per Census 2011, out of total female main workers, 55 per cent were agricultural labourers and 24 per cent were cultivators. Rural women perform numerous labour intensive jobs such as weeding, hoeing, grass cutting, picking, cotton stick collection, separation of seeds from fibre, keeping of livestock and its other associated activities like milking, milk processing, preparation of ghee, etc. With women predominant at all levels-production, pre-harvest, post-harvest processing, packaging, marketing – of the agricultural value chain, to increase productivity in agriculture, it is imperative to adopt gender specific interventions. An 'inclusive transformative agricultural policy' should aim at gender-specific intervention to raise productivity of small farm holdings, integrate women as active agents in rural transformation, and engage men and women in extension services with gender expertise.

Along with it, owing to the need of today's world farmers are constantly on the lookout for newer and more efficient ways of cultivating crops. From transforming the lives of farmers and focusing on chemical-free produce, to bringing city-dwellers closer to nature and giving them a hands-on agricultural experience, women in agriculture are constantly experimenting with nature of work and getting success too.

In this paper we will analyse the success stories of such women who are constantly engage in agribusiness and making a remarkable success. This will be an analytical review paper based on reported success stories.

TIED: 8.

UTILITY AND MARKETING MANAGEMENT OF AONLA IN UTTAR PRADESH

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The arrival of aonla in market starts from the week of September and ends with mid March. The marketing system of aonla under study area was traditional and operated by aonla merchants itself. Out of the selected growers for the study, more than 50% of the growers sold their orchards to the pre-harvest contractors. The pre-harvest contractor harvested the produce according to the market situation and sold it in local mandi of district. A very less number of pre-harvest contractors transported the produce up to other districts mandies. Below 50% farmers sold aonla to wholesalers through commission agents in mandi of district. The wholesaler played a major role in the marketing of aonla. The wholesaler sold the produce in various markets falling within 250 kilometers area, mainly in Allahabad, Lucknow and Varanasi markets and in distant markets such as Mumbai, Calikat and Ahmadabad markets. Wholesalers also sold their produce to the retailers of the local markets and factories. The factories were demanding small size aonla because they were cheaper and were used in the preparation of Chayawanparsh and other products made from aonla. On account of perishable nature of fruits, its quick disposal is a matter of great concern. The growers sold their orchards on annual contract basis to the pre-harvest contractors. Only some farmers had written documents of contract and the remaining contracted on the basis of mutual understanding and trust in the pre-harvest contractors. On the basis of personal interview, it was realized that generally pre-harvest contractors paid nominal of the contracted amount to the growers in the form of advance at the time of signing the contract and rest of money was paid at the time of harvesting of aonla. In the wholesale markets, the product was sold through open auction system and at retailer's level in the terminal market, aonla was sold at per kg basis in different markets, the payment was done at the time of dealing.

There were two types of packaging system found in the study area for selling the produce in the local markets as well as to the factories. Aonla was packed in jute bags of 80-100 kg capacity but for the distant markets it was packed in the basket made of dried Arhar (*Cajanus cajan*) stem of 40 kg size. Papers, paddy straw and leaves were used to protect the fruit from physical injury during the transportation as packaging material. Grading means sorting of unlike lots of produce into various lots according to quality specification laid down. Each lot has substantially the same characteristics so far as quality is concerned. The presence of grading system facilitates in comparing the lots of different qualities of particular produce in the same market and differences in prices of the same grade as well. In general no scientific grading was practiced in aonla marketing. The grading of aonla was practiced in two ways, one according to the variety and other according to the size of aonla fruit. Farmers grew mainly three varieties viz. Chakaiya, Francis and NA-7 and fruits were graded according to these varieties. Within a variety aonla was graded according to size such as small, medium and large. Small aonla was sold to the factories at cheaper rate and medium and large size aonla were sold in different markets at different prices. Storage is an important part in the marketing of aonla. It was found that the storage practice in study area was only done by wholesalers for a very short period otherwise no storage was done. Pratapgarh is the largest producer of aonla in India and produces best quality aonla in the world. Therefore the demand for aonla of Pratapgarh is throughout the country. To fulfill the requirement of local and distant market a smooth, efficient and speedy transport system is required. After harvesting the aonla was transported to mandi of the district by hand cart, bullock cart and tractor and afterwards wholesalers handled the produce, the trucks were major vehicles to transport the produce from mandi to different places for transportation by train the consignments was booked by passenger train instead of goods train for quicker transportation. To transport aonla to Mumbai and Calikat, railway booking was done from Lucknow railway station. The train transportation was comparatively cheaper than road transport. The retailers to transport the produce to the various mandis used small vehicles. The aonla orchard was sold through auction method based on eye estimation by the pre-harvest contractors. Pre-harvest contractors negotiated with growers

regarding price of the orchard considering number of fruit bearing trees, setting of fruit, maintenance of orchard, age of plant etc. In wholesale markets aonla was sold with the help of commission agent by open auction system. At retailers level aonla was sold on per kg. basis.

TIED: 9.

DOUBLING YIELD AND TRIPLING INCOME

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Agriculture has always been the mainstay of food security oriented dynamics of rural economy. Government of India has set the target to double the income of farmers by the year 2022 will require annual growth rate of 10.4 per cent. The drivers of income growth for farmers are diversification of farm activities towards high-value crops as high value crops, technology up gradation and mechanization, knowledge based enterprise development will double the productivity, value chain management at each level of movement of produce from farm to fork, better price realization for farmers through competitive markets, capacity building of stakeholders and improvement in terms of trade. The efficacy of off-farm strategies to accelerate income growth for farmers must be considered carefully, particularly in the short term, it is likely to be counter-productive- especially for small and marginal farmers, to suggest that off-farm resources must be major engine that drives their growth in income. In the long run, if sufficient success is seen in the government's various initiatives to develop skills and capacity for non-agricultural work among the rural populations, substantial growth in off-farm opportunities can be expected. However, in the interim, it might be far more prudent to focus farmers in both kind of income one is on farm and another is non-farm activities together. However to increase the income in real terms would imply restructuring agriculture processes and policy interventions also.

Keywords: Doubling, Income, Farmer, Productivity, Farm etc.

TIED: 10.

ROLE OF ICT IN WOMEN ENTREPRENEURSHIP DEVELOPMENT

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In the last decades, ICT has undergone a very quick development and has been introduced into all segments of people's lives. This brought new opportunities for businesses and individuals (e.g. social networks, searching and sharing the information), and better quality of life. A wide range of information and communication technology options are becoming available even to remote and difficult areas. It raises overall productivity levels, increasing economic growth. Women entrepreneurs are important contributors to Indian economy. ICT is powerful tool to support women entrepreneurs by creating psychological comfort at their work place. Even rural women are started to utilize various kinds of technological instruments to develop their business. ICTs helps women entrepreneurs to learn many new and innovative things in doing their business like new machineries available in the market, storing of raw material/products, latest techniques in packing, preservation, growing of specific crop, nutrition, and health etc. Women's greater participation in business empowers and promotes gender

equality, which will contribute to economic development. These ICTs can help to overcome time and mobility constraints i.e. ease access to formal financial services, increase access to information, skills training, and personalized advice and enable participation in business networks.

Keywords: Women entrepreneurs, Entrepreneurship, Entrepreneurship development, Information and Communication Technology, Women empowerment and Economic growth.

TIED: 11.

NEEDS AND CHALLENGES OF YOUTH ENTREPRENEURSHIP IN INDIA

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Entrepreneurship is now a days a major opportunity for the young people. On the contrary it is also a fact that the entrepreneurs are facing many problems due to non-availability of primary amenities in developing country like India. Due to lack of education, financial problems, insufficient technical and conceptual ability it is difficult for the entrepreneurs to establish industries in their areas. Defining entrepreneurship is not an easy task. Entrepreneurship is considered as one of the most important factors contributing to the economic development of the society. Entrepreneurship means primarily innovation, risk-taking, starting, owning and managing a small business. Entrepreneurs have been considered instrumental in initiating and sustaining socio-economic development. An entrepreneur is a person who either creates new combinations of production factors such as new methods of production, new products, new markets, finds new sources of supply and new organizational forms or as a person who is willing to take risks or a person who by exploiting market opportunities, eliminates disequilibrium between aggregate supply and aggregate demand or as one who owns and operates a business. True entrepreneurs are resourceful, passionate and driven to succeed and improve. This paper assesses the needs and Challenges for the potentiality of youth Entrepreneurship. It also focuses and provides an insight into the meaning, qualities required for an entrepreneur and opportunities for youth entrepreneurs especially in the fields of Marketing of products, financial amenities and other primary amenities, i.e. availability of electricity, water supply, transport facilities and required energy etc.

Keywords: Entrepreneurs, Entrepreneurship, Economic Development Entrepreneur, Youth Entrepreneurship

TIED: 12.

ROLE OF ICT IN SUSTAINABLE AGRICULTURE MARKETING

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Agriculture plays an important role in economic growth, enhancing food security, poverty reduction and rural development. According to FAO (2003) world report agriculture is the main source of income for 2.5 billion people in the developing countries. Information and Communicational Technology (ICT) has many roles to perform to agricultural development from the initial stage to last stage i.e., decision making to trading of crops. Globally, the emerging concept of e-agriculture incorporates the sophisticated use of innovative information and communication technologies (ICT). ICT based initiatives can be taken for dissemination of information, transfer of technology, acquisition of inputs and selling of outputs in a way so that farmers can be benefitted. ICTs (e-

agriculture) provide farmers with useful and beneficial information, such as new farming techniques, weather reports, and crop prices. ICT has the great prospective in widening the market knowledge to the farmers (ex. current prices for their products or commodities), so that they can directly approach customers without middleman or other appropriate users for maximum benefit. It also provides access to the global market at home. With the globalization of market, farmers have to transform themselves from mere producer-sellers in the domestic markets to producer-cum-seller in a wider market to improve their returns on investment, risks, efforts and it strengthens the capacity of small-scale producers. Internet-based market information systems are working well in more developed countries. This can only occur through the promotion and adoption of ICT services among farmers.

Keywords: Information and communication technology, Agriculture marketing, Farmers, Agricultural practices, sustainable agriculture

TIED: 13.

GREEN INNOVATIONS IN THE AGRI-FOOD VALUE CHAIN

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With the effect of food trade globalization, the distance between the consumers and producers is becoming wider. The major food loss is incurred at the processing end. Greening food value chain is a modern concept of ameliorating food security and have potential for sustainability. Food losses and waste (FLW) are the edible portion that are produced at source but are not ultimately consumed at the sink. Minimizing the FLW not only ensures food security but also helps in resolving major social issues. The green food value chain is mainly concerned on all those processes that affects the environment. These chains can be made sustainable by focusing on environmental aspects when selecting the crops, the cultivation practices, less irrigation, using renewable sources of energy and avoiding deforestation. These strategies will increase the efficiency of natural resources as well as natural cycles and ultimately the climate. Green value chain requires the public sector and economy to make partnership with all stakeholders. Food losses can be prevented by a number of ways including modified low cooling systems, sustainable packaging using bio-based packaging materials, e+ Removar Technology for ethylene adsorption, time temperature indicator technology, antimicrobial active systems, nanotechnologies etc. Postharvest innovations cited above will have a great role in minimizing the food losses incurred during the process. These approaches clearly works towards food security, alleviating poverty, mitigation of climate change, improving employment opportunities and strengthening gender equality.

Keywords: Globalization, sustainable, climate, deforestation, stakeholders, postharvest.

TIED: 14.

DOUBLING FARMER'S INCOME THROUGH NEW APPROACHES OF MARKETING INTERVENTION WITH SPECIAL FOCUS ON VALUE ADDITION

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Agriculture in India has been source of livelihood for majority of people residing in villages. And over the

period, this sector has seen various structural reforms but still marketing infrastructure system has not been fully developed to its potential to act as buffer system to enhance farmers incomes. Marketing infrastructure has huge impact not only on lives of farmers but also has pivotal role to play in providing boost to economy by doubling farmers income by 2022 as per the NITI Aayog's report. This paper attempts to strike a cognizance between doubling farmers income and marketing infrastructure whereby, identification and filling the void between infrastructure facilities and farmers income has been the focus of the study. The research study has been undertaken in Indore district. Total 100 farmers were selected by the convenient sampling method. It has been found that Value Addition at the grass root level as part of marketing intervention is indeed proved to be the game changer which not only helped farmers generating extra incomes but also made agricultural practice more sustainable for the future. This paper explored new ways of doubling farmers income through significant value addition as a tool of marketing facility which in turn emphasis on turning farmers into entrepreneurs and opens up new vistas for them.

TIED: 15.

IMPACT OF INTERCROPPING ON YIELD PER UNIT AREA AND FARMER'S INCOME IN DISTRICT KUSHINAGAR, U.P

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Food security for growing population is a big challenge for farming community resultantly agriculture people should optimize the use of resource especially land. Krishi Vigyan Kendra is working for the transfer of technologies like inter cropping to motivate farming community for optimum use of land and other resources. A survey was conducted with the objective to assess the impact of intercropping on yield per unit area & farmer's income. The total 250 Farmers from 5 villages namely Padripiperpati from block Bishunpura, Daunaha from block Seorahi, PurenaKatiya from block Tamkuhi Raj, Premwalia from block Kasia and Prithvipur from block Dudahi was interviewed. The result revealed that in one year cropping pattern 53.6 % farmer's were growing sugarcane as a sole crop while 46.4% farmers were doing intercropping in main(base) crop of Sugarcane. The oilseed crop toria, pulse crop green gram, vegetable crop cowpea, potato and bottlegourd were the selected intercrops. It was observed that by adoption of intercropping the yield / ha can be increased from 1.09% to 32.99 % and net return can be increased from 20.39% to 147.68 %. Therefore, it may be concluded that in the one year cropping pattern inclusion of intercrop can increase the income of farmer's and overall production of crops

Keywords: Intercropping, cropping pattern, soil, sugarcane, banana and bitter gourd

TIED: 16.

DOUBLING OF FARMERS INCOME THROUGH POPULARIZATION OF FIELD PEA VARIETY "AMAN" IN CAHANDUALI DISTRICT OF UTTAR PRADESH

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The small-and marginal farmers are dominated in agriculture. Raising productivity is likely the single most important factor, if incomes of farmers group are to be doubled. To overcome the problem, here is need to focus on irrigation, seeds/planting materials, reduction in input cost and new technological based interventions coupled with a shift into high-value, short duration and cost effective commodities such as pulses during rabi

season and replace the wheat with field pea to get extra crop during summer season. Despite the scope and importance for cultivation of field pea, farmer in mass are not adopting the latest production technologies. To overcome this anomaly Krishi Vigyan Kendra, Chandauli conducted frontline demonstrations in farmers' fields at different locations in the district with high yielding variety "Aman" and applying scientific package and practices in cultivation including line transplanting. The field pea productivity and economic returns under improved technologies were calculated and compared with the prevailing farmers' practice. Results revealed that "Aman" variety under improved practices recorded higher yield of 23.12% and 25.34% during 2017-18 and 2018-19 and the recommended practice gave higher net returns of Rs. 32343 and 37810 per ha and B:C ratio of 3.47:1 and 3.62:1 respectively as compared to farmers practice (1.93:1 and 2.14).

Keywords: Aman; Extension gap, Frontline demonstration; Line sowing; Net returns.

TIED: 17.

CONTRACT FARMING AND PUBLIC PARTNERSHIP

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India is an agricultural country and farmers are its backbone. They have the rights for well-being but the scenario is quite dissimilar. Although they work hard yet several constrains (i.e. lack of availability of quality seeds, fair marketing, productivity gap etc.) that conceal their economic status. *Only slogans will not double farmer's income by 2022, strategy must match.* So, contract farming and public private partnership strategies could be very useful way to get over this fence. Contract farming is a buy back agreement between the farmer and sponsoring agency, which insures the guarantee of production and marketing of the farm product(s). In this, the farmer provides assured amount of particular agricultural product with quality standards and the agencies supply essential resources, technical support and crop supervision. Secondly, the public private partnership in agricultural production, is a broad approach which basically encourage the minimization of productivity gap in local basis, till the availability of genetically improved new germplasm. It also decrease the burden of high cost of farm input (i.e. subsidies for quality seeds, fertilizers and farm machineries). These approaches would be very effective as farm produce will be easily available to the market at right time and in sufficient quantity and the price of these agricultural products will be satisfactory in the favour of farmers. Such innovative initiatives should be promoted by government in partnership with agriculture based companies in the form of institutional projects, several farmer welfare schemes and also rural development that can improve the socioeconomic of our country. So, basically it is summarised that these extension and policies would be very helpful for sustainable agricultural development in changing global scenario.

Keywords: Fair marketing, productivity gap, fense, farm produce, socioeconomic.

TIED: 18.

AGRICULTURE PRODUCTION WITH CLIMATE SMART AGRICULTURE (CSA)

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Climate-Smart Agriculture (CSA) is an approach that helps guide the activities required to transform and reorient farming systems to promote efficient growth and guarantee food security in a changing climate. CSA seeks to address three primary goals: sustainable increase in agricultural efficiency and income; adapt and build

resilience to climate change; and reduce greenhouse gas emissions. CSA helps in ensuring food security through appropriate agricultural policies under climate change. The main vision for sustainable food and agriculture is to make the agriculture, forestry, fisheries and livestock more productive without wastage. Main method of enhancing grazing management effectiveness is through rotational grazing; where the frequency and timing of grazing is adjusted to suit the requirements of the livestock along with availability of pasture. Silvopasture may store carbon on and above soil (growing trees on grazing soil) which can mitigate greenhouse gas. The natural regeneration, which allows a tree seed already in the soil to develop, leaves ground ungrazed for up to a few years, carries several advantages for soils on the rangelands. It increases the cycle of nutrients by drawing nutrients out of the ground. It also improves organic surface soil carbon as leaves fall, disintegrate and enter the soil. Trees also provide protection for soil and individuals and animals from periods of heat which are likely to increase as a result of climate change.

TIED: 19.

WHAT ENTREPRENEURSHIP MEANS: IT'S BASIC ELEMENTS

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Entrepreneur means a person who starts his own business irrespective of all the consequences that he can face in the venture world or an entrepreneur is basically an innovator who tries to develop new technology, products, markets, etc to become successful and provide job opportunities to the young youths of the country. Entrepreneurship is recently gaining a lot of attention but not all of entrepreneurs can succeed in entrepreneurial business. Timmons (1999) defines “entrepreneurship” as “a way of thinking, reasoning, and acting that is opportunity obsessed, holistic in approach and leadership balanced”(P34). The word entrepreneur is originated from France in the 17th century, when people regarded an entrepreneur as an individual who undertook a particular commercial business. Entrepreneur is therefore the person who exploits potential opportunities to create values creatively and innovatively by imputing limited resources (Wickham 2001). Different academic studies have concluded entrepreneurs as four types which are:- 1) Innovative, 2) Imitating, 3) Fabian, 4) Drone. Some characteristics of entrepreneurs are:- psychological characteristics, behavior characteristics, knowledge, capability, risk bearing or taking, good communicational skills, business oriented mind and so on. Entrepreneurship is important as it has the ability to improve standards of living and create wealth, not only for the entrepreneurs, but also for related businesses. Entrepreneurs also helps to change the venture world and competition within the market values and their products as the new and improved products are introduced in the markets and people gets attracted to the new products easily. Entrepreneurs also helps in employment generation for the young generations who are well educated and are still unemployed due to high competitions for government sector jobs etc. The discussion above indicates that characteristic of entrepreneurs and its importance etc are basic elements to start an entrepreneurial business.

Keywords: Entrepreneurship, Characteristics of entrepreneurs, types of entrepreneurs.

TIED: 20.

ENTREPRENEURIAL BEHAVIOUR OF DAIRY FARM WOMEN IN NAINITAL DISTRICT OF UTTARAKHAND

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In India, dairy farming has been practicing for generating employment and steady income. Dairy farming is considered as an entrepreneurial venture predominantly for women because most of the women are involved in dairy activities starting from caring of animals to marketing the milk products. In Uttarakhand, about 90 per cent of dairy farmers operates dairy on small and medium scale. Thus, entrepreneurial development in the field of dairy sector might be the best possible way to make women competent and self-reliant. Thus, the need to explore the entrepreneurial behaviour of dairy farm women was realized. The study was carried out in Nainital district of Uttarakhand state in 2019. Haldwani block was selected purposively and total 120 respondents were selected from five villages based on maximum number of dairy entrepreneurs.

The findings of the study revealed that majority of the respondents (72.5%) belonged to middle age category, had education up to high school (30.83%), had medium family size (69.17%), with medium dairy experience (59.16%) and all of them were married. Results further revealed that majority of the respondents (52.50%) had medium herd size and milk production, 72.50 per cent had medium level of monthly income from dairy farming, 37.5 per cent had small land holding i.e. one to two hectares, three fourth of the total respondents had medium economic motivation and 77.5% had medium scientific orientation. Regarding the entrepreneurial behaviour of dairy farm women, majority of the respondents (62.5%) had medium level of entrepreneurial behaviour with medium innovativeness (46.67%), achievement motivation (57.5%), decision making ability (70%), risk orientation (50%), coordinating ability (67.5%), planning ability (59.17%). Further, it was found that respondents had medium information seeking behaviour (73.33%), cosmopolitaness (82.5%) and self-confidence (56.67%). The results showed that majority of the respondents had medium to high level of entrepreneurial behaviour. Thus, KVKs' and extension agents should put more emphasis on designing entrepreneurship development programmes. The findings of the study will be helpful to the extension administrators and veterinary experts to plan and execute training programmes.

TIED: 21.

BER: VALUE ADDITION TO INCREASE FARMER'S INCOME

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Ber (*Zizyphus mauritiana* Lamk) belongs to the Rhamnaceae family and is also called as jujube. It grows in arid and semi-arid regions of India and there are 125 varieties of ber in India. It is in rich taste and high nutritional value, it also contain protein with many essential amino acids like as parginine, arginine, glutamic acid, aspartic acid, glycine, serine and contains good amount of vitamins A, B complex and C in comparison to other fruits. It also rich in calorific value and is considered as underutilized fruit and is available only for a short period of time because postharvest losses in ber 3.16%. So Value addition is a great way to increase the shelf life of the product along with adding economic value to it. It is an effective to use the surplus and meet the demands during scarcity. Many Products of ber can be utilized as jam, candy, preserve, powder, murabba, beverages, wine, pickle etc. can be prepared from ber. Value-added is simple way to increases the value of our product in the market. It is key to future of sustainable farming, because many growers are enable to advance economically without the production of raw materials from the land. Value addition can be achieved by processing the fruits into various

forms. These forms are liquid and solid, semi-solid and solids forms. Liquid forms include unfermented beverages (pure fruit juice, fruit juice beverage, squash, cordial, crush, fruit juice concentrate, RTS, nectar, crush, syrup, sarbat, barley water, carbonated beverage) and fermented beverages (alcohol, vinegar), puree, sauce, ketchup etc. Semi-solid forms include pulp, jam, jelly, marmalade and candy. Punctured fruits are used in candy making and fully mature fruits of ber are utilized as ber preserve like murabba, Mostly fruits are spoiled due to fungal infection and microorganisms attack, it can be preserve by sundried and dehydration because it reduce the moisture content from ber. These products increase farmer income and consumer interest as wells as also increases value of fruits on aesthetic purpose.

Key words: Ber, Value addition, Nutritional Value

TIED: 22.

CONSTRAINTS FACED BYAGRIPRENEURS OF U.S.NAGAR DISTRICT OF UTTARAKHAND

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Agriculture is the backbone of Indian economy. In this changing World scenario, agriculture is taking a new shape and expanding its scope beyond the limits of mere crop cultivation and animal husbandry for livelihood of rural population. Activities like diversification, value addition, precision farming, high tech agriculture, agriprenurship, global marketing, organic farming, etc. are gradually getting due attention of people involved in redefining agriculture. Agriprenurship is a strategy that can lead to economic self-sufficiency of rural people. Agriprenurship can generate employment opportunities in the primary sector, reduce migration to urban areas and can help in making villages self sufficient. Despite of several efforts to promote entrepreneurship in rural areas, rural agripreneurs are very few in number because even though agripreneurs start entrepreneurial venture assuming high risk, they soon give up due to various constraints. So, a study was conducted on agripreneurs of Udham Singh Nagar district of Uttarakhand using case study method to identify various constraints faced by rural agripreneurs. It was found that majority of agripreneurs faced technical constraints while establishing or running the enterprise followed by marketing constraints. Other than these constraints, there were psychological constraints, socio-cultural constraints, information related constraints, financial constraints, administrative constraints and managerial constraints which were faced by the agripreneurs in running the enterprise smoothly.

Keywords: Agriculture, agriprenurship, agripreneurs, constraints

TIED: 23.

A REVIEW ON CHANGE IN LAND USE PATTERN

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Land is a scarce resource, whose supply is fixed for all practical purposes. The demand of land for various competing purposes is continuously increasing with the increase in human population and economic growth. Land use pattern at any given time is determined by several factors including size of human and livestock population, the demand pattern, the technology in use, the cultural traditions, the location and capability of land. The land is the sole resources of sustenance mankind supporting the planed, animal and human life for providing the food and shelter. Man utilizes land for various purposes like urban development, settlement of industrial

activities etc... The growing pressure population coupled increasing varieties of demands being made on the land resource have brought extra pressure on the land resource all over the country. Growth in the agriculture sector may well be judged by the increase in agricultural production over time. The area under different crops has been fluctuating. However, there was improvement in production, which is mainly on account of increase in productivity as a result of generation of new varieties or technology of their cultivation. It is a challenging task for policy makers to maximize the income of farmers from a continuously declining in net sown area, deteriorating climatic conditions as well as labor scarce conditions. In order to boost the production and enhance farmer's income, it is necessary to discourage the rising tendency in current fallows or to bring the current fallows under cultivation.

Keywords: Land use pattern, production, productivity and income

TIED: 24.

CONTRACT FARMING FOR AGRICULTURE DEVELOPMENT: AN ANALYSIS ON THE SOCIO-ECONOMIC CHARACTERISTICS OF OIL PALM GROWERS IN KOLASIB DISTRICT OF MIZORAM

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In order to reduce several constraints caused by jhum cultivation such as land degradation, deforestation, loss of biodiversity and productivity and also to increase the socio-economic condition of the people, the Government of Mizoram has oil palm cultivation started after identifying potential areas and signing M.O.U with reliable companies. The companies purchased the FFBS (Fresh Fruit Bunch) at Rs 5.50 per Kg and the department of Agriculture also provides a support price of Re 1/ kg FFB for all the purchase made by the companies. Descriptive design was used for the present study and the state of Mizoram was purposively selected. The study area was confined to Kolasib District which has the only functioning oil palm processing mill in the state. Eight villages were purposively selected for the study from which 15 farmers cultivating oil palm were selected purposively thus making a sample size of 120. The socio-economic analysis of the growers revealed that majority (48.33 %) of the respondents belonged to Old age group (> 30-60 years) and had education up to Middle school (35%). Majority of the respondents were married, had family size of 3-8 with small (1-2 ha) land holding under Oil palm cultivation and annual income of 2-3 lakhs. Their income from oil palm cultivation was 1-2 lakhs with majority 74.17 % having 7-13 years of experience in oil palm cultivation. Through contract farming, the oil palm growers were able to solve different problems related to marketing, transportation, middlemen issue, income irregularity etc. The farmers who were once engaged in jhum cultivation can now profit greatly from their plantations and intercropping with different crops such as lemon, coffee, broom etc.

TIED: 25.

ROLE OF ARTIFICIAL INTELLIGENCE AND MODERN TECHNOLOGIES IN AGRICULTURE

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Artificial intelligence (AI) is the branch of computer science that emphasizes the creation of intelligent machines that work and reacts like humans. It is the science and engineering of making intelligent machines,

especially intelligent computer programs. Whereas, modern agriculture practices has made impressive contribution in increasing food grain production in the country. The country could achieve self-sufficiency in food grain production by using modern methods of agriculture using better quality of seed, proper irrigation and adequate supply of plant nutrients by using chemical fertilizers and control of pests and diseases in crop plants by using pesticides. The global population is expected to reach more than nine billion by 2050, requiring a growing in agricultural production by 70 % in order to suit the demand. Only about 10 % of this growth may come from availability of unused lands, with the result that the rest of 90% will need to come from intensification of current production. Using modern agriculture and farming is a must because modern farming methods can increase production and can feed the world. Agriculture is seeing rapid adoption of Artificial Intelligence (AI) and Machine Learning (ML) both in terms of agricultural products and in-field farming techniques. Cognitive computing in particular, is to become the most technology in agriculture services. Increasing production in limited land area requires the use of superior quality seeds. Improving the quality of seeds by applying knowledge of genetics and plant breeding are being done in a routine manner. By applying the knowledge of biotechnology, superior quality seeds are being produced. There are different Modern Technology in Agriculture in India like Breeding, Nanotechnology, ICT in agriculture, GPS systems, use of tissue culture techniques etc. One can use them in his farms which will increase their productivity. Since there are many advantages of modern technology in agriculture, farmers should opt this modern technology in agriculture in India. So that we can hope that these modern techniques of agriculture will help in improving the economy. It can understand, learn, and respond to different situations (based on learning) to increase efficiency. Currently, Microsoft is working with 175 farmers in AP, India to provide advisory services for sowing, land fertilizer and so on.

TIED: 26.

IMPACT OF DAIRY SHG ON LIVELIHOOD OF WOMEN DAIRY ENTREPRENEUR

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Agriculture and animal husbandry are two main pillars of Indian agriculture on which entire structure of village life rests. They are twin occupations, which from time immemorial have played a significant role in improving the rural economy. Dairy farming is a crucial component of Indian agriculture and it is more than wheat and rice crops put together. Livestock rearing provides employment especially self-employment to a substantial number of rural and urban population, many of whom are women who play a major role in the care and management of livestock. The women are the backbone of agricultural work done but worldwide her hard work has mostly been unpaid. She does the most tedious and back-breaking tasks in agriculture, animal husbandry and homes. The present study will be conducted in Kathua district of Jammu and Kashmir State in 2019. Maximum numbers of women dairy entrepreneurs are present under the Mahila Grameen Hastkala Welfare Society which was established in 1995 and works for the over all upliftment of women and other weaker sections of the society. The NGO has by far established 600 SHGs in different villages around Kathua. Out of these SHGs, 50 dairy SHGs has set up their ventures and got training from the NABARD. Using simple random sampling method, 8 SHGs were selected out of 50 SHGs. All the members were selected. The study revealed that majority of the dairy entrepreneurs (73%) belongs to middle age group, followed by old age group (14%) and young age group (13%). There was a significant difference between the knowledge level of dairy SHGs entrepreneurs and non-SHG entrepreneurs. Major constraints admitted by the women entrepreneurs were high price of dairy feed and medicines, difficult loan procedure and distant locations of A.I. centers.

Keywords: Women entrepreneur, SHGs, Dairy, Rural economy, NGO

TIED: 27.

AGRICULTURAL MARKETING IN THE ERA OF eNAM

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In a dynamic and growing economy like India, the agricultural marketing plays a pivotal role as it acts as a linkage between the farm sector and non-farm sector. Since independence, India has become self-sufficient in the agricultural commodities as the food grains production has increased tremendously from 50 million tonnes during 1950-51 to 284.95 million tonnes in 2018-19. But there is no substantial growth in terms of farmers income as they are not able to find the right market to sell their produce at right time. Thus, the present study conducted to know the progress in agricultural marketing with the introduction of the Electronic National Agricultural Marketing (eNAM) and is based on the secondary data collected for Etah and Bareilly mandis of Uttar Pradesh. eNAM is an online market, launched during April 2016 with an objective of connecting farmers directly to buyers without the involvement of middlemen. Initially it was launched in 21 mandis of 8 states for the trade of 24 commodities and was extended to 585 mandis in 16 states and 2 union territories and with common tradable parameters for 150 commodities. Around 1.65 crore farmers and more than 1.24 Lakh traders have been registered on eNAM portal, further increase in number of traders will help in the creating a competitive environment for securing higher income for farmers. The inter-mandi trade under eNAM has started in nine states among which Andhra Pradesh has done maximum trade followed by Haryana and Telangana till July, 2019. The impact of change in prices of commodities have been studied in selected mandis of Uttar Pradesh which has shown positive increase in prices after the implementation of eNAM except for paddy in Etah mandi and Potato in Uttar Pradesh with a decrease of 13 and 46 per cent respectively. Despite the progress in eNAM, many farmers are still far behind due to lack of training and lack of access to modern technology.

Keywords: eNAM, technology, agricultural marketing, middlemen.

TIED: 28.

A STUDY ON WOMEN INDULGED IN ENTREPRENEURSHIP AT VARANASI

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Entrepreneurship is the main component to India's development. This is important because it uses local means, engagement and rural development. The Indian economy has industrialized since liberalization, attracting foreign stock, increasing its per capita GDP, deepening stock market capitalization and reaping these gains in the economy. With the growth, globalization and facts channel penetration marketplace had shortened crafting new avenues for entrepreneurs to raise and exploit the openings. The role of modern women is much higher than before. The role of modern women is much greater than before. Women entrepreneurs can stand on their feet by acquiring an essential skill through education and training (Kapase, 2001). Indian women are breaking roots and enjoying the effects of globalization, and affecting not only the domestic but also the international arena. Entrepreneur is key factor of entrepreneurship. Women entrepreneurship is a recent phenomenon and there are various ways of motivation in the process. This paper is an attempt to explore the motivational factors which could be pull or push factors for women to start the enterprise. The study was done in Bhelupur and Nagwa ward of Bhelupur zone at Varanasi. The sample size opted for the study was 217 which were registered in DIC, Varanasi.

84.8% started their enterprise to fulfill the family's need and to support the family economically. 70.0% women entrepreneurs were motivated by family to start the enterprise by providing mental & financial support to 17.8% respondents and 14.4% to fulfill family need/economic support. Women entrepreneurs can play an important tool to increase economic development of India.

Keywords: Entrepreneurship, Entrepreneurs, Women, Factors, Motivated, Pull, Push

TIED: 29.

SCIENCE POLICY ADVICE FOR SUSTAINABLE AGRICULTURE IN INDIA

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Agricultural mediated activities in India contribute approximately 16% to the economy and employ almost 50% of the country's workforce. Furthermore, according to the World Bank statistics, agricultural land makes up almost 60.45% of the total land area of India. However, despite figures reflecting heavy influence of the agricultural sector within Indian economic, social and ecological dimensions, agricultural production in India grapples from certain challenges. Some of these include inadequate adaptation of modern technological innovations, incompetent financial instruments, sub-standard functioning of post production market systems, vulnerability towards natural disasters in the form of droughts and floods as well as lack of awareness on part of the Indian farmers regarding sustainable agricultural practices and government schemes formulated for their socio-economic advancement. Research institutions and educational organisations can contribute significantly towards the alleviation of these challenges through development of effective frameworks and policy recommendations targeted towards the attainment of the three-fold objectives of farmer welfare, nutritional security and soil quality conservation. The present analysis therefore aimed towards ascertaining the Centrally Sponsored Schemes dedicated towards agricultural management in India, government bodies responsible for their implementation as well as coherence of the policy objectives with the targets of the Sustainable Development Goals. The analysis revealed that although agriculture in India has several national level missions dedicated to it targeting multiple targets of SDG 1, 2, 5, 6, 7, 8, and 15 further linking of the policies with national indicators for SDGs and increased inputs from the scientific community would substantiate sustainable agriculture policy of India.

Keywords: Centrally Sponsored Schemes; Indicators; Policy advice; Scientific community; Sustainable agriculture; Sustainable Development Goals

THEME 6: SOCIAL, EDUCATION, EXTENSION AND POLICY ISSUES (SEEP)

SEEP: 1.

TRANSFER OF TECHNOLOGY AND IMPACT OF FLOWER PRODUCTION OF LILIUM IN HILLS AND PLAINS

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Today floriculture has been identified as the most rapidly expanding enterprises. In our country there has been a tremendous increase in demand for flower in the form of bouquets, flower decorations, floral baskets and a rising tendency to celebrate festive occasions like Christmas, Mother's Day, Valentines Day etc. Government Institute like Indian Agriculture Research Institute is playing a crucial role in the development and promotion of bulbous commercially important cut flower crops as a business. The genus *Lilium* belongs to the family Liliaceae. Lilies are native to northern hemisphere in Asia, Europe and North America. It is widely used in the floral industry as cut flowers and potted plants. It is evaluated as a high income generating flower crop in Indian floriculture industry. Soil and climatic conditions are very important for growth and development of *Lilium* plants. Indian Agriculture Research Institute developed the cultivation technology of *Lilium* as cut flower and trainings given to trainers of state Department of Horticulture to transfer the technology at farmer's field. Farmers adopted to cultivate *Lilium* as commercial cut flower crop in hills as well as plains area. The impact of this ToT was realized by farmer through the sale of cut flower of *Lilium* at Delhi flower market. It was analysed that the income generated by *Lilium* cultivation was ten times more per unit area as compared to traditional vegetable crops like Potato, Pea etc.

SEEP: 2.

ROLE OF HOME SCIENCE IN SOCIAL WELFARE OF THE COMMUNITY

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The well being of the whole society depends on the quality of life the people live in that society. The role of Home Science is as much important with the view that it is an art of managing resources efficiently and the science of achieving a healthy and happy home as well as a foundation for better society. Home Science is an interdisciplinary field of knowledge which includes study of many disciplines such as Food & Nutrition, Textile & Apparel Designing, Human Development and Family Studies, Family Resource Management, Extension and Communication, applied Physics and Chemistry, Consumer Economics, Human Anatomy and Physiology, Science and Technology for rural Development, Gender Sensitization For Empowerment etc. This aims achieving and maintaining the welfare and well being of home, social and family life in an ever changing society. Traditionally, Indian society had clearly demarcated areas of work for both men and women. However, with the changing social and economic environment, managing a home requires the efforts of all the family members. Today, more and more women are working- whether they go to an office or work from home. Therefore, gender based stereotype roles do not hold relevance any longer. Today, we have become capable to manage your own resources better by studying various areas of Home Science. Home Science has opened a large arena of possible job opportunities for women. Home scientists, can provide an opportunity to make an important contribution in development of Society.

Keywords: Social Welfare, Home Science, Nutrition, Textile & Apparel Designing, Human Development.

SEEP: 3.

DRUDGERY REDUCTION OF INDIAN WOMEN FARMERS THROUGH TECHNOLOGY INTERVENTION

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India is mainly an agricultural country and farming is one of the main occupations accounting for 17% of the GDP (Gross Domestic Product). It is worth to mention that agriculture sector provides jobs to around 53% population of India. About 78% of the economically productive women in the country are engaged in agricultural activities. However, current farming practices used by women farmers has considerable degree of health impact on their body causing them immense pain and hardship. Though much development has taken place in agriculture, the work that women do has not been altered. Women do not have proper awareness and knowledge about improved tools and equipment that can reduce their drudgery. The women don't have access to tools and machines to ease their hard manual labour. Since women's contribution in agriculture is significant to economy, improving their work efficiency is of concern and needs to be given high priority. These concerns of women farmers have been addressed through a project entitled, 'Mitigating hardship of Indian women farmers through technology intervention', initiated by IEA for funding through John Deere Foundation. Under the project a Technology Resource Center (TRC) has been established for easy access/availability of technologies to reduce their drudgery. Regular demonstrations on the usage of tools have been conducted in the three selected villages with the project staff rotating the demonstrations based on seasonal requirements. These demonstrations were instrumental in making the farmers realize the benefit of using these modern tools and have encouraged many farmers to hire these tools. Additionally, the project team members made door to door contacts and gathered feedback on tools distributed as tool kit to beneficiaries. The families using the tools have benefited immensely from the use of the tools given as part of the tool kit as well as the tools hired from the TRC. Higher outputs, less strain on the body, less time consumption are some of the feedback shared by the farmers. The capacity building training as well as field demonstrations of technologies is transforming lives of women farmers full of drudgery to that of ease and comfort improving efficiency and output in agriculture work. Additionally, the time saved through use of improved tools and technologies can be transformed to money by initiating various agro and non-agro enterprises.

Keywords: Drudgery, Technology, Women farmers, Capacity building.

SEEP: 4.

SUSTAINABLE AGRIBUSINESS AND TRADE IN INDIA

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The objectives of the study are to analyse the trend of agricultural export and import in India in globalization era focusing mainly on its growth and to highlight the recent agribusiness developments in India. The study is based on secondary data collected from Agricultural Statistics, RBI website and Ministry of Commerce using line graphs, descriptive statistics etc. The agribusiness is very important to sustain the livelihood of millions of farmers in India. The sustainability of agribusiness to ensure the welfare of consumers and producers is the need of the time. Though the technological solutions can address the challenges of low productivity in agriculture, robust sustainable agricultural practices and crop diversifications can only ensure the

livelihood and income of farmers. The agricultural scenario all over the world is undergoing a rapid change after globalization and agribusiness assumes significance in view of this changed scenario. As per WTO trade statistics, the shares of India's agricultural exports and imports in world agricultural trade in 2015 were 2.26 per cent and 1.74 per cent respectively. The post reform period has been adverse to export but favourable for imports. The share of agricultural products in India's global imports during post-reform period has increased to 6.1 per cent per annum, as compared to 4 per cent during pre-reform period. Total agricultural exports show a continuous increasing trend since 1990-91 to 2015-16 but share in total export has declined. It is suggested that the increase in the supply of agricultural products, diversification of agricultural exports, improvement of the cold storage facilities for the highly perishable agricultural exports are very crucial for the maximization of agricultural exports and agri-business.

Keywords: Agriculture, Agribusiness, Export, Import, Sustainability

SEEP: 5.

PULSE CULTIVATION, MARKETING AND LIVELIHOOD SECURITY IN KANDI BELT OF JAMMU DIVISION OF J&K STATE

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The present was conducted in Samba district of J&K state during agriculture year 2016-17. A sample of 120 farmers was taken using multistage sampling technique for analyzing the results. The results of the study revealed that there were three types of marketing channels involved in the marketing of major pulses (urd bean, moong bean and gram) in the study area viz. producer – village trader- wholesaler-retailer-consumer (Channel-I), producer – wholesaler-retailer-consumer (channel-II) and producer – consumer (channel-III). It was found that for all the major pulses, the marketing efficiency was highest in channel-III followed by channel-II and channel-I. For urd bean, the marketing efficiency in channel-III was 3.11 followed by channel-II (2.09) and channel-I (2.03). For moong bean, the marketing efficiency in channel-III was 6.47 followed by channel-II (3.56) and channel-I (3.45). In case of gram, the marketing efficiency in channel-III was 5.98 followed by channel-II (3.13) and channel-I (3.02). From the results, it was concluded that the marketing efficiency in different channels was highest when there was no marketing intermediary involved in between producer and consumer and the produce is sold directly from producer to consumer. It was also found that the major marketing constraints involved in the marketing of major pulses in the study area were lack of remunerative price for the produce unorganized market, high cost of transportation and lack of market information

Keywords: Marketing channels, Marketing efficiency, Multistage sampling

SEEP: 6.

AGRICULTURE EXTENSION RESEARCHES: ITS COMPLEXITIES AND DIVERSITIES

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Agriculture extension which is also known as Agriculture Advisory Services plays crucial role in improving living conditions of rural people as well providing right pathway to the researches who are enrolled or involved in these area. The research area of extension is so vast that it does not has any boundary of work. Major area of work for extension people is growth in agriculture, marketing, innovation, rural connectivity with

advancement, etc. The lacking of extension researches being implemented at ground level is due to insufficient coordination of public and private sectors, reduction and aging of public staff/ brain drain/ gender bias. Other than this the advisory profiles have hardly revised over the past decades. Insufficient research on advisory system had created a gap between the actual need and performance related to those need. Extension is all about technology transfer/ food crops, intensification and diversification of the farming system, management of natural resources and climate change impact, promotion of farmer's organisation and mainstreaming gender and women specific areas. The extension researches face lots of complexities i.e. different objectives, various functions, diverse contents and different performers. Diversification in training, information provision, advice, process facilitation, facilitation in linkages tends to cover as much possible areas of extension work. Country specific analysis and policy design, improved governance and strengthened advisory institutions leading to organisational development approaches, pre-service education and in-service training which includes new agenda, comprehensive approach (problem/constraints, demand/client), contextualize capacity development, testing and evaluation of alternative institutional, organisational and financial solutions in action research approach, more research and impact studies, cost effectiveness of information delivery through ICTs and mass media, etc. are various comprehensive approach to cope up the gap between research and implantation of those work among the society/individual.

SEEP: 7.

ECONOMIC AND ENVIRONMENTAL IMPACT OF RESOURCE CONSERVATION TECHNOLOGY: A CASE STUDY OF ROTAVATOR IN CHANDAULI DISTRICT OF UTTAR PRADESH, INDIA

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Resource Conservation Technologies has potential to meet future food demand besides maintaining sustainable rural development. Out of several options of Resource conservation technologies, rotavator can improve inputs use efficiency, increase farm income by improving crop yield, protecting soil biodiversity and natural resources etc. Present study was carried out in Chandauli district to assess the economic and environmental impact of resource conservation technologies. The study was based on primary data and it was collected through personal interview. Chandauli district was purposively selected for present study because large number of farmers was using rotavator for wheat cultivation. From the selected village 30 rotavator adopters and 30 non-adopters was selected using snowball sampling method for primary data collection. Results suggest that after adoption of Rotavator, wheat yield and net income from wheat was increased significantly as compared to non-adopters. In case of Rotavator adopter, per hectare net income received from wheat production was Rs 54493.29, whereas in case of non-adopter it was Rs 33940 and incremental net benefit was Rs 20553.29 over non-adopters. Per hectare wheat yield was found to be 45 and 37.5 quintals for rotavator adopters and non-adopter respectively. The benefit-cost ratio was 2.06 and 1.63 for rotavator adopters and non-adopters respectively. The reduction in use of fossil fuel for land preparation, sowing of wheat crop and running diesel pump for pumping irrigation water leads to reduction in carbon emission. After adoption of rotavator, per hectare carbon emission was reduced by 11.69 kg as compared to non-adopters. It is suggested that government should provide more subsidy on purchase of rotavator and post sell technical support to farmers for large scale adoption of technology. This will not only increase the wheat grain availability but also reduce the carbon emission.

SEEP: 8.

MARKET LED EXTENSION: JOURNEY FROM FARMER TO AGRIPRENEUR

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The point of convergence of the extension functionaries need to be extended beyond production. Farmers should be incited on various aspects on sustainable environment and agriculture, quality of produce, consumer's preference, market intelligence, processing and value addition and other marketing information. It will assist the farming community to envision high returns for the produce, minimize the production costs, and augment the product value and marketability. The need for market led is of necessity by the paradigm shift of present agriculture scenario which calls for conversion of the sector into profit oriented business. (Kaleel and Krishnamurthy, 2007). Market led extension is one of the new dimensions of agricultural extension that envisages farming as an enterprises with diversified options to suit different farming situations. (Reddy and Chandrashekhara, 2002). The pace with which the market is getting globalized, farmers need to revamp themselves from mere producers-sellers in the domestic market to agripreneurs in a wider market sense to best realize the sustainable form of agriculture, returns on their investments, risks and efforts. The approach of market led extension is a perfect combination of agriculture, economics, and extension equipped enough to reach the doors of common man with the help of appropriate technology. (Kaleel *et al.*, 2007)

Keywords: Market led extension, Sustainable agriculture, Agricultural extension, Agripreneurs

SEEP: 9.

FEMALE MORBIDITY AND MORTALITY IN INDIA: A CURRENT TREND

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Healthy lifestyle and high intake of nutritious food can provide good health throughout life to the humans. The poor nutrition and unawareness on the utilization of health facilities during their childhood and reproductive age are the major factors responsible for the high maternal mortality. Though government of India has been taking several efforts to improve the health status of the women, poverty, gender discrimination and illiteracy in the population are the major problems associated with the implementation of appropriate interventions. Women's health concern is influenced by interrelated biological, social, and cultural factors. It is generally expected that women can live longer than men it does not necessarily ensure a better quality of life. Profound studies reported that women are more sickly and disabled than men throughout the life cycle. It has been suggested that women are particularly vulnerable, where basic maternity care is unavailable. Due to the involvement of biological factors, women are more prone to sexual exposure of contracting sexually transmitted infections. Moreover an early marriage and childbirth could be responsible for the prevailing wide variation in the socioeconomic status. Maternal mortality remains stubbornly high in India as compared to many developing nations India contributed approximately 20 percent of all maternal deaths worldwide between 1992 and 2006; due to lower socioeconomic status and cultural constraints as well as limiting access to health care. Maternal mortality is 57 fold higher in Indian women than in the United States. India's maternal mortality ratio is lower than the ratios for Bangladesh and Nepal, while it is higher than those in Pakistan and Sri Lanka. Severe anemia accounts for 20% of all maternal deaths in India. It has been suggested that, higher literacy has greater maternal health as well as lower infant mortality. Cardiovascular disease is the major contributor to increased female mortality in India, which is due to differential access to health care between the sexes. Surprisingly men are tending to visit hospitals

more frequently than women to treat their ill-health. Moreover, Indian women suffer from mental depression at higher rates than Indian men.²⁶ More Indian women committed suicide as compared to men, which are directly related to depression, anxiety, gender disadvantage and anguish related to domestic violence. Very strict, strong and sustained laws should be framed by the government to prevent the gender based violence in as well as to improve the educational and health status of the women. A strong and sustained government commitment is therefore needed to improve women's morbidity and mortality rate.

SEEP: 10.

STEPPING TOWARDS ANAEMIA FREE BHARAT: ROLE OF SOCIAL AND BEHAVIOUR CHANGE COMMUNICATION

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The most prevalent nutritional deficiency disorder in the world is Anaemia. Every age group is affected but the most vulnerable are pre-school age, pregnant and non-pregnant women of child bearing age. Due to multifactorial reasons prevalence of anaemia is highest in the developing world. It affects health, survival, income, productivity and development. Several attempts and policies are designed to combat the problem. Efforts are also concentrated upon holistic approach in eradicating the public health issue like community awareness, uninterrupted supply of iron and folic acid. The target of World Health Assembly of 50% reduction of anaemia in women of reproductive age by 2025 and poshan abhiyaan (2018-22) to reduce the prevalence amongst young children (6-59 months), adolescent and women in reproductive age groups (15-49 years) by 3 % per year.

Evidence suggests that simply increasing knowledge and awareness of good nutrition practices rarely leads to sustained behaviour change. The field of social and behaviour change communication is a collection of approaches and tools informed by behavioural theories and used to design public health and nutrition interventions. Since social and behaviour change communication about nutrition awareness is one of the key interventions proposed in Anaemia Mukht Bharat Campaign. The aim of present paper is to highlight the steps or efforts to tackle the scenario with special emphasis on role of social and behaviour change communication.

Keywords: Anaemia, nutritional deficiency, social and behaviour change communication

SEEP: 11.

EDUCATING FAMILIES ABOUT THE VISUAL TASK PERFORMANCE

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The visual sense is the most important channel of information in information-intensive work. From the point of view of seeing and eye fatigue, the ordinary visual displays are not the most optimal solutions. Stability of the image, lighting conditions, reflections and glare, as well as the invisible flicker is among the most common factors affecting the visual observations. The eyes are designed to be stimulated by light and to control the amount of light entering the eyeball. There are, however, conditions that exist today that are foreign to the natural lighting environment and can cause an adverse reaction to light. Vision is actually defined based upon the sensitivity of the eye and visual system to electromagnetic radiation. Without the eye and visual system, there is only electromagnetic radiation. The eyes are true windows to our world and to our soul. Because of their connection to the brain, they influence most of our cognitive thought processes. The eyes are simple tools designed to catch

light. However, the method by which they gather, filter and guide the light, as well as the way in which our brain processes the information received by the eyes, makes for the wonder of vision. Therefore, there is much need for educating the visual task performance as the largest single factor in the workplace is glare.

Keywords: Visual Task Performance, Eye, Vision

SEEP: 12.

THE ROLE OF INFORMATION AND COMMUNICATION TECHNOLOGY IN STARTING AN ENTERPRISE

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ICT development at the grass-root level is appalling in India. The increasing body of literature in the field of development theory holds that information and Communications Technologies (ICTs) are essential for improving the living conditions in developing countries, since this view is shared by many governments and international Organizations. It is also a foundation for policy making. Technology playing a bigger role in fueling the Indian economy, the deployment and usage of technology is moving beyond large enterprises. Entrepreneurship is defined as to gain the expectation of profit by utilizing the resources. Small and medium sized businesses and startups are adopting technologies faster than ever before. The advances in ICT facilitate startups to deliver their new services to large enterprises across the globe in a profitable manner. ICT entrepreneurs have an important role for increasing the level of ICT awareness. Internet cafés have many important functions in the society and serve many other purposes than just providing Internet. The focus is mainly on technology aspects like the Internet or e-mail technology, without looking at how the business can use this technology to be successful. The focus is thus only on the success of the technology driving the business; no consideration of the Small and Medium Enterprises is made. Success is measured from a technology point of view and is not appraised on the success of the business. The advances in these ICT facilitate helps startups to deliver their new services to large enterprises across the globe in a profitable manner. Thus the paper aims to study the role of ICT in entrepreneurship.

Keywords: Enterprise, Entrepreneurship, ICT (Information and Communication Technologies), Small and Medium Enterprise, Technology

SEEP: 13.

ROLE OF SCHOOL READINESS IN EARLY CHILDHOOD EDUCATION

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Children are the nation's most precious resource, and nurturing children is an investment to ensure a brilliant future for the nation. School readiness is the foundation of equity and quality education. The transition into school represents a major step in a child's life. By the time children turn three, they have already begun laying the foundation for life-long learning and success. With respect to school readiness, transition as children moving into and adjusting to new learning environments, families learning to work with a sociocultural system (i.e. education), and schools making provisions for admitting new children into the system, representing individual and societal diversity. Interlinked, they support each other in building competencies and preparing for the

transition from home to school. Early environments are important that affect children's development and learning. It also implies that the child has reached a certain stage in their development where formal education will be advantageous to the child. It is gaining global support as a viable means to help young children reach their full developmental potential and engage in lifelong learning. School readiness is linked to improved academic outcomes in primary and secondary school and positive social and behavioral competencies in adulthood.

Keywords: Young children, School readiness, Education, Learning and development.

SEEP: 14.

AUTOREGRESSIVE INTEGRATED MOVING AVERAGE WITH EXPLANATORY VARIABLE (ARIMAX) MODEL FOR RICE YIELD ON DIFFERENT FERTILIZER COMBINATIONS

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There nitrogen uptake by rice crop based on historical data of LTFE (long term fertilizer experiment) at Raipur has been considered for upcoming years forecasting. For this purpose, Autoregressive Integrated Moving Average (ARIMA) and Autoregressive Integrated Moving Average with Exogenous variables (ARIMAX) time-series model along with its estimation procedure has been compared. There ARIMAX model developed by including nitrogen content and organic carbon as an input variable in ARIMA. After comparison of both model, ARIMAX model outperformed ARIMA model for forecasting of nitrogen uptake. Comparative study of the fitted models has been carried out from the viewpoint of lower root mean squared error (RMSE) and higher r squared. The reason for better performance of ARIMAX model may be attributing to consideration of exogenous variables in ARIMA time series model. So that, the present study may be useful for deciding optimum recommended dose of fertilizers for rice by better forecasting of nitrogen uptake. The Result of study also concluded that, the combination of organic and inorganic fertilizer (100% NPK+FYM & 50% N+100% NPK+GM) could be used in increasing nutrient uptake and helpful in maintaining soil health.

SEEP: 15.

IMPORTANCE OF PARENTAL INVOLVEMENT IN EARLY CHILDHOOD EDUCATION AND DEVELOPMENT

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Early childhood education is a fundamental educational program basically provided for the young children up to 6 years of age. It is a preparatory stage for the holistic development of a child's social, emotional, cognitive and physical needs in order to build a sound foundation for lifelong learning and well being. Early childhood education is one of the best investments a country can make to promote human resource development, gender equality, and social cohesion and reduce the costs for later remedial programs. Many of the Parents have a notion that their role in their child's education comes to an end once they place their toddler in a preschool program. Parental involvement in early childhood plays an important role in the development of young children because it creates a connection between the school and home environment. As their children's first teachers, parents have an amazing opportunity to nurture their children's growth and development. Many research studies found that children perform better in school when their parents are involved. The parental involvement will also

improve children's social functioning, better behavior, better mental health, academic achievement, and meaningful learning which significantly shape the later years of an individual's life. Despite of growing research on the importance of parent involvement in early childhood education, there are still many difficulties when it comes to involving parents. Early childhood educational centers play a significant role in supporting parents. It is the responsibility of teachers and administrators in early childhood schools to involve parents educating parents on child development

Keywords: Early childhood education, holistic development, environment, mental health, behavior, academic achievement, early childhood centers.

SEEP: 16.

ECONOMIC ANALYSIS OF SORGHUM PRODUCTION UNDER IRRIGATED AND RAINFED CONDITION OF MAHARASHTRA

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Sorghum is a coarse cereal crop cultivated for grain and as a major food crop in several parts of the world. It is one of the main staple food crops for world's poor and food insecure people. It is also an important source of feed, fodder and bio-fuel. The study was conducted using secondary data collected from Directorate of Economics and Statistics. Maharashtra was selected as the study area because it is the highest Sorghum producing state. CACP cost concepts was used for estimating cost and income measures. Cobb Douglas production function was used to estimate the productivity of resources. Cost of cultivation in irrigated condition was Rs. 45640.95. Per hectare return from main product was Rs. 36439.29 and Rs. 18537.26 from by-product. Net return obtained was Rs. 9335.6 per hectare. Average total cost of production per quintal was Rs. 997.92. The net return over cost A_1 , B_1 , B_2 , C_1 and C_2 was estimated to be Rs. 27754.86, Rs. 27267.80, Rs.18103.21, Rs. 22649.37 and Rs. 13484.78 respectively. For rainfed condition, cost of cultivation was estimated to be Rs 32413.073. Per hectare return from main product and by-product were Rs. 21988.83 and Rs. 13842.74 respectively. Net return obtained was Rs. 3418.497 per hectare. Average total cost of production per quintal was Rs. 911.592. The net return over cost A_1 , B_1 , B_2 , C_1 and C_2 for rainfed condition was found to be Rs. 15095.89, Rs. 14775.37, Rs. 8802.25, Rs. 12338.26 and Rs. 6365.14 respectively. Regression analysis showed that the coefficient of elasticity of production of human labour, machine labour and fertilizer was positive and significant in both conditions. The coefficient of elasticity of irrigation was found to be positive and insignificant in irrigated condition. The sum of the regression coefficients of variables in irrigated and rainfed condition showed increasing returns to scale.

SEEP: 17.

SOCIO- ECONOMIC STUDY OF HIGH VALUE CROP GROWING FARMERS IN VARANASI DISTRICT OF UTTAR PRADESH

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The contribution of agricultural sector to National Gross Domestic Product (GDP) has continued to decline over the years. In 1970-71 agriculture contributed about 44 % of GDP which declined to about 7.2 per cent in 2018-19. Presently total horticultural production is estimated 314.87 million tonnes as compared to 281.37 million tons of food grains, which indicates diversification of agriculture towards high value horticultural crops. The study was conducted to examine the socio economic characteristics of farmers growing high value crops and

their constraints in Varanasi district. A multistage stratified sampling technique was followed to select the respondents. Two blocks from Varanasi district were randomly selected purposively viz Kashi Vidyapeeth, Arajji line. From each selected block four villages were selected purposively and finally 80 farmers were selected from 8 villages randomly. The study found the average family size in the study area was twelve i.e. four male, three female and five children. The occupation is categorized into three group's viz. agriculture and allied activities, agriculture with business and agriculture with other services. The Social Characteristics Agriculture and allied activities whereas only 30 and 12.50 per cent of farm families are involved in agriculture with business and agriculture with other services, respectively. It was found that most of the population (44.87 %) were primary educated. Maximum farmers (97.50 %) have reported that the fluctuation in climatic variables like rainfall and minimum maximum temperature is the major constraints in the production of High value Horticultural commodities. The storage problem was the another major problem reported by farmers (91.25%). It is suggested that risk mitigating strategies be adopted and storage should be created.

Keywords: High value crops, Household, Land Holding, Varanasi.

SEEP: 18.

GENDER WISE STUDY ON SOCIAL MATURITY & ITS RELATIONSHIP WITH THE ADJUSTEMENT OF ADOLESCENTS FROM ORPHANAGES, SINGLE PARENT FAMILIES AND INTACT FAMILIES

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The aim of the study was to investigate gender differences in social maturity of adolescents from orphanages, single parent families and intact families. The relationship between social maturity of adolescents and adjustment was also investigated in the present study. Present study was conducted in the randomly selected orphanages and government schools (from four cities) of Punjab. Total of 300 school going adolescents were included in the sample. Sample was equally distributed across both the genders. Social Maturity Scale and Bell's Adjustment Inventory was employed in the research study. The data was analyzed by using t-test and coefficient of correlation. By the statistical analysis, it was revealed that social maturity of girls from intact families was observed to be significantly better when compared with boys. Furthermore, in single parent families, total social maturity of boys exhibited statistically significant and positive correlation with adjustment. On the other side, total social maturity of girls who brought up in orphanages and living with intact families projected a significantly positive relationship with the adjustment.

SEEP: 19.

DEVELOPING RESILIENCY AMONG BULLIED CHILDREN IN SCHOOLS THROUGH INTERVENTION FOR EDUCATIONAL REFORMS

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Bullying in middle schools is well on the way to happen in unclear open spaces, for example, corridors, washrooms, play areas, stairwells, cafeteria and locker rooms. These areas are not claimed or characterized by any individuals from the school network. Since these areas need instructor or grown-up supervision, they are spaces where spooks can escape with their demonstrations of mischief. Bullied children are those children who become

victim of ill-intentioned behavior shown by bully throughout bullying whereas, bullying may be a recurrent negative, ill-intentioned behavior by one or additional students directed against a student who has issue defensive himself or herself. On the other hand, Resilience is that the ability to cope once encountering negative events, troublesome things or challenges to come back to nearly an equivalent level of emotional well-being. It helps in overcoming from the bullying by adopting numerous strategies like being social, by telling to elders, ignoring the bullies and even facing them whenever it's necessary. It becomes challenge for their families of bullied children as they have developed lack of confidence, conservative behavior, hurt, stay humiliated etc. Therefore, to eradicate such negative qualities it's necessary for them to just accept the challenge of developing resilience against the bullying among bullied children.

Keywords: Challenge, Resilience, Bullied children, Families, Bullying

SEEP: 20.

KNOWLEDGE AND AN AWARENESS OF FOOD SAFETY AMONG THE UNDERPRIVILEGED WOMEN IN SLUM AREAS

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The ugly manifestation of rapid urbanization is the mushroom growth of slums. The informal employment sector pulled unemployed and under employed people from rural to meet the labor demands of the urban sector. Due to poverty to take a house on rent is next to impossible. Therefore, migrants with their family take asylum in slums located in the abandoned and unhygienic areas having poor sanitation and susceptible to health hazards. There is no dearth of slum studies undertaken by the social scientists. However, women centric studies are rare. As usual the women are the home managers and are expected to look after food preparation and survey the family members within the congested space. With the study Objectives of to know the knowledge and practices of food safety among the women of slum dwellers, to know the hygiene and sanitation practised by the slum women's, and to assess the purchasing power of the slum women. The study was conducted in Bhubaneswar city in two slums namely "Biseswar slum" and Patharabandh slum. Randomly 150 women have been selected for sample survey with a small interview scheduled was formed to collect data from the slum women about their-education awareness, knowledge and attitude about food handling and cooking practices. The gap between knowledge and practice is attributed to the hangover of the cultural based of the community and place of origin of the women living in slums. These processes of imitations and exposure to the media, however, have sensitized a few women who have been conscious of food safety but then are constrained due to inbuilt city planning and expansion and also to the demographic and socioeconomic condition inflicted upon them.

Keywords: Knowledge, Awareness, health and food safety.

SEEP: 21.

HEALTH PROBLEMS FACED BY MIGRANTS WORKERS: A REVIEW PAPER

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Migrants are mainly employed in "3D jobs" which are dirty, dangerous, and difficult, are characterized by monotony and intense rhythms, and are found in sectors with higher risks such as construction, heavy industry, and agriculture. The aim of this study is to find out the problems faced by migrant workers. Migrant workers face

health problems and it is important for the health system to prepare itself to face these. In keeping with a UNESCO report entitled Social Inclusion of Migrants in India (2013), three out of ten Indians are migrants. The population of migrants in India went up from 309 million in 2001 to 400 million in 2011. Migrants today face critical troubles regarding their identification, child schooling, and fitness problems, problems confronted via female migrants, legal resource, and different disputes. To triumph over those issues and to enhance the betterment and development of migrant people in India, a few serious measures should be taken by way of the government and civil societies along with NGOs. This paper tries to recognition on some problems and its measures may be adopted for the betterment of internal migrants in India as a result we are able to circulate collectively to a social development.

SEEP: 22.

EDUCATIONAL REFORMS IN INDIA

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Education is the key to the task of nation building as well as to provide requisite knowledge and skills required for sustainable growth of the economy and to ensure overall progress. Education reform is the name given to the goal of changing public education. Historically, reforms have taken in different forms because the motivations of reformers have differed. In 2000, 164 nations got together and pledged "Education for All" by 2015. Education for All Global Monitoring Report, 58 million children does not attend primary school. And the worst part is, the ones going to schools and universities are not getting a complete high quality education. Education reform comprises any planned changes in the way a school or school system functions, from teaching methodologies to administrative processes. Higher education is the most powerful tool to build a knowledge-based society. New reforms in the education system help to maintain creativity, adaptability and quality of education. There is a felt need for reforms in education due to sociological, political, economic and technological changes. Despite, its impressive growth, higher education in India could maintain only a very small base of quality institutions at the top. Standards of the majority of the institutions are poor and declining. Presently about 12.4 percent of students go for higher education from the country. National Survey conducted few years back reveals that, more than 80% of the school principals in India blame rote-learning as the reason for poor standards to learning in students passing out from schools. Of these, nearly 70% of them felt that the curriculum followed in India today did not give sufficient scope for creative thinking.

Keywords: Curriculum, Education, Educational Reforms, Higher Education

SEEP: 23.

ADOPTION BEHAVIOUR OF FARMERS ABOUT SCIENTIFIC POTATO CULTIVATION

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The study was conducted in Kannauj district of Uttar Pradesh state of India to know the adoption

behaviour of potato farmers. Out of eight blocks, one block i.e. Jalalabad was selected purposely for the study. From this block, five villages were selected for the study purposively. Then from each village, 25 potato growers were sampled randomly. Hence, the total sample size was 125. The data were collected from each respondent through personal interview method with the help of structured scheduled. Adoption of various component technologies and package of practices by the farmer were studied. The results showed that the adoption of sequence cropping was maximum i.e. 82% of all the component technologies followed by harvest and post-harvest management. Most of the farmers were not using seed treatment due to lack of knowledge about seed treatment, plant protection measure due to high cost, non-availability of bio-fungicide spray, duster and problem in using the sprayer in standing crop to control tuber moth. Therefore, to enhance the production and productivity of potato crop, the strategy should be made for getting the more and more recommended technology adopted by the farmers. The extension program may be effective in changing attitude, skill and knowledge of potato farmers about recent technologies of high yielding varieties, balanced dose of fertilizer and biological disease management including their adoption. With the result it will also improve the relationship between farmers and scientists and build up confidence between them.

Keywords: Effect, Adoption, Scientific potato cultivation

SEEP: 24.

DISILLUSIONMENT, DISSONANCE AND ENTROPY AMIDST INDIAN AGRICULTURE: THE REFLECTION AND REFRACTION

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According to primer and various propositions, the farmers and the farm economy of India have adequate reasons to be called fatigued and disillusioned. A scenario where more than 2.5 lakh farmers committed suicide, outnumbering the count of people killed in any big war between nations. Even in this situation, we remained fearsome to observationally substantiate that it was another fight against humanity, whereby those travailing hard to guaranty food security for a nation have become victim to ruthless insecurity and devastated their own lives. The stress, chaos, entropy, and the dissonance being inflicted into the psychology of farmers in India have seldom been researched from an ecological point of view. If a farmer has to spin constantly under stress, no NPK can reach the field to attain the golden harvest. The study was conducted at Fingtore village of Labpur Block, in Birbhum district of West Bengal. It includes a dependent variable, i.e. disillusionment (Y1), which was foretold using a set of 19 exogenous variables. In total, 130 respondents were selected through both purposive and random sampling approaches to ultimately deduce and evoke their behavioural attributes in defining the disillusionment. Some self-evident clarification suggest that haphazard income from agriculture, whims of market response, dishonour of agricultural job condition in an open-air and crude exposure to harsh weather parameters, transformation of risks into threats are hindering agriculture from becoming a profitable venture and remunerative pursuits. The emergence of off-farm economy as well as economically viable service sectors have gone miles to refute the so-called profitability of agriculture over other rural livelihood options. Even under good weather and with splendid technological support to potato growers, and of course for a resultant record production of potato, the farmers were thrown into an extreme entropy [AQ: Please check the use of the word “entropy” for clarity and correctness in this context and edit as necessary here as well as in the article title and throughout its occurrence in the article.] due to market failure, and in worst cases some of them committed suicide. Sometimes good harvests bring more misery to growers, leading to an inharmonious situation. To understand the factor contributing to social disorder, before adding to a new order into the same system, it is necessary that new age extension research should throw light on system rather than simply on adoption research.

Keywords: Chaos, Disillusionment, Dissonance, Off-Farm migration, Social entropy, Socialization of technology.

SEEP: 25.

ROLE OF ACADEMIC GOAL ORIENTATION IN EDUCATIONAL CURRICULUM

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The study was to know the importance of incorporating academic goal orientation in the educational curriculum. Goal orientation is one of the concepts that has emerged in educational psychology over the last few decades and also is one of the most important concepts regarding learning in any educational setting. But still, there is a lacuna in the achievement of the students in all aspects of life. To strengthen the students in mastering their skills there is a need to improve the students' academic goal orientations i.e. mastery approach, performance approach, performance-avoidance, and work avoidance. Students with mastery goal orientations strive to achieve or improve their competences and show enthusiastic to learn new things around them. So, it is very essential to enhance the mastery orientation to increase the outcome of the students. Therefore, it has to incorporate in the educational curriculum. While personality development is done in the colleges, academic goal orientation through educational curriculum can be the best effective mode for motivation. This strategy can also be effectively used for motivating school dropouts in the schools to improve the literacy rate to the 100% level.

Keywords: Academic Goal Orientation, Mastery Orientation, Educational Curriculum

SEEP: 26.

IMPACT OF MAHATMA GANDHI NATIONAL RURAL EMPLOYMENT GUARANTEE SCHEME ON SUSTAINABLE DEVELOPMENT THROUGH ASSETS CREATION.

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Sustainable development is one among the main objective of MGNREGA which include creation of assets, creation of livelihood resource base and restore environment (Singh, 2013). MGNREGA is not just a welfare initiative; it is a development effort that can take the Indian economy to a new trajectory (Ghosh, 2009). The paper assesses the impact of MGNREGA on the nature of assets created and their durability. The study conducted using multi-stage random sampling in Sirmaur district of Himachal Pradesh. Both secondary and primary data were used in study and the primary survey covering 100 households from 10 panchayats of 2 blocks was done. The study finds that scheme has positively affected the asset creation which leads to sustainable development. For the purpose of the present study, status of assets created under MGNREGA was operationalized as the respondent's perception on individual and community assets. The nature of relationship between the variables and assets were computed through correlation coefficients. Significance of relationship between score of variables and assets of respondents has also been tested. Expectations from the MGNREGA were not completely realized during its initial years because the returns from the assets were not uniform throughout the country. The gains were positive in favourable pockets, but they were marginal in disadvantageous situations, the reasons being mostly generic. The works taken up under the MGNREGA has opened up greater livelihood opportunities through the increased availability of wage income.

SEEP: 27.

DIVERSIFICATION IN FOOD GRAIN PRODUCTION IN UTTAR PRADESH: IMPLICATIONS OF CLIMATE CHANGE

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This study has examined the trends in food grain production and estimated the compound agricultural growth rates of major food grains grown in the study Uttar Pradesh. The data on area, production and yield have been collected from various government published sources from (1991-2017). The study revealed that area of total food grain follows the decreasing trend while the total food grain production and yield shows upward trend. The Compound growth rate analysis of various food grains shows that among cereals rice and wheat showed positive growth rates and significant. During the study period bajra revealed 1.76 percent growth rate which is highest among cereals, on the other hand maize had lowest position and it recorded negative growth rate -1.91 percent for area and -0.50 for production. Rice and wheat showed positive growth rates viz, 0.25 and 0.40 percent respectively. Total cereals secured negative growth rates in terms of area and production. The study revealed negative CAGR of area, production and yield of many pulses (Gram, Lentil, Tur) on the other hand Urad recorded positive growth rate in area, production and yield during the study period. Total pulses show negative growth rate. It is concluded that farmers have allocated higher area in the non-traditional cereal like Bajara and Urad among pulses. Therefore, it is recommended that suitable marketing strategies for these products should be designed and linkages should be established, which will improve producers' profitability.

Keywords: Food grain, CAGR, Uttar Pradesh, Trends

SEEP: 28.

EDUCATION, EXTENSION AND POLICY ISSUES

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Reforms in the education sector have been one of the top priorities of the governments in India. Reforms can only be possible if it is implemented properly, which is an extremely difficult challenge. The Government has introduced several schemes and policies to improve the education system of the country, particularly the quality and content of instruction. The concept of demand driven service implies making extension more responsive to the needs of all farmers, including women and those who are poor and marginalized. Agricultural sustainability can only be achieved when the ends are target from the means. This does not include only safe production in terms of consciousness of future generation needs but building up the capacity of the Agricultural system towards increase in productivity cum profit maximization through the new trend of extension services. Another important issue is contract farming where the contractor provides all the material inputs and technical advice regarding crop production to the farmer. The essence of such contract is commitment to supply agricultural products of specific type at specific time, price and quality to the contracting party. Trade policy aims to boost the nation's international trade. These policies are specific to each country and are formulated by its public officials. A country's trade policy includes taxes imposed on import and export, inspection regulations, and tariffs and quotas. The concept of sustainable agribusiness is a response to ecological, social and health threats in modern society caused by globalization and economic growth. Agribusiness is one of the world's largest manufacturing sectors in terms of output value, employment and international trade.

Keywords: Educational Reforms, Contract Farming, Demand driven extension, Trade policy.

SEEP: 29.

ASSESSMENT OF DIFFERENT WEED MANAGEMENT PRACTICES IN PADDY TROUGH ON FARM TESTING (FARMERS' PARTICIPATORY FIELD TRIALS)

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An increasing water crisis, as well as the unavailability and high cost of labor, in India, farmers have forced to grow paddy directly into the field. However, severe weed infestation causes heavy loss in the productivity of paddy crop. In this study Farmers' participatory field trials were conducted at Buxikheda and Arerkalan. The six field trials laid out in different locations three in each villages during *Kharif* (rainy season) 2017 and 2018. This research aimed to evaluate pre emergence and post emergence herbicides for providing feasible and economically viable weed management options to farmers for predominant rice varieties of Unnao district. Treatments with Butachlore as pre-emergence, bispyribac-sodium + metsulfuron as post-emergence and one hand weeding at 35 DAT were evaluated. Application of bispyribac-sodium + metsulfuron as post-emergence increased the number of productive tillers, 1000 grain weight, number of grains per panicle and grain yield over the other methods of weed management. The treatment bispyribac-sodium + metsulfuron as post-emergence also improve water productivity and economic returns of the direct seeded rice. Bispyribac-sodium + metsulfuron had lower weed biomass at 45 days after sowing (DAT). At Arerkalan, highest grain yield of Kaveri paddy variety (5.24 t ha⁻¹) was recorded with application of bispyribac-sodium + metsulfuron as post-emergence application. However, at Buxikheda, yields were similar with bispyribac-sodium + metsulfuron as post-emergence application. In conclusion, the postemergence application of bispyribac-sodium + metsulfuron can be used effectively to control weeds, increase water productivity and improve the economic returns and yield of direct-seeded rice

Keywords: Bispyribac-sodium, direct-seeded rice, OFT's, weed control, weed flora, Weed management.

SEEP: 30.

ASSESSMENT OF ACADEMIC ACHIVEMENT AND NUTRITIONAL STATUS OF THE ADOLESCENT GIRLS IN RESIDENTIAL SCHOOL SOUTHERN ODISHA

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Nearly half of the total population in our country are women while majority of them belong to rural area. These women are in a very deplorable condition which makes the whole society backward. They are always discriminated. Women are considered as the weakest part of our society and they are always deprived social groups from all side. It is needless to know that women's literacy and education levels help secure social equality and human development, higher economic productivity and a tolerant democratic society which the national policy on Education 1986 has identified as a challenge in India. Latest contribution in the field of girls education is made by SSA mission which introduced a very novel ideal of providing residential schooling facilities to the girls education up to VIII by a special school called Kasturba Gandhi Balika Vidyalaya (KGBV). The Government of India has launched a new scheme called Kasturba Gandhi Balika Vidyalaya (KGBV) in August 2004 to provide educational facilities for the girls education between 10-14 years belonging to SC/ST/OBC and

Minority communities and families below poverty line (BPL) in educationally back ward blocks. The objective of KGBV is to ensure access and quality education to the girls of disadvantage groups of society by setting up residential schools with boarding facilities at elementary level. Ganjam is a district in the Indian state of Odisha. There are 17 Kasturba Gandhi Balika Vidyalaya In Ganjam district. There are five Kasturba Gandhi Balika Vidyalaya in five blocks of Ganjam district which have been chosen in the most educationally back ward areas of the district. All the Kgbv's of Ganjam district included in the present study.

Keywords: Girls, education, poverty, district

SEEP: 31.

TECHNOLOGICAL INTERVENTION FOR DRUDGERY REDUCTION OF WOMEN FARMERS: AN APPROACH TOWARDS INCOME GENERATION

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Most of the drudgery prone tasks performed by women in agriculture are cutting, uprooting, transplanting, weeding, sowing, harvesting and post-harvest tasks like manual threshing of maize, millet and pulses, sieving and cleaning. These activities are time consuming and cause so many occupational health hazards to women. Hence technological interventions are needed to reduce occupational health hazards and to save time of the farmers. This time can be used for any other income generating activities to improve income and standard of living of the farmers. The study was conducted in tribal development block of Udaipur district namely Kherwara. The maize production system was selected to calculate human cost of work. Data were collected from 30 tribal women farmers by a pre-designed interview schedule. Different socio-personal characteristics revealed that most of the tribal women were in middle age group, belonged to nuclear and not heading the family, illiterate and engaged in all type of agricultural activities and rearing small herd of livestock. The mean age of subjects was 33.38 years mean height 159 cm and mean weight 56.5 kg. All the selected women were healthy and having normal heart rate and blood pressure. Three activities namely weeding, harvesting and maize shelling were elicited as most drudgery prone activities in which technology intervention was given and selected improved tools were introduced. The human cost of work was measured by using physiological (energy expenditure, PCW), biomechanical (Angle of deviation of body parts, RULA, REBA), psycho-physiological variables (RPE, Body Map). The comparative analysis was done for conventional and improved tools and data revealed that all the variables were found high when conventional tools were used and increased human cost of work which was automatically reduced when improved tools were used. It was also found that the improved tools reduce the time of performing the various operations with high productivity. The time which is saved by using improved tools in performing various drudgery prone agriculture activities can be utilized for initiating entrepreneurial activities thus increasing the income of women farmers

Keywords: Tribal, physiological, biomechanical, psycho-physiological, drudgery reduction.

SEEP: 32.

COMMUNITY SCIENCE: AN APPROACH TO RURAL DEVELOPMENT

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The rural areas are considered to be remote and isolated, the individuals residing in rural areas are mainly poverty stricken, they possess either low levels of education or no education at all, they are either unemployed or engaged in minority jobs. People residing in rural areas are primarily engaged in the agricultural occupation; rural areas are characterized by the economies based on logging, mining, gas exploration and tourism. Development refers to the progress, evolution, and stage of stimulus or advancement. This progress or growth is measured and had successive phases. Always there is growing distinction; it also refers to the overall movement towards greater effectiveness and multifaceted situations (Chauhan, 2012). Various areas, such as food and nutrition, resource management, human development, textiles and clothing and extension and education must be considered in the area of Community Science when it comes to rural development. Community Science as a discipline plays very crucial role in development of society, linking community science to the grassroot level, optimization of knowledge, transfer of knowledge to rural areas, Monitoring and evaluation of knowledge and technology transfer. In rural development, there are numerous areas that are required to be taken into consideration and through the subject of community science; an individual acquires immense knowledge about how to lead to adequate rural development. Women are primarily considered to be home-makers in rural areas and these prove to be impediments within the course of their development. Community science makes provision of fundamental knowledge, which can be used to liberate men and women from any kinds of pressures, within and outside the home.

Keywords: Community science, Rural Development, women, food and nutrition, and resource management

SEEP: 33.

SOCIO-ECONOMIC ASPECTS OF THE FORAGE GROWERS IN RURAL SUBTROPICS OF JAMMU DIVISION

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A judicious integration of tree species with agricultural crops and/or animals has been practiced since ancient times across the world in both the tropics and temperate regions. Agro forestry provided both ecological and socio-economic benefits including product for households and national economics like fodder, fruits, and medicines judicious integration of tree species with agricultural crops and/or animals has been practiced since ancient times across the world in both the tropics and temperate regions. The milk yield and care and management of animals depend upon the quality and quantity of feed animals consume. Therefore a Socio-economic Aspect of the Forage Growers in Rural Subtropics of Jammu Division was taken up in purposively selected two rainfed districts viz; Samba and Kathua of Jammu region. Nine villages from each district and 6 blocks were selected purposively Thus, from 18 villages 144) respondents were selected randomly for study purpose .The data revealed that majority (72.91%) of the farmers were lying in the age group of 43-68 years with a mean of 55(±13). Nearly one half (47.93%) of the responds were having family size of 5-10 members. Regarding educational level 37.51 per cent of the respondents were matriculate with a mean of 8.25± (4.14) .For majority (72.91) of the farmers. Agriculture+labour were main occupation with 116 farmers having marginal land holding of below 1 ha. Agricultural+labour was main source of income for 72.91 per cent of the farmers. Only 4.67 per cent of the farmers were having social participation in the community organizations or other social institutions.

Cent percent respondents were aware about the developmental scheme KCC but only a meager percentage (02.77) have availed the loan facility .Majority (95.13%) of the forage growing farmers had not attended the training programme. Cow contributed a major share (61.62) as far as live stock possession is concerned. More than two-third (68.05) of the respondents were having medium level (score 6-9) of information sources with an average score $7.56 \pm (2.25)$. Among eight independent factors only family size was found to be significant with utilization of agro forestry trees. Z proportion showed significant difference perception regarding utilization of tree species between the two districts. The major constraints uncounted by the respondents were, lack of irrigation facilities, crop damaged by stray animals and lack of training programmers.

Keywords: Forage utilization, Socio-economic factors, agro-forestry systems, sub-tropics, judicious integration

SEEP: 34.

ROLE OF EXTENSION EDUCATION IN COMMUNITY DEVELOPMENT

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Extension is the type of education which is stretched out to people in the rural areas far to near, beyond these limits of the educational institution to which the formal type of education is usually confined. Education is the process of developing capabilities of the individuals so that they can adequately respond to their situations. Education is an integral part of extension. Because of this, extension is pursued in agriculture and in many other disciplines of education, motivation, demonstration, changing the behaviour of community people like life style, technology knowledge, entrepreneurship qualities development, provide training for self employment and stretching, orienting the delivery system so as to reach the people at the bottom of human pyramid. Economic development and technological change are hindered by institutional factors. Thus, modification should be in the institutional framework of society and alteration in attitudes of people.

Keywords: Extension education, community, Development.

SEEP: 35.

SOCIO-ECONOMIC PROFILE OF USERS OF DOMESTIC PHOTOVOLTAIC SOLAR SYSTEM IN PUNJAB IN RELATION TO THEIR AWARENESS

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Today the world is passing through a phase of scarcity of energy required for development on one hand and the near extinction of renewable sources of energy on the other. The sustainability of natural resources and switching to green energy is the only solution. This prospective study was carried out on users of domestic photovoltaic system residing in various cities of Punjab, India. A total of 300 respondents (both male and females) constitute the sample of the study. The study is descriptive in nature and primary data is used for this purpose. A self-constructed interview schedule was used to collect the data from the users of the solar photovoltaic (PV) system. A sample of 300 families from different cities of Punjab consisting 27 families from Jalandhar, 47 families from Patiala, 13 families from Mohali, 200 families from Ludhiana and 13 families from Amritsar who had installed photovoltaic systems in their residence in 2014-17 were selected for the study by proportionate random sampling technique. The present study is an attempt to study the socio-economic profile of users of solar photovoltaic system and to correlate it with their awareness of solar system so that the myth of attaching affluence with the affordability of domestic photovoltaic solar system be broken. It will help in correcting myopic

perspective of users pertaining to solar photovoltaic system and contribute towards ecological sustainability without compromising the development.

Keywords: Net metering, renewable energy system, socio-economic status, solar photovoltaic system

SEEP: 36.

PERFORMANCE OF CORIANDER CROP AS AN INTERCROP IN AUTUMN SOWN SUGARCANE AS OFT UNDER THE CONDITION OF DISTRICT LAKHIMPUR- KHERI.

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The KVK Lakhimpur- Kheri has conducted on farm trial (2016-18) on farmer's field with objective to utilize inter row spaces for coriander crop in autumn sown sugarcane crop . The sugarcane crop covers 80% under spring season and rest 20% in autumn season. This gives ample scope for introduction of coriander crop (dual purpose variety Azad dhania-1). Planting of sugarcane sett becomes at 90 cm spacing due to introduction of trench maker in this region and these spaces have been utilized by two rows of coriander with full package of practice. The data have been obtained during the trial clearly revealed that percent increase in mean CEY 23.2%, mean gross return 11.44%, mean net return 13.78% and mean BCR 4.44% under intercropping of coriander in autumn sown sugarcane crop as compared to sole cropping of sugarcane under farmer's practice. It is interesting that farmers have given their feedback that insect infestation has been reduced during the month of February and first fortnight of March.

SEEP: 37.

ROLE OF WOMEN CHANGED AFTER GREEN REVOLUTION IN AGRICULTURE

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Women are active partners in farming and undertake management along men in addition to their responsibilities at home stead level. The nature and extend of women's involvement in agriculture varies greatly from region to region. The role of women in agriculture has gone in tremendous change after the advent of green revolution in Punjab. The present study was carried out to assess the change in role of women in agriculture after green revolution in district Hosiarpur and to assess the factors affecting the change. The result depicts that small and medium land holder woman of group I were used to perform all operations. Large land holder women of group I and group II were lesser engaged in all main three operations. Large i.e., farm subsidiary and allied farm operations.

Keywords: Participation of women, Activity, Land holders

SEEP: 38.

STATISTICAL DOWNSCALING OF GENERAL CIRCULATION MODEL OUTPUT: A COMPARISON OF METHODS

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A range of different statistical downscaling models was calibrated using both observed and general circulation model (GCM) generated daily precipitation time series and intercompared. The GCM used was the U.K. Meteorological Office. Hadley Centre's coupled ocean/atmosphere model (HadCM2) forced by combined CO₂ and sulfate aerosol changes. Climate model results for 1980–1999 (present) and 2080–2099 (future) were used, for six regions across the United States. The downscaling methods compared were different weather generator techniques (the standard “WGEN” method, and a method based on spell - length durations), two different methods using grid point vorticity data as an atmospheric predictor variable (B - Circ and C - Circ), and two variations of an artificial neural network (ANN) transfer function technique using circulation data and circulation plus temperature data as predictor variables. Comparisons of results were facilitated by using standard sets of observed and GCM - derived predictor variables and by using a standard suite of diagnostic statistics. Significant differences in the level of skill were found among the downscaling methods. The weather generation techniques, which are able to fit a number of daily precipitation statistics exactly, yielded the smallest differences between observed and simulated daily precipitation. The ANN methods performed poorly because of a failure to simulate wet - day occurrence statistics adequately. Changes in precipitation between the present and future scenarios produced by the statistical downscaling methods were generally smaller than those produced directly by the GCM. Changes in daily precipitation produced by the GCM between 1980–1999 and 2080–2099 were therefore judged not to be due primarily to changes in atmospheric circulation. In the light of these results and detailed model comparisons, suggestions for future research and model refinements are presented.

Keywords: GCM, HADCM, ANN, climate change, downscaling and predictor

SEEP: 39.

DEMAND-DRIVEN EXTENSION AND MARKET LED EXTENSION

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The extension agent plays a significant role in agricultural development in developing countries. The role of extension agent of Agricultural has now changed it has shifted its approach from top-down approach transfer of technology to bottom-up, demand-led strategies. The term demand driven refers as a supply and demand Demand-driven extension based around farmers, it emphasizes on the need to provide services and also focuses to identify the needs and priorities of farmers and market. In Demand –Driven approach extension agent acts as an active person to identify that what type of services are needed. Today's farming is just not subsistence but it becomes an enterprise. In India agriculture does not require only the higher cultivation of crops but it also demands a reasonable price of crop to the farmers. Even though farmers have a good cultivation but they don't have proper linkage of market supply. The biggest problem in market is that existence of middleman. Where farmer have to face two types problems first is selling problem in the market and other is input market where they have to buy various inputs. Due to lack of knowledge they have to struggle the choice and procure quantity and quality of seeds, fertilizers and pesticides and farm machinery. To overcome these challenges such as lack of knowledge, existence of middleman, the poor prices for the crops and to access the latest technologies and inputs,

demand driven extension plays a significant role to get the better information related to local market and it helps to increase their income.

Keywords: Demand-driven, extension reforms, market led extension

SEEP: 40.

ISSUES AND PROBLEMS IN AGRICULTURAL DEVELOPMENT

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Agricultural Development is one of the most talked about issues as a major portion of our population is still engaged with the agricultural industry. Over the years Government of India has tried to promote agricultural development with their many initiatives Government of India have tried to convince farmers so that they can adopt modern techniques for the cultivation of their crops and most importantly for the improvement of Production. But often the issue of access to these facilities came in the Way. Irrigation is an important problem among the all farmers in every villages of West Bengal for example, flower farmers in the Panskura region of the District Purba Medinipur cultivate paddy once in a year which is in the rainy season because of limited water sources, soil problem is an important issue in farming. The fertility of soils is destroying day due to use of more chemical fertilizers Labour demand is adversely affected by the mechanization process wage employment was gradually being displaced by the increased mechanization of agriculture in villages. Farmers stated that storage is often one of a huge problem after the harvesting of crops. There in no good cold storage hear the villages. Sometimes proper preservation of potato is done in the cold storage.

SEEP: 41.

A STUDY ON SOCIO-DEMOGRAPHIC STATUS OF WOMEN SELF-HELP GROUP MEMBERS OF VARANASI DISTRICT

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For a developing country, men and women should have equal rights for achieving their developmental goals but in India women are deprived of their rights. Women should be given opportunities to achieve their developmental goals. When there is development of women, family develops, society develops and country develops. SHGs play an important role for women who have entrepreneurial goals. SHGs help them to bring awareness about savings, education, and health etc. especially among rural women. Rural women entrepreneurs can bring revolution in rural development as well as country development. The focus of the study was on the socio economic status of the SHGs women in selected place of Varanasi District of Uttar Pradesh. Validated questionnaire was used for data collection and appropriate statistical tools were used to analyze the collected data, simple random sampling technique was used in the selection of 100 SHGs member as the sample of this study. The result shows that after joining the SHG, respondents have better living standard, they participate in decision making and their social circle is increased.

Keywords: SHGs, Country development, Uttar Pradesh, Entrepreneurial goals.

SEEP: 42.

A STUDY ON JOB PERFORMANCE OF VILLAGE DEVELOPMENTAL OFFICERS OF VARANASI DISTRICT

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Achieving developmental goals have been a central issue of every government and organization. Employees who are progressive and committed towards their work are the assets of every organization. The term job performance signifies someone's work achievement which includes: decision-making ability, job involvement, orientation and dedication towards the job, managing problems, resolving conflicts and communication skill etc. this paper is an attempt to measure and understand the job performance of Village Developmental Officers of Varanasi District. Covering all blocks of Varanasi which were 8, the whole population was 132. In the present study, data will be presented only of 20 respondents who are 15% of the whole population as this is a pilot study. Pretested and self-structured interview-schedule was used in the collection of data. The result shows that Village Developmental Officers performing their job very well.

Keywords: VDOs, Varanasi, Job performance, Government, Village Development.

SEEP: 43.

ROLE OF HOME SCIENCE IN PROMOTION OF SOCIAL AND ECOLOGICAL JUSTICE PEDAGOGY

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Home Economics has been regarded by as a relevant discipline in that it aims to help people live well; a shifting target reflective of the evolving needs and concerns faced by members of society. Changing issues of importance to society towards supporting social and ecological sustainability practices are reflected in the United Nations release of 17 Sustainability Development Goals (SDGs) in 2015. The purpose of the SDGs is meant to unite industry, governments, and civilians in improving social and ecological issues by 2030, ensuring prosperity for people and the planet. Social justice-oriented SDGs include eradicating poverty, hunger, inequality (due to race, ethnicity, religion, gender, age, ability, income) and improving education, sanitation, and health, outcomes and economic opportunity for individuals and countries. Ecological justice-oriented goals include the protection, conservation, and restoration of life on earth and water that has been threatened through industrial processes. SDGs aimed at human development impacting the environment centre around climate action through responsible production and consumption practices, and the development of innovative and sustainable cities, communities, energy sources, and industries. Our current ecological crises means understanding the links between ecological health and broader social stratification issues based on race, class, gender, region, and other variables of inequity. A critical social and ecological justice theoretical framework of Home science has three stages: crisis stage, healing stage and activism stage. The crisis stage takes into account the student's prior knowledge, questions, and desires, because what students learn will vary depending on their experience, knowledge, and positionality. The healing stage, promotes personal reconciliation through the embracing of conflicting knowledge. The activism stage encourages the aims of social and ecological justice to be achieved through civic participation. A social and ecological justice pedagogy of Home science is essential if we are to challenge dominant, capitalist discourses and consider ways of living that will work towards a restoration of ecological balance where people assume the role of caretaker versus consumer.

Keywords: Home science, Sustainability Development Goals, crisis stage, healing stage and activism stage.

SEEP: 44.

GOVERNANCE OF HIGHER EDUCATIONAL INSTITUTIONS: SHIFTING PARADIGM

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Historically, administration of higher educational institutions (HEIs) has been government's prerogative. State predominantly used direct methods like funding, appointment of chief executive, legislations etc. to keep universities under its ambit. Rise of liberalization, privatization and globalization in all spheres of life world over, has forced HEIs to change. Ever expanding role of market have shook these institutions and motivated them to move on relatively newer paths. State is changing attitude towards HEIs. Striking balance between excess control and no control is need of the hour as either extremes of intervention is bound to be counterproductive. In such cases, steering rather than rowing is required. Governments are now using innovative ways like; ensuring accountability for performance, innovative fund controls, quality regulations, instructions like generating resources for themselves, publish or perish etc. have given clear cut indications that these institutions should not take their existence for granted. University leaders have a challenging job of generation and dissemination of knowledge as well as taking community forward. Universities have to change according to present culture, adjust themselves and keep themselves relevant by catering needs of society. Successful way of running and developing HEIs lies in the art of policy formulation ensuring achievement of public goals through influence, not direction. Maximum governance and minimum government is the right way out for times to come.

SEEP: 45.

ROLE OF GOVERNMENT IN CONTRACT FARMING AT PRESENT INDIAN SCENARIO

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The government making constant efforts to integrate framers with the agro-industries to ensure that they get better prices for their produce. Contract farming is a system of contractual production of agriculture raw materials by the farmer for procurement. The private companies entered the Indian scenario in big way in the early 2000s. In India contract farming is regulated under the Indian contract act 1872. The model APMC (Agriculture Produce Market Committee) Act 2003 provides specific provisions such as compulsory registration of contract firms, settlement of disputes. The Model Contract Farming Act, 2018 intends to establish win-win framework for both the parties. Three-fourth of Indian states were allowed contract farming in one or the other, Punjab –one of the states where contract farming has been practiced for almost 15 years now. The market for contract farming suffers from monopsony market structure and lack of information. Government should take the corrective steps such as focus on attractive private sector investors and linking farmers with agri-businesses. Contract farming helps in uplifting the small and marginal farmers and integrating them into agriculture value chains. And it also creates market infrastructure, farmer's education, and bridging information gap between farmers and buyers.

Keywords: Agro-industries, Contract farming, Monopsony, Agri-business, Marginal farmers etc.

SEEP: 46.

ANALYSIS OF DECISION MAKING OF SLUM WORKING WOMEN RESIDING IN VARANASI CITY'S SLUMS

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Slums women are lives worst condition in the world. Varanasi's slum working women's living in very poor condition. This paper presents the description of the working women who residing in slum on the basis of their participation of decision making in their family and family related matters such as children marriage, children occupation, family planning and related to others family and social issues. The review of literature revealed that very little study has been done on decision making power of working women living slums of Varanasi city and the basic objective was to analysis of decision making of slum working women residing in Varanasi city's slums. Present study conducted in Utter Pradesh state, which was selected purposely while Varanasi district was also taken up purposely as for the demand of the topic. The study consisted of 293 working women from 12 different- different slums area of Varanasi city. The respondents are the main source of data. 5 percent household from the list of each selected slum, were selected with the help of convenience sampling methods. The required information were collected from only working female of the family of selected household as respondent. Data was collected from primary as well as secondary sources. The study was conducted from November 2013 to October 2017 and the data were processed to undergo statistical analysis using SPSS windows program. Microsoft word and Microsoft excel were used to represent the tabular and chart icon. Here the paper endeavors to investigate and analyze the decision making pattern of slum working women in Varanasi in the term of various indicators of decision making like family related mattes, health related matters, money related matters, social participation related matters, family planning related matters. The paper also explores the participation level of decision making by sum working women in their personal and professional life. Result founded that in slum of Varanasi city most of female not much aware about their decision making power regarding purchases of food items, buying goods for housing and renovation of old house. A considerable number of respondents were not aware about their children related specially matters related to children occupation. Same condition was appearing in matters regarding money related and in social participation related matters. But in matters regarding heath related and family planning related, considerable numbers of respondents could take all the decision. While considerable numbers of respondents had voter id card and they vote as their self-choice.

Keywords: Analysis, Decision Making, investigated, children occupation

SEEP: 47.

GREEN COMPUTING –AN ECO-FRIENDLY APPROACH FOR E-WASTE

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The need for environmentally friendly computing gadgets and energy saving devices, under the auspices of 'Green Computing' has become a global phenomenon with the aim to reduce environmental decadence that emanates from abuse and the rising threat of global warming. "Green computing" represents environmentally responsible way to reduce power and environmental e-waste. Green computing is the practice of using computing resources efficiently. This term generally relates to the use of computing resources in conjunction with minimizing environmental impact, maximizing economic viability. Green computing is like reducing the use of environmentally hazardous materials like CFCs, promoting the use of recyclable materials, minimizing use of non-biodegradable components, and encouraging use of sustainable resources. EPEAT (Electronic Products

Environmental Assessment Tool).EPEAT products serve to increase the efficiency and life of computing products. Moreover, these products are designed to minimize energy expenditures, minimize maintenance activities throughout the life of the product and allow the re-use or recycling of some materials. In 1992, the U.S. Environmental Protection Agency launched Energy Star, a voluntary labelling program that is designed to promote and recognize energy-efficiency in monitors, climate control equipment, and other technologies. Many IT manufacturers and vendors are continuously investing in designing energy efficient computing devices, reducing the use of dangerous materials and encouraging the recyclability of digital devices and paper.

Keywords: Green computing, computing, e-waste.

SEEP: 48.

IMPACT OF GREEN COMPUTING IN ECO FRIENDLY ENVIRONMENT

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The tremendous explorations in Information Technologies and the range of new equipment being developed every passing day, 21st century can aptly be labelled as the —Century of Gadgets and Gizmos || . The term Green Computing refers to the practice of using energy wisely and efficiently, causing negligible degradation to environmental resources and parameters also maintaining feasibility on the other hand. It is basically a balanced and sustainable approach towards the achievement of a healthy and clean environment without compromising the needs and necessities of technology for the present generation. Thus taking up a more holistic and careful approach to making our IT-industry greener definitely falls in our list of responsibilities in creating a more healthier, safer and clean environment. This also revolves on spreading awareness and ensuring people to take their necessary individual steps towards achieving the goals of Green Computing. In the present paper the authors have made a systematic study of several strategies, approached and practices of green and energy efficient computing, in context to the growth and impact of the IT industry on environment in the recent years. The plans towards a greener IT-industry should include new electronic products and services with optimum efficiency and all possible options solutions towards energy savings.

Keywords: Green computing, Computing, e-waste, environmental resources.

SEEP: 49.

DISPOSAL BEHAVIOUR OF BACKYARD POULTRY REARING RURAL WOMEN IN BUNDELKHAND REGION OF UTTAR PRADESH

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Bundelkhand region of Uttar Pradesh is highly un-developed and maximum population directly or indirectly depend on agriculture for their livelihood. The agriculture is highly unpredictable due to climate change. In this situation agricultural allied activity play vital role in improving of rural life. Poultry is one of them which is an important source for generating income for rural women in Uttar Pradesh. Rural women rear manageable flock of Desi type chicken in free range system. It acts as small scale business with negligible investment. The present study was conducted with the objective to assess the disposal behaviour of backyard poultry rearing rural women in Bundelkhand region of Uttar Pradesh. For this study 80 rural women were selected those reared backyard poultry from 2 or more than 2 year with five or more than five birds at the time of

investigation. Data was collected through semi-structured interview scheduled. In this study we discuss about the ways of utilization and disposal of products (eggs, cocks and hen) adopted by backyard poultry rearing rural women. It includes consumption of poultry products, selling of products, marketing channels etc. Majority (75%) of rural women sold eggs to others and only 25 percent rural women kept eggs for self consumption. Majority (88.75%) of rural women sold birds to others and only 11.25% rural women kept birds for self consumption. It shows that rural women pay more focus on generating income for family, children and own daily requirements. Overwhelming majority of rural women (93.75%) sold product direct to consumer while 6.25 percent in local market. It might be due to fact that rural women are getting satisfactory price of eggs and bird without travelling to nearby local market, poor knowledge of rural women about marketing and poorly developed marketing facilities for the selling of poultry products in this area.

Keywords: Backyard poultry, Poultry product, Marketing channel, Bundelkhand region

SEEP: 50.

HOME SCIENCE EDUCATION: A KEY FOR WOMEN WELFARE AND DEVELOPMENT IN INDIAN SOCIETY

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Women welfare is a enormous field which involves different aspects related to the life of women and its environment. Home Science means the art of managing your resources efficiently and the science of achieving a healthy and happy home as well as successful career. The concept of Home Science is based on the zealous desire to improve the well being of the community through every home. It enables women to sort out family problems and find out solutions for them. Home Science education helps one to start self employment and become an earner in any age. The curriculum empowers to take intelligent decisions concerning the use of materials and resources. Women, as a mother becomes more efficient to nurture and take care of the young, to foster their healthy growth and development. It also provides technical knowledge and information from various branches of Home Science for both personal and professional use. There are five different areas of specialisation in Home Science. Which are Human Development, Family and Community Resource Management, Food and Nutrition, Textile Design and Extension Education. Human development deals with the development of a child from conception to old age. Under Family and Community Resource Management, time, money, and energy management are the main topics for study. In Food and Nutrition food science and nutrition are included. Chemistry of food, nutrient retention, sources of nutrients, nutritive value of food and judicious mixing of food are scientifically instructed in food science. Textile Design includes all details about textile fibres and fabrics, fabric construction processes. In Extension Education, basics of programme planning, preparation of audio visual aids, social work, etc. are included. Over all it can be said that, Home Science education can play a prominent role in developing good individuality and welfare of women.

Keywords: Women welfare, Home Science education, Community Resource Management, Extension Education.

SEEP: 51.

INDIGENOUS LOCAL KNOWLEDGE AND PRACTICES OF SOIL CONSERVATION IN A DRY TROPICAL REGION OF UTTAR PRADESH

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In India, the traditional agricultural practices are as old as civilization itself and may differ across the agro-climatic zones. Due to changing land use scenario, population growth, overexploitation of resources, agricultural sector facing threats that have subsequently resulted in the land degradation, which affecting the soil fertility and accelerating soil erosion. The present study deals with the indigenous knowledge on conservation of soil by tribal communities in a dry tropical villages of Uttar Pradesh. In survey area, different villages were selected for intensive study of soil conservation practices and associated indigenous knowledge. Traditionally, the farmers in the study villages adopted various traditional practices, which include tillage system and fallow period, crop rotation, burning of crop residues, planting forestry based tree species, checking soil erosion, mulching, applying farmyard manure, maintaining soil moisture and making land boundary. The traditional soil conservation practices are interlinked with the cultures, belief systems and existing resources. It is interesting to point that tribal people are well equipped pertaining to technical know-how and do-how in order to maintain fertility of the soil and health of the agro-ecosystem practices by linking the usage of animal and forest based resources. The traditional practices appeared viable, relevant and time tested in conserving soil for sustainable crop production in this study. This paper will discuss traditional practices of soil conservation which are environmentally sound, economically viable and socially acceptable therefore, the community must be encouraged to continue such practices in view of the ongoing consequences of climate change as well.

Keywords: Traditional practice, Agriculture, Soil conservation, Degradation

SEEP: 52.

ग्रामीण महिलाओं के जीवन में ई-लर्निंग की भूमिका

रिफायत निगार बानो

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ई-लर्निंग इलेक्ट्रॉनिक मीडिया से पढ़ना सीखना और सीखनाई-लर्निंग शिक्षा कहलाती है। ई-लर्निंग के माध्यम से प्रत्येक स्तर एवं आयु के व्यक्ति अपनी इच्छानुसार कहीं भी, कुछ भी और कभी भी सीख सकता है। जो शिक्षा बीच में छोड़ चुके हैं, अशिक्षित हैं, कम पढ़े लिखे व्यक्ति हैं एवं गृहणियाँ, कौशल प्राप्ति के उद्देश्य के अपनी रुचि, आवश्यकता, नवीन ज्ञान, कौशल, सूचना, संचार माध्यम, नवीन तकनीकों को ई-लर्निंग के माध्यम से सीख सकते हैं। शोध का उद्देश्य ग्रामीण महिलाओं द्वारा ई-लर्निंग के उपयोग के क्षेत्र, ग्रामीणों की सूचना एवं संचार एवं नवीन तकनीकों के प्रति जागरूकता, उनके सम्प्रेषण व्यवहार, समस्याओं के समाधान में ई-लर्निंग के उपयोग, एवं उनके सामाजिक और आर्थिक स्थिति का अध्ययन करना है। प्रस्तुत शोध कार्य के लिए मैंने ग्राम कमालपुर, जिला चन्दौली, ब्लाक धानापुर क्षेत्र के अन्तर्गत 50 महिला उत्तरदाताओं का चयन प्रति दर्श इकाई के रूप में किया है। प्रस्तुत शोध में 100 प्रतिशत उत्तरदाता महिलाएं हैं। ग्रामीण महिलाएं स्मार्ट फोन/मोबाइल, लैपटाप एवं टी0 वी इलेक्ट्रॉनिक साधन का प्रयोग करती हैं। इंटरनेट से सीखने में सबसे अधिक यूट्यूब, गूगल, व्हाट्सएप का प्रयोग करती हैं। इन महिलाओं का इंटरनेट से सीखने का उद्देश्य जागरूक होना, समस्याओं के समाधान में, प्रशिक्षण के उद्देश्य से, नवीनज्ञान हेतु तथा आवश्यकता से संबंधित है। ग्रामीण महिलाओं का शिक्षा, कौशल प्रशिक्षण, रोजगार, तकनीकी ज्ञान, स्वास्थ्य एवं आहार संबंधित, गृहस्थी संबंधित तथा जागरूकता हेतु ई-लर्निंग के प्रयोग क्षेत्र है। यह महिलाएं सिलाई, कढ़ाई, बुनाई, आर्ट

एण्ड क्राफ्ट, खाना बनाना, फल सब्जी उगाना, तकनीकी ज्ञान, स्वास्थ्य संबंधित, उपचार संबंधित तथा नवीन ज्ञान आदि इंटरनेट से सीख रही है। इंटरनेट से सीखने का विचार इन महिलाओं को पड़ोसियों से, रिश्तेदारों से, बच्चों से, टी0वी0 से, समाचार पत्र द्वारा तथा रेडियो से प्राप्त हुआ। इंटरनेट से सीखने में महिलाएं परिवार के सदस्यों से, स्वयं से, तथा इंटरनेट साथी से, सीखने में सहायता प्राप्त करती है। कुछ महिलाओं ने इंटरनेट से सिलाई, कढ़ाई, मेहन्दी, आर्ट एण्ड क्राफ्ट ब्यूटीशियन, क्रोशिया वर्क तथा एप्लिक वर्क का कौशल प्रशिक्षण प्राप्त कर रोजगार शुरू किया है।

मेरे लघु शोध से स्पष्ट होता है कि आधुनिक संचार के युग में ग्रामीण महिलाएं शिक्षा व रोजगार के क्षेत्र में व इंटरनेट के द्वारा प्रदत्त सहायता, योजनाएँ, सूचनाएँ, शिक्षा, रोजगार, स्वास्थ्य तथा व्यापार जैसे अनेक जानकारियाँ प्राप्त कर रही है। आज उन में स्वरोजगार, प्रशिक्षण उद्यमिता का विचार, घर की चारदीवारों में चूल्हा-चौका के अलावा शेष बचे समय का सदुपयोग कर पैसा कमाने की ललक व पढ़ने-लिखने के प्रति जागरूकता ये बता रही है कि बदलाव की यह बयार रूढ़ियों और परम्पराओं की बेड़ियों को तोड़ने के लिए आतुर है।

SEEP: 53.

OPPORTUNITIES FOR IMPROVING ECONOMIC STATUS OF FARM WOMEN THROUGH PRODUCTION OF ROUND THE YEAR GREEN FODDER IN LUCKNOW DISTRICT

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A women empowerment through rearing of milch animals was carried out in a village of Lucknow district of Uttar Pradesh. A women belonging to a very poor family started rearing one milch animal gifted by her mother, about 15 years ago. Gradually when she earned some money by selling milk, calves and dung, she got interested in developing this unit in to a big dairy of 30 milch animals. At present, the daily milk production in the unit is about 190 litres per day. The enhancement in the milk production is due to green fodder based cropping pattern with 47.5% of the gross cropped area under green fodders followed by the entrepreneurship in her four acre farm in order to ensure round the year supply of sugar rich green fodder. In order to ensure the same, an overlapping cropping system was also followed. The time based schedule of green folder production adopted by the entrepreneur is a) feeding of sugarcane top and *berseem* from January to March b) feeding sugarbeet @ 4.5 kg/ milch animal from April to June, c) feeding of hybrid sweet sorghum from July to October and feeding of *berseem* along with dry fodder from November to April. With this feeding schedule, the availability of 17.5 kg sugar rich green fodder could be made available for feeding of milch animals daily. The improved feeding pattern on the farm of women entrepreneur resulted in an average increase of milk production of 780 g/animal and on an average increase of 15.6 litre milk/ day in her dairy unit. At a price of Rs. 25/= litre, the entrepreneur has earned Rs 1.42 lacs per annum by growing and feeding sugar rich green fodder. The net income due to dairy unit comprising income from by-products/ancillary activities was estimated at around Rs. 13.12 lac per annum. The self sufficiency achieved in dairy unit in term of quality green fodder production has resulted in women empowerment in real sense by way of her becoming the President of Cooperative Milk Producers Society and the member of district milk union. The women entrepreneur is also contributing in enhanced milk production and in encouraging the fellow women earn more from dairy enterprises. A strong demonstration effect has been experienced in the vicinity. The sugar rich green fodder has great potential to be used as livestock fodder in our country. The sugarcane top, sugar beet and hybrid sweet sorghum are very good sugar and energy rich fodder for livestock. The KVK, Lucknow has also introduced sugar rich green fodder in many dairy farms of Lucknow district and the suggested cropping system & feeding schedules has resulted in enhanced milk production in all the selected farms. The introduction of sugar beet into cropping system of farming has led to green fodder security and resulted in enhanced milk production during fodder scarce period and in peak summer. This cropping system and feeding schedule needs to be popularised in rural areas for empowering women also. A suitable training module on this aspect need to be devised for imparting training to the farm women at KVK/departmental level.

SEEP: 54.

POSTURAL STRESS ASSESSMENT OF MALE AND FEMALE DAIRY WORKERS OF HIGHER AND LOWER AGE GROUP PREPARING FOOD FOR CATTLE

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Osteoarthritis of hip and upper limb complaints and hand arm syndrome are the occupational disease and hazards associated with work related risks factors prevalent in dairy farming activities. Age and sex of dairy workers are contributing factors in developing occupational diseases. Further, work force of dairy sector in India is heterogeneous ie females and males of various age group are engaged in it. In present study, an attempt has been made to find out postural stress among males and females of lower and higher age groups during preparing food for cattle and to find out impact of age and sex on postural stress caused during preparing food for cattle. Postural stress was measured by assessing time spent in different body postures, frequency of adopting various body postures and angle of body deviations in lumbar region of dairy workers preparing food for cattle. Findings of study suggested that bending posture was adopted by dairy workers of all four groups for the longer period along with the highest frequency of adopting various standing in preparing food for cattle. Lifting of bundle of fodder is the work posture which requires maximum angular deviation of spine from the normal position. Further, time spent in different posture, frequency of adopting different posture and angle of body deviation in lumbar region were maximum in females of the higher age group and minimum in males of lower age group.

Keywords: Occupational diseases, postural stress, angle of deviation, age and gender, preparing food for cattle

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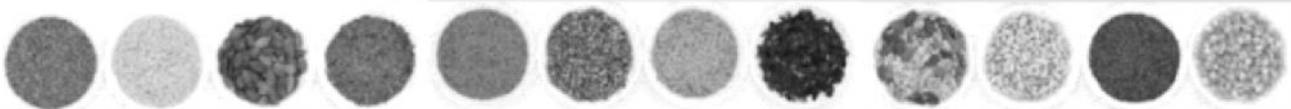
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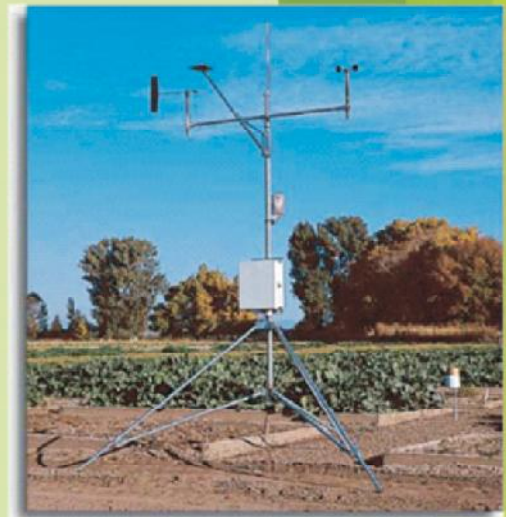
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