9th International Seminar

on

Sustainable Intensification of Agriculture Through Resource Management and Conservation

July 7 – 9th, 2017

Mahatma Gandhi House, Göttingen, Germany

Abstract Book

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Editors: Dr. Machiavelli Singh, Dr. K. W.Giorgis & Prof. R.K. Behl

IFSDAA / International Foundation for Sustainable Development in Africa and Asia

in

Afrikanisch-Asiatische Studienförderung e.V. (AASF)
African Asian Studies Promotion Association

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9th International Seminar
Sustainable Intensification of Agriculture through Resource Management and Conservation
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Mahatma Gandhi House, Göttingen, Germany

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Kuma Demeksa Tokon
Ethiopian Ambassador to Germany
Federal Democratic Republic of Ethiopia

Message

I am delighted to know that the International Foundation for Sustainable Development in Africa and Asia at the Afrikanisch-Asiatische Studienförderung (AASF) in Göttingen, Germany, in collaboration with the Faulty of Agriculture and Land Scape Architecture, Fachhochschule Osnabruek, Germany, are jointly organizing the 9th International Seminar on "Sustainable Intensification of Agriculture Through Resource Management and Conservation" from July 7-9, 2017 in Göttingen.

Sustainable intensification of agriculture is utmostly needed to enhance food production for teaming of millions worldwide while maintaining the environment and the natural resource base of production systems. Integrated nutrient supply systems with optimum blend of chemical fertilizers, biofertilizers, vermicompost or composts should be followed to maximize crop yields while maintaining good soil health. Likewise resource conservation technologies like the use of laser levelers, rotavetors and drip irrigation should be followed where water and nutrient deficit is a reality. Also weed management should be integrated with sound crop agronomy. Thus resource management and conservation in intensive and low input agriculture are key determinant of sustainability. Linking productivity, profitability and sustainability is central to the sustainable intensification of agriculture for food security and livelihood.

I trust that aspects like agro-ecosystems, crop production in high and low input conditions, effect of climate change on crop production and mitigation strategies, post harvest processing and small scale enterprises, emerging advances in agro-technology, use of advanced technologies like information technology, bio-nano-technology, remote sensing, plant and animal genetic resources and their utilization for food security through conventional breeding and modern biotechnology will be discussed during this seminar.

I am glad that the organizers have emphasized the need for sustainable development and related socio-economic aspects are relevant globally in general and in Africa and Asia in particular. I trust valuable recommendations will emerge from the seminar and IFSDAA/AASF will consider organizing such an interesting conference in Africa in the coming years.

I congratulate the organizers and participants of the 9th international seminar and wish successful deliberations

.

Kuma Demeksa Tokon

GEORG-AUGUST-UNIVERSITÄT
GÖTTINGEN

Prof. Dr. Elke Pawelzik
Dean, Faculty of Agriculture
Georg August University, Goettingen, Germany

Message

It is a matter of delight and pleasure that the International Foundation for Sustainable Development in Africa and Asia, at African Asian Studies Promotion Associattion (AASF) in collaboration with the Faulty of Agriculture and Land Scape Architecture, Fachhochschule, Oesnabruek,, Germany are jointly organizing the 9th International Seminar on "Sustainable Intensification of Agriculture Through Resource Management and Conservation from July 7-9, 2017.

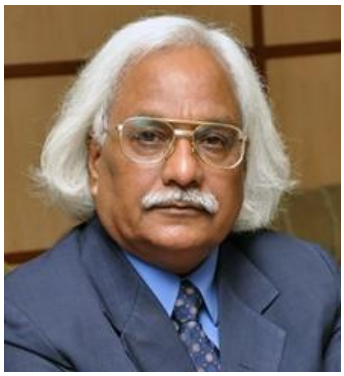
During green revolution crop production increased in many parts of the world mainly due to high yielding varieties and adoption of improved agro-technology. However, grey patches emerged due to over exploitation of natural resources like soil,, water and agro-chemicals. Sustainable intensification is needed to enhance food production and for mitigating adverse effects of over mining of nutrients. Climate change further complicates already existing complex problems.

I trust that this interdisciplinary seminar will cover topical issues related to recent innovations in agro-technology, use of plant growth promoting rhizobacteria and other commercial products, agro-processing, applications of biotechnology like biofertilizers, genetic and nano-engineering, development of climate resilient high yielding improved varieties, management of plant and animal genetic resources and their utilization towards food security etc.

I wish scientists, scholars and development functionaries converging at a common platform during the 9th IFSDAA International Seminar will avail excellent opportunity to share experiences and to work out a holistic approach to harness gains of recent technology for food security.

I congratulate the organizers and wish them grand success.

(Prof. Dr. Elke Pawelzik)



Prof. P.B. Sharma

Message

from the desk of
The President
Association of Indian Universities (AIU)

I am delighted to note that an International Seminar on "Sustainable Intensification of Agriculture Through Resource Management and Conservation" is being organized by International Foundation for Sustainable Development in Africa and Asia (IFSDAA), Goettingen, Germany in collaboration with Afro Asian Studies Promotion Association (AASF), Mahatma Gandhi House, Goettingen, Germany on July 7-9, 2017.

Food Security, Energy Security and Water Security are the three major challenges before the community of nations to create a Happy, Healthy and a Prosperous Global society. We need to pursue the agenda of Food, Energy and Water Security on the strength of the new and emerging advances of Science and Technology.

I am indeed delighted to note that the International Seminar is being participated by Researchers, Policy Planners and Professionals across various disciplines from developing and developed countries.

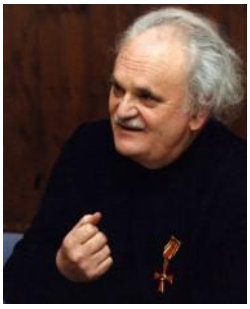
I extend my very best wishes on behalf of the Universities in India and also on my personal behalf for the success of the International Seminar in formulating implementable strategies for improving Food Security and Environmental Sustainability.

Prof. P.B. Sharma
President
Association of Indian Universities (AIU)
& Vice Chancellor
Amity University Haryana, India

Abstracts

9th International Seminar 2017

Sustainable Intensification of Agriculture Through Resource Management and Conservation



Dr. Karl Fritz Heise (1925 - 2004)

Mitbegründer der AASF e.V.

Geschäftsführer der AASF e.V.: 1959 - 2004

Verleihung des Bundesverdienstkreuzes: 1996

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Some Recent Developments in European Agribusiness: Potential Consequences for Developing and Transition Economies

ABSTRACT

The agribusiness sector in many European and other industrialized countries has constantly been undergoing major structural changes. These developments include, but are not restricted to: growing concentration ratios along the value chains, increasing globalization of once domestic industries like the food sector, increasingly critical media coverage and public perceptions of intensive agriculture and modern food processing, growing requirements regarding sustainability management and corporate social responsibility are. These developments have a major influence on the future management of agribusiness companies in industrialized countries but will also provide opportunities as well as threats for agriculture and the food industry in developing and transition economies. In the 2nd Karl Fritz Heise Key Note Professor Theuvsen highlights some of the on-going developments in the European agribusiness sector and outlines potential consequences for developing and transition economies.

Hidden Hunger versus Impertinent Intemperance: Some Dogs and Cats Feed Gourmet-Quality – and a Lot of People Eat Dirt

An Eye-Opener - Not a Vision

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ABSTRACT

"*Sustainable Intensification of Agriculture through Resource Management and Conservation*" is the the title of the 9th International Seminar of IFSDAA in Göttingen, July 2017. Resource Management and Conservation are key topics of this seminar, but a sustainable or ethical use of resources or in other words, for which purpose our resources are used, should be consideredas well.

End of last century, there were 235.000.000 dogs and 245.000.000 cats on earth. Data from 2012 are showing, that 300 million companian dogs and 600 million stray and free-ranging dogs were living on our globe. Two thirds of the total global companion dog population lives in just ten countries (USA, Brazil, China, Mexcico, Japan, Russia, UK, France Indonesia, Italy).

By 2025 it can be foreseen, that the number will go up to 360 million companion dogs and may be, by 2050 there will be over 475 million companion dogs on earth plus non assessable hundreds of millions of stray and free-ranging dogs.

All these pets need significant amount of feed/food and consume significant amount of natural resources. According to Global Industry Analysts (GIA, 2012), "the rise of 'alone or single-person families' and a decreasing birthrate means that pets are increasingly being considered family members and companions – not just animals. The change attitude, combined with growing urbanization and an increase in disposable income, have contributed to the increase in number of households owning pets – which in turn – drives the demand for pet foods."

Pet foods represents one of the fastest growing sectors in the food industry. In 1998 the global pet food market was 30 billion Euro, in 2009 it was 56 billion Euro, in 2017 it will be 74 billion Euro and by 2021 the market will increase to more than 117 billion Euro. This means, that within 25 years, there is an increase of the pet food market by factor of 4!Furthermore, the pet foods are highly specified and specifically adapted to the different races, age, physiological fitness, obesity, and health of the pets – often better prepared than for human beings.Meanwhile, halal dog and cat food is marketed reflecting the increasing number of pets in islamic countries.

On the other hand,almost all the hungry people, 780 million, live in developing countries, representing 12.9 percent, or one in eight, of the population of developing counties. Furthermore, more than one-third of under-five deaths are attributable to undernutrition, 165 million children under 5 are stunted, and 51 million children suffer from wasting.Beginning 2017, Kenya Red Cross estimated about 2.7 million people were in need for food aid after a severe draught -in Somalia 6 million people, and in Ethiopia 10.2 million people.

Just as a reminder: serving a dog with 200g/day or 400g/day implicates a proportional paw/foot print of 0.18-0.36 ha arable land/year. Furthermore, e.g. the CO_2-Paw Print of a cat in Germany is 2.2 t CO_2/year and comparable to 2.3 t CO_2/year produced by a person living in Egypt - a child in USA: 9.4 t CO_2/year; a child in

China: 1,4t CO_2/year; a child in Bangladesh: 0.06 t CO_2/year. The human induced CO_2-Paw Print of pets is a print related to soil, water, climate change, environment and last but not least to humans.

At the moment, around 10 percent of arable land for global crop production/food production is consumed by global pets – tendency is increasing!The question is: Is this, what we want?

Yield development in Eternal Rye Trial in Halle/S. (Germany) 1879 - 2010

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ABSTRACT

In Eternal Rye Trial of Halle/Germany the development of yields is considered for winter rye 1879-2010 and as well as corn and potatoes 1962-2010 to four fertilizer treatments based on decade averages and possible causes for changes in level are mentioned. The yields of winter rye decreased up to 1920, thereafter they remained until the 1960 years more or less constant, and then went up to the present on all variants. In the unfertilized variant, the decade average grain yield was after the start of 22.7 dt/ha, decreased to the 1920s up to 10.7 dt/ha from and increased from the late 1960s until the last decade again to 22.2 dt/ha. The causes of the yield drop in the first 40 years after the start of Eternal Rye were mainly in the negative effects of monoculture and the use of seed of the trial area. The yield increase since 1920 were caused mainly by cultivation of new, higher-yielding varieties, regular use of plant protection products and perhaps also by elevated atmospheric CO_2 concentration.

Requirements for sustainable intensifications in agriculture today

Some proposals related with fertilizer input in France and Africa

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ABSTRACT

Depending on the level and actors considered, sustainable intensification has not the exactly the same requirements. Since the publication of the Brundtland UN report in 1987, we are of course first to meet the essential needs of everybody by considering the present technological and social organizational limitations, by trying to overcome these limitations, while considering the environment's ability. The economic social and environmental nexus - and not only the environmental issues - is therefore to be considered in all case. With the climate change threat, which is considered today to be more important and imminent than in the 1990's, emphasis has also been laid upon reducing GHG emissions and adaptation to climate change. This has been reinforced with the 2015 Paris Agreement. At the same time the UN has adopted different agendas related with sustainable development. In 2015, countries adopted a set of goals to end poverty, protect the planet, and ensure prosperity for all, by 2030.

But this is to be achieved through decisions taken by different countries (developed, least developed and developing countries), at different levels and by different actors: (1) at the governmental level (2) at sectorial levels (3) at the enterprise and farm level, (4) at the landscape level, depending on financial and social constraints, on their national and sectorial policies and measures, as well as on their insertion in the global world, in particular in the global market and environment. To assess sustainability this requires both top down and bottom up approaches.

This will be applied to assess the possibility to adopt technologies for sustainable intensification of cereals production by considering mineral and organic input. This with or without complementary irrigation, and with or without intercropping with nitrogen fixing plants, both in developed countries,- e.g. France, and African developing and least developed countries- by taking into account the local and national constraints and opportunities.

The Conservation and Exploitation of Plant Genetic Resources in the Federal *Ex situ* Genebank for Agricultural and Horticultural Crops in Gatersleben

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ABSTRACT

Plant genetic resources play a major role for global food security. The most significant and widespread mean of preserving plant genetic resources is *ex situ* conservation. World-wide 7.4 million accessions are stored in about 1,750 *ex situ* genebanks. The largest numbers of accessions stored are of wheat (855,000), rice (775,000), barley (465,000) and maize (325,000). Other large germplasm holdings include bean, sorghum, soybean, oat, groundnut and cotton. One of the ten largest *ex situ* collections of our globe is located at the Leibniz Institute of Plant Genetics and Crop Plant Research (IPK) in Gatersleben, Germany, conserving 150,000 accessions from 3,200 plant species and 780 genera. Since the majority of genebank holdings globally are stored as seed, seed storability is of exceptional importance for germplasm conservation. Seed storage is managed in large cold chambers at -18°C. Seeds are kept in glass jars, covered with bags containing silica gel. The maintenance of the collection requires regeneration. Each year between 8 and 10% of the collection is grown either in the field or in glasshouses. Regeneration is carried out locally to ensure genetic integrity and to minimize genetic erosion. Special attention has to be given to out-pollinating species, which are either multiplied in small glasshouses or in isolation plots in the field.

A pre-requisite for any further exploitation activities is to maintain a high seed quality during storage. The lifespan, or longevity, of seeds is crop specific. However, there are also strong hints of an intraspecific variability which is genetically determined. Consequentially, studies were initiated determining genetic loci responsible for seed storability. At IPK investigations were performed on barley, wheat, oilseed rape and tobacco employing both bi-parental mapping populations and association mapping panels.

Array of genotypic variability among wheat germplasm accessions for various grain yield attributes under rainfed conditions

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ABSTRACT

World over the climate change effects particularly with regard to environmental fragility is being witnessed. The climate change effects are diurnal in nature and differently distributed over space and time, This necessitates evaluation of wheat germplasm accessions for phenological and yield attributing traits under rainfed conditions compounding water and heat stress at various phenophases. In this present investigation 1485 accessions of bread wheat germplasm obtained from National Bureau of Plant Genetic Resources (NBPGR), New Delhi were evaluated during 2015-16 at CCS, Haryana Agricultural University (Hisar) Research Farm in augmented design with five checks, namely HD 2967, Raj 3765, C 306, WH 1080 and WH 1105 under rainfed conditions. Data were analysed and clusters of accessions on the basis of similarity in traits were idendified. There were distinct pattern of clusters, some genotypes were of very early types, other were of medium maturity and few of them were of stay-green types and late maturing. Likewise, accessions were evaluated for yellow and brown rusts. The accessions varied from highly resistant to completely susceptible e.i. 0s to 100s .Based on plant height the accessions were grouped into distinct categories <60cm (Dwarf), 61 to 100 cm (Semi-dwarf), 101 to 120 cm (Medium tall) and 121 to 150 cm (Tall types). Similarly, accessions varied for number of tillers per metre length from 50 to 165, number of grains per spike ranging from 30 to 125 grains and thousand grains weight (TGW) 37g to 65g. The accessions marked difference for biological yield (110g to 630 g) and grain yield (70 g to 235 g) per metre row length. Thus the accessions indicated vast spectrum of variation for phenological and grain yield attributing traits in wheat. During 2016-17 same set of 1485 accessions were evaluated under rainfed and irrigated conditions. Out of two years evaluation seventy accessions emerged promising for different traits for enhancement of grain yield for enhancing variability in crossing programme to generate populations from which selection of elite line can be made to mitigate the environmental effects and to infuse resilience against climate change effects.

KeywWords: Wheat, Germplasm accessions, Grain yield attributes

Extension of the elusive genus *Piriformospora* with plant growth-promoting endophytic fungi from Congolese rhizospheric soils

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ABSTRACT

The growing world population is associated with an increased demand for food, a trend which is more pronounced in developing countries where the availability of fertile arable land is becoming limited. To meet global demands, 70% more food will have to be produced by 2050. This can be achieved by higher yields, greater cropping intensities, and land expansion (SDSN, 2013). Since access to mineral fertilizers in developing regions is restricted, a sustainable intensification of land use can only be addressed through an integrated soil fertility management approach (Vanlauwe et al., 2010). Over the last decade, there has been an increasing focus on the implementation of plant growth-promoting organisms as a sustainable option to compensate for poor soil fertility conditions in developing countries. In an effort to obtain plant growth-promoting fungi to apply in integrated soil fertility management in the Democratic Republic of Congo, we discovered that rhizospheric soils collected in the region of Kisangani are a promising source of fungi of the elusive Basidiomycota genus *Piriformospora* (recently transferred to the genus *Serendipita*). Different environmental molecular analyses have shown the ubiquitous presence of fungi of the order Sebacinales, including *Piriformospora*, within the roots of terrestrial plants worldwide (Selosse et al., 2009; Weiß et al., 2011). Nevertheless, to date, the genus only comprises single isolates of both species *Piriformospora indica* (Verma et al., 1998) and *P. williamsii* (Basiewicz et al., 2012), possibly suggesting difficulties with direct isolation from field samples. Since its discovery in 1998, *P. indica* has attracted great attention due to its stimulating effect on plant growth and yield, and its capacity to confer systemic resistance against (a)biotic stress, which resulted in a strong interest for the implementation of the fungus as biofertilizer, bioprotector, and bioregulator (Franken, 2012).

With sudangrass (*Sorghum sudanense* (Piper) Staph.)-based trap systems, we managed to obtain a collection of 51 new axenic *Piriformospora* cultures which could be divided in seven closely related 'genetic groups'. Based on morphological data, inter simple sequence repeat (ISSR) fingerprinting profiles, and internal transcribed spacer (*ITS*) and translation elongation factor 1-α (*TEF1α*) marker gene sequences, we propose that these isolates together with *Piriformospora williamsii* constitute a species complex designated *Piriformospora* (= *Serendipita*) '*williamsii*' (Venneman et al., 2016). Furthermore, a selection of isolates strongly promoted plant growth of i*n vitro*-inoculated *Arabidopsis* seedlings, which was evidenced by an increase in shoot fresh weight and number of lateral roots of up to 40% and 86%, respectively. This isolate collection provides unprecedented opportunities for fundamental as well as translational research on the Serendipitaceae, a family of fungal endophytes in full expansion. Their implementation as local inoculants in an integrated soil fertility management approach will hopefully contribute to resolving serious issues in agriculture and horticulture in sub-Saharan Africa where plant production is impaired by diverse abiotic and biotic stresses.

Keywords: biodiversity study; integrated soil fertility management; Sebacinales; plant-microbe interaction.

Pulses for human health – Chickpea (*Cicer arientinum* L.) to combat obesity and type 2 Diabetes

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ABSTRACT

Type 2 Diabetes mellitus (T2DM) is increasing at an alarming rate in the world. Obesity has been suggested as one of the major reasons for the high prevalence of the T2DM. Obesity is directly associated with diet and the type of food intake. Therefore, it is imperative to develop new strategies for T2DM prevention and management. Diet rich in refined or rapidly digestible carbohydrates with reduced dietary fibre contributes to obesity and other related metabolic syndromes like T2DM. Diet with higher dietary fiber and slow digestible carbohydrates can reduce the incidence of T2DM.

Pulses have relatively high protein concentration (18-30%), a very high proportion of carbohydrates (50-65%) and minor quantities of lipids, vitamins and minerals. Pulse proteins have less methionine than cereals but are rich in lysine an essential amino acid deficient in cereals. Pulses and cereals consumed together are a good source of proteins with an adequate mix of amino acids. Pulse consumption in the human diet has been associated with prevention and/or reduced incidence of several diseases, including but not limited to obesity, type-2 diabetes, colon health and cardiovascular disorders. There is a growing consensus that the beneficial effects of pulses could be attributed to pulse polymeric carbohydrates such as starch and non-starch polysaccharides (Chibbar et al., 2010).

Among the pulses chickpea (*Cicer arientinum* L.) is one of the five most favoured protein foods (Food Business News 2014) by humans. The other four foods are pea, pumpkin seeds, quninoa and pecans. Chickpea besides being a good source of protein, is also rich in dietary fibre, starch with increased amylose and other carbohydrates (Jukanti et al., 2012). In this research project we will analyze the chickpea seed constituents and study the in vitro enzymatic digestibility of chickpea starch and meal to select the genotypes with leaststarch digestibility. Diets cotaning chickpeas with reduced starch digestibility result in low glycemic index, that can be beneficial to combat obesity, diabetes and improve cardiovascular health.

Developments of Seed Sector in Turkey

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ABSTRACT

The seed is the most important technological input in increasing the yield and production in agricultural system. However, with the increase in the world population, the seed has been regarded as a strategic product even more than commercial and commercial in many countries. The ability of seed to be used in agriculture, which is extremely important in agricultural production and food supply, depends on the structural and legal arrangements and investments required for the development of the seed sector, the public sector and in particular the private sector. In 1925, seed breeding stations were established in different ecological regions. In 1950, State Production Farms were commissioned with seed production. In 1961, the first private seed company was established. With the enactment of the Seed Law No. 308 in 1963, a public-oriented system of production and procurement was introduced and continued until 1980. Since 1983, seed policies have been adopted aiming to integrate with the world in the free market economic conditions, where the private sector also takes place. The Turkish seed sector has gained significant momentum and has begun to be restructured with the adoption of the "Protection of breeders' rights of new plant varieties" in 2004 and the adoption of "Seed" laws in 2006. Depending on these developments, seed production capacity, R & D activities, certified seed production and use in our country have increased over the years. Certified seed production was 110 thousand tons in 1996, 369 thousand tons in 2006 and 958 thousand tons in 2016. Private seed sector has been developed faster and its share in certified wheat seed production increased from 4% to 20% in 2006 and to 69% in 2016. However, certified seed use rates in self-pollinated crops are not adequate.

Keywords: Turkey, seed, seed sector, certified seed

Gendered competitive advantage and sustainability: a research framework and illustration

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ABSTRACT

In Africa, many agrifood systems have become proliferated by both domestic and foreign private business enterprises because of the on-going globalization process. As a result, different non-traditional agricultural exports (NTAEs) like dairy, fresh fruit, vegetables, and seafood consequently evolved in the region. However, in an attempt to efficiently meet the increasing demand and stringent standards, supply chain (SC) relationships have become more complex. Vertical linkages have become higher but closer as a result of new interdependencies and governance mechanisms (e.g. contracts and strategic coalitions). Evidence from previous studies suggests that complex international SCs tend to exclude rural producing households from national and global markets because of the strict formality of transactions, high requirements on minimum quantity, quality and safety standards etc. Thus, individual SC actors continuously strive to engage in competitive strategies that will help them to gain and/or maintain competitive advantage. One of the competitive strategies employed by rural households in the light of exclusion from the urban/global market is the gendered division of labor along the value and supply chains. Hence, many SCs earlier dominated by men witnessed increasing integration of women. Previous studies suggest that women's participation, access to resources and benefits and power within SC are essential for the attainment of a sustainable development. However, there is an ample empirical research that proves the relationship between women's role – as a response to the contingency state of market exclusion – in attaining sustainable competitive advantage within SC and sustainable household welfare status. To the best of our knowledge, this has not been explored within the Nigerian shrimp and prawn (NSP) sector – a highly perishable high-value NTAE. Since a contextual understanding of women's participation in SC is necessary, our study seeks to bridge this gap by relying on the contingency theory, resource-based view in strategic management (Chowdhury *et al.*, 2014) and the gendered value-web approach. We intend to construct a research framework with which we can model the aforementioned relationships and provide an illustration by reference to the NSP sector.

Solar Lamps for Ghanaian School Children as Incentive for sustainable Tree Planting in the context of North-South school Partnership.

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ABSTRACT

The impact of increasing forest degradation in West Africa is remarkable and unfortunately this deforestation has direct consequence for rural forest dwelling communities and particularly school children in these areas in Africa as a whole. In Ghana, for instance, the rain forest decreased from 8 to 1, 4 million hectares within a period of less than 100 years. In previous times, there were shade trees on school compounds and rural community settlement areas where school children and adults could sit, play and study. However, many of these places are now void of trees, become eroded and dusty, exposing health risks to these children. Reforestation is therefore extremely necessary if children and the people living in the country side are to have a secured future

In 1995, the Project "Tree Planting on School Compounds in Ghana" was therefore initiated by Dr. Essiamah, a Forest Research Scientist, Chairman and Project Coordinator of an Association "School Forests for West Africa", based in Germany, with 4 schools. The number of participating schools has since increased to 75 mainly in the Central Region. The school children plant and tender for shade trees, donated by the Association in Germany (s. (Homepage: www.schulwaelder.org) and German partner Schools and supervised by the Partner Organisation in Ghana "Youth and Environment Club" together with their teachers. The aim is to change the negative attitude of children (the future generation) towards trees or Rain Forest so as to slow down the degradation or stop it in future.

Since 1997, solar equipments are being introduced into the Project as incentive to motivate the children and teachers to involve themselves in the tree planting Project.

In the presentation, "Introduction of solar lamps as incentive to tree planting", for a successful implementation of the project will be discussed. By combining tree planting with solar lamps, a school child qualifies for a free solar lamp after planting four trees and catering for them for six months while parents also contribute to half of the price of the lamp with micro-credit. This is to enable children and their families to have decent light at night to study and to replace thousands of kerosene lamps which are unhealthy but at the same time ensure the reforestation of degraded areas. The Project is therefore being presented as a lighthouse project to serve as a model for other African countries to promote reforestation through school children and to focus on solar as the future energy source for Africa.

Sustainable Wheat Production in semi arid nutrient and water deficit areas using Biofertilizers

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ABSTRACT

The use of microbial inoculants popularly known as biofertilizers has increased gradually world over in the recent past. The reasons for farmers turning to biofertilizers are environmental and economic. In an ideal fertile soil, apart from optimum physical and chemical characteristics conducive to plant growth, all the microbiological processes also must be maintained in equilibrium. These microbiological processes are part of nitrogen, phosphorus and carbon cycles and responsible for maintaining all natural ecosystems. Bacteria of the *Azotobacter* genus fix nitrogen and synthesize auxins, cytokinins, and GA-like substances, and these originating from rhizosphere/root surface are the primary substances controlling the enhanced plant growth.. In order to guarantee the high effectiveness of inoculants and microbiological fertilizers it is necessary to find the compatible partners, i.e. a particular plant genotype and a particular *Azotobacter* strain that will form a good association. Over the past two decades our group is engaged in investigating aspects like effect of *Azotobacter* application in wheat crop under different agro-ecological conditions, whether genotypic differences exist among various strains of *Azotobacter* and wheat genotypes which determine efficiency of plant microbe interaction, effect of co-inoculation of *Azotobacter* and VAM on wheat. Agronomic significance of its application includes increased seed germination, better root development, increased water uptake and higher nutrient efficiency. We have observed significant increase in grain yield, number of tillers, dry matter accumulation and uptake of NPK and micronutrients like Cu, Fe, Zn and Mn in wheat varieties/disomic chromosome substitution lines with phosphate solubilizing and phytohormone producing soil isolates and mutants of *Azotobacter chroococcum*. The effect of inoculation was more obvious in the root than in the shoot parameters. The total root length was improved. However, the response of grain yield to *Azotobacter* was plant genotype and soil type dependent and appeared to be related to improved P and N utilization efficiency. Phosphate utilization efficiency in grain yield production was more enhanced (average 13%) than N utilization efficiency (5%). The interaction between *Azotobacter* and wheat plants on one hand, and between individual microbial species and their metabolites, on the other hand, is the basis for the different transformations of inorganic and organic compounds. We examined crop effects of bioinoculants, localization of bioinoculant responsive genes on different wheat chromosomes and effects of individual partners to develop technology to harness synergy due to favourable plant-microbe interactions for sustainable wheat production in semi arid tropics.

Rural Industrialization is a sign of sustainable development for improving the rural prosperity

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ABSTRACT

The self-reliant villages were based on rural economy under Gandhian vision of 'Gram Swaraj', which has led the sustainable development of villager and make them prospers. In this model, Gramodyog was the main vehicle using personal skills rather than energy-intensive machines. The farming was aimed for food security, livelihood and extra income from surplus agro-produce to manufacture required products. However, in spite of seventy years of planned development and phenomenal growth in almost all the sector, yet our villagers are becoming poorer and youths are migrating from rural area to urban area for the search of their livelihood. To overcome these problems, a rural industrialization is needed at a village level to revert back the migration and changing the socio-economic system of the country.

To alleviate these rural miseries in health, nutrition, shelter and education, a focus is imperative in creating large scale employment opportunities in rural areas for sustainable development through decentralized, simple, small scale, locally useful and cost-effective production systems. To achieve the goal of rural industrialization a national institute under the ministry of Micro, Small and Medium enterprises (MSME) has been developed with the help of IIT Delhi and KVIC Mumbai at Wardha, named, Mahatma Gandhi Institute for Rural Industrialization (MGIRI) and started functioning from October 2008.

Based on last 9 years working of MGIRI, 37 enterprises based on Khadi & textile technology, 140 enterprises bio-process & herbal technology, 46 enterprises chemical technology, 57 enterprises craft and engineering and 41 energy and infrastructure and total 321 enterprises has been developed by the MGIRI Wardha, which has provided 4815 direct employment and 50000/- indirect employment in rural area and made significant and sustainable impact on rural prosperity.

To achieve above a four-tier approach has been made e.g. planning, proper execution, mid-term corrective actions and consolidation of progress through periodic review. Nothing succeeds like success. So also money multiplies money. Success and money would induce a chain of reactions to boost productivity, value-addition, profit and ultimately confidence. These activities have provided an eye-opening for the sleepy village of today to transform itself in a rural industry meeting the vision of the father of the nation to improve the rural prosperity.

The MGIRI has worked as a catalyst in all the above mentioned enterprises development activities through its management skills by providing (i) relevant literature the for technology, products and processes, (ii) a pilot plant facility for familiarizing with the production process, its techno-economic analysis, (iii) seed money through various linkages like NABARD,KVIC, SIDVE, MUDRA etc. (iv) guidance in packaging and branding, (v) initial outlet for sale of product generated at the rural hub and (vi) streamline their operator's training, operations, trouble shooting (if any), accounting practices, repayment of installments of seed money and create an environment of confidence for sustaining the activities for rural industrialization and its prosperity

Keywords: Gramodyog**,** Sustainable development, rural prosperity, enterprises and prosperity.

Theme

Sustainable Development & Socioeconomic Concerns

9th International Seminar 2017

Sustainable Intensification of Agriculture Through Resource Management and Conservation

Monitoring Trees outside Forests (TOF)

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ABSTRACT

Trees outside Forests (TOF) provide a wide range of ecological, economic and social services and are recognized as important landscape elements. Among others, they supply wood, sequester carbon, protect soils, improve water quality, regulate the micro-climate and contribute to the preservation of biological diversity. Due to the multitude of benefits associated to TOF, and as it has been recognized by the scientific community that substantial tree resources are disregarded when focusing on forests alone, international conventions, such as the convention on climate change (UN-FCCC) and the convention on biological diversity (UN-CBD), encourage reporting up-to-date information also on trees growing outside forests. Hence, approaches to reliably monitor tree resources across large areas are needed. While for the assessment of forest trees a variety of sophisticated inventory methods has been developed in the past, fewer efforts have been undertaken that focus on the assessment of TOF. Though the variables of interest are essentially the same, differences in the monitoring of trees within and outside forests arise from the distinctive characteristics of TOF, including uneven spatial distribution, geometric arrangements, specific functions and the fact that TOF may occur on any land use except forest. Here, we present an overview of inventory approaches suitable for the science-based assessment of TOF and highlight how designs developed for forest inventories can be adapted to the assessment of trees on non-forest lands. Further, current approaches to monitor TOF resources with active and passive remote sensing sensors, such as LiDAR, RADAR, SPOT, RapidEye, Landsat, MODIS etc., are discussed. Considering the substantial ecosystem services provided by TOF, a plea is made to shift from forest monitoring to a more comprehensive tree monitoring that considers all trees that grow in a study region. By doing so, we do explicitly not advocate the view that TOF may replace forests in any regard; however, a non-forest land use with a good tree cover is considered more valuable than a landscape void of trees.

Renewable Energy for Sustainable Agriculture

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ABSTRACT

Agriculture is the sole provider of human food. Most farm machines are driven by fossil fuels, which contribute to greenhouse gas emissions and, in turn, accelerate climate change. Such environmental damage can be mitigated by the promotion of renewable resources such as solar, wind, biomass, tidal, geo-thermal, small-scale hydro, biofuels and wave-generated power. These renewable resources have a huge potential for the agriculture industry.

The farmers should be encouraged by subsidies to use renewable energy technology. The concept of sustainable agriculture lies on a delicate balance of maximizing crop productivity and maintaining economic stability, while minimizing the utilization of finite natural resources and detrimental environmental impacts. Sustainable agriculture also depends on replenishing the soil while minimizing the use of non-renewable resources, such as natural gas, which is used in converting atmospheric nitrogen into synthetic fertilizer, and mineral ores, e.g. phosphate or fossil fuel used in diesel generators for water pumping for irrigation.

Hence, there is a need for promoting use of renewable energy systems for sustainable agriculture, e.g. solar photovoltaic water pumps and electricity, greenhouse technologies, solar dryers for post-harvest processing, and solar hot water heaters.

In remote agricultural lands, the underground submersible solar photovoltaic water pump is economically viable and also an environmentally-friendly option as compared with a diesel generator set.

If there are adverse climatic conditions for the growth of particular plants then there is need for renewable energy technology such as greenhouses for maintaining the optimum plant ambient temperature conditions for the growth of plants and vegetables.

The economics of using greenhouses for plants and vegetables, and solar photovoltaic water pumps for sustainable agriculture and the environment are presented in this article.

Clean development provides industrialized countries with an incentive to invest in emission reduction projects in developing countries to achieve a reduction in CO_2 emissions at the lowest cost. The mechanism of clean development is discussed in brief for the use of renewable systems for sustainable agricultural development specific to solar photovoltaic water pumps in India and the world. This article explains in detail the role of renewable energy in farming by connecting all aspects of agronomy with ecology, the environment, economics and societal change.

Utilizing agricultural wastes to improve land productivity for sustainable production

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ABSTRACT

The Sbai grass is perennial in nature and can be grown on waste and fallow land. It's a raw material for making ropes, door mats and chair etc. Our objective is to evaluate the relative efficacy of different agricultural wastes after balancing with chemical fertliser on the performance of grass and peanut. The IPNM with 50 kg of nitrogen, 25 kg of potassium per hectare increase the crop yield to extend of 30% over sole application of chemical fertilizer. Among the waste paper factory sludge recorded higher grass and peanut over the sole application of fertilizer.

Theme

Sustainable Intensification

9th International Seminar 2017

Sustainable Intensification of Agriculture Through Resource Management and Conservation

Potential for sustainable intensification with novel fertilizers: Organo-mineral pellets from regions with high quantities of manure

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ABSTRACT

Heterogeneous distribution of livestock densities and biogas plants across Germany leads to partially high nutrient surpluses from organic manure. Particularly, in north western Germany water quality suffers from high application rates on soils with poor nutrient retention capacities. Sustainable concepts for future agricultural practices are needed to fulfill the legal framework of the European Union. To improve the transportability of organic manure into regions with lower quantities, a novel pellet fertilizer was developed within the W-Bast project. Based on 50 % organic sources (farmyard manure, biogas digestate) complemented by mineral nitrogen from urea, an organo-mineral fertilizer was designed. The prototype showed a total nitrogen content of > 20 %. The chemical performance of the novel pellet fertilizer was tested in soil incubation trials against conventional urea on three different soil types. Since nitrogen release rates were not significantly different from mineral urea, the novel fertilizer type could be a contribution to sustainable intensification in regions with low concentrations of organic manure due to the additional advantage of soil organic matter improvements. The next steps will focus on physical characteristics to ensure good mechanical spreading performance as well as on greenhouse and field trials with selected crops.

Key words: sustainable intensification, organo-mineral fertilizer, soil incubation experiment, nitrogen surplus

Potential for sustainable intensification with novel fertilizers: Performance of co-composted fecal sludge in Sri Lanka

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ABSTRACT

Sri Lanka faces severe issues concerning their organic waste streams. The most obvious problem is urban waste disposal. In many municipalities waste services are restricted to collection and disposal only, whereas treatment and recycling options are hardly implemented. Furthermore, most current sanitation systems waste agricultural resources from human excreta since they are either disposed of or enter the aquatic system. New approaches towards a simultaneous processing of these two waste streams into a pelletized fertilizer could be a contribution to sustainable intensification by substituting mineral fertilizers in agriculture. Particularly, the use of co-composted fecal sludge (FS) and organic municipality solid waste (MSW) as a fertilizer seems to be a promising method. Besides plant nutrition such a novel fertilizer type could contribute to soil improvement and resource protection by nutrient recycling as well as protecting citizens towards hazardous substances. In a first study, the potential of nutrient availability from four different fertilizer compositions (FS, FS co-composted with rice husks, FS co-compost with MSW, pelletized FS co-compost with MSW). All types showed high contents of organic carbon, with the highest rates in co-compost of FS with rice husks. Highest total nitrogen contents were detected in the dewatered FS compost whereas co-composting with other sources slightly reduced the nitrogen content. Highest amount of calcium was found the pelletized samples. Moreover, micro nutrients and heavy metals from all pellet compositions were analysed. Co-composting of FS and MSW seemed to be a promising possibility to ensure good nitrogen availability while reducing heavy metal contamination. Pelletizing did not affect the nutrient contents but enhanced storage and handling.

Key words: sustainable intensification, pellet fertilizer, nutrient cycling, co-composting

Potential for Conservation agriculture in Tajikistan

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ABSTRACT

Tajikistan is a landlocked country in Central Asia (CA)with a territory of 143.1 thousand km^2 and it is home for 8.2 million inhabitants. Whereas, 93 % percent of the territory is covered by mountains the climatic conditions make this country suitable for agriculture. From an agro-ecological perspective Tajikistan is classified in the irrigated area of CA thanks to Syrdarya and Amu darya river basins. However, some of the mountain areas have a rain fed agriculture system. Yet this issue creates concerns about the sustainability of agriculture in Tajikistan due to future climatic scenarios predicted for the region. Since, soil erosion is the most frequent problem in Tajik agriculture as a result of weak soil resistance. This is mainly because of destructive influence of water coming from the mountain slopes, strong winds and rugged relief along with heavy showers. In the other hand Tajikistan has the highest rate of population growth among Commonwealth Independent States (CIS) countries and one of the weakest agriculture sectors in terms of domestic production. In addition, food security is one of the main problems which the Tajik government is struggling with. Therefore, a new approach that could ensure sustainable agriculture in Tajikistan taking in to account new technologies and cropping systems that could prevent external shocks such as soil erosion and increase productivity is necessary for Tajikistan. A possible approach for achieving the above-mentioned goals is Conservation Agriculture (CA). It has been proved that CA has the potential to provide various tools such as technologies and practices to combat soil erosion and degradation as well as raise productivity and resilience. In the other hands CA is not known among the farming population of Tajikistan, even half of the irrigated areas of lower Central Asia are not familiar with this concept. In this paper we will review the agro-ecological conditions of Tajikistan and define the possible CA practices that can be implemented in mountainous smallholder farming systems of Tajikistan in order to ensure sustainable agriculture approach for this country.

Cavitation in small grain cereals: how vulnerable are wheat, rye and triticale to drought stress?

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ABSTRACT

The performance of small grain cereals under drought stress is of high interest in the context of current climate change. For woody species, it is known they have the capacity to mitigate water shortage by releasing internally stored water, while ultimately cavitation will hamper hydraulic conductivity. Therefore, vulnerability curves and the change in hydraulic capacitance can be quantified using continuous measurements of acoustic emission (AE), radial diameter shrinkage and gravimetrical water loss. In this study a similar experimental setup is used to assess the hydraulic response of wheat, rye and triticale to drought-induced cavitation. Cumulative acoustic emission signals, radial diameter shrinkage, change in volumetric water content and xylem water potential are combined with µCT visuals in order to gain substantial insights in mechanisms underlying drought-induced cavitation.

This study included DuikerMax, US2014 and Excalibur respectively as rye, triticale and wheat cultivar and first results are promising. Acoustic emission signals could be picked up using broadband point-contact AE sensors and vulnerability curves are established. Generally, the water potential at which hydraulic conductivity is reduced by 50%, Ψ_{50}, is used as an indication of vulnerability to cavitation. However, our findings suggest that sole reliance on Ψ_{50}-values could lead to wrong conclusions. The cereal's anatomy linked to hydraulic capacitance is part of the unravelling of drought-induced cavitation processes and by extension drought survival strategies.

Cow urine and waste human hair hydrolysate (amino acid mixtures) improve the seed cotton crop productivity

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ABSTRACT

Cow urine and waste human hair is easily and abundantly available which contains 17-18% organic nitrogen besides having rich organic carbon and various trace elements. These two unutilized raw materials converted into its hydrolysate by controlled mineral acid hydrolysis provided cost effective and eco friendly novel agro-nutrients. The hydrolysate was purified by pH adjustment, carbon treatment followed by filtration and formulation. The formulated product was taken for field trial on the experimental farm of ICAR-Central Institute for Cotton Research, Nagpur, under rain fed conditions on cotton crops. The soil at the site was deep black and slightly alkaline in nature (pH 7.8) with low N and P and high in exchangeable K. All the recommended package of practices was followed to grow the crop as per ICAR norms and each treatment was in randomized block design having 40 square meter area. The treatments were involved control, NPK at per recommended dose, NPK + water spray, NPK + cow urine hydrolysate diluted for spray @ 9ml / liter of water. The product was sprayed at early flowering, peak flowering and boll formation stage on Ajit 155 BG II Bt hybrid variety of cotton plants. During trial plant height, number of ball formation, ball weight and final seed cotton yield was monitored. From this field study, it was found that the cow urine and waste hair hydorlysate provided 15% higher seed cotton yield as compared to NPK as a control.

Key words: Cow urine, waste hair, hydrolysate, agro nutrients, seed cotton and plant growth promoter

Regulation by *Arbuscular Mycorrhizae* of the Integrated Physiological and Biochemical Response in Wheat (*Triticum Aestivum* L.) under Different Soil Moisture Regimes

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ABSTRACT

The continued use of chemical fertilizers and manures for enhancing soil fertility results in unexpected harmful environmental effects. Biofertilizers have been used as sources to improve plant nutrients in sustainable agriculture. Biofertilizers are low cost, renewable sources of plant nutrients which supplement chemical fertilizers. *Arbuscular Mycorrhizae* (AM) fungi provide a variety of benefits to their hosts, including increased nutrients uptake under low input condition. Water uptake may be improved by mycorrhizal association, making more resistant to drought condition. An experiment was conducted on wheat (*Triticum aestivum L.*) during rabi seasons to find suitable physiological response in relation to yield improvement in wheat genotypes WH 1142 under restricted irrigation. The experiment was designed as split plot consisting of three irrigation schedules viz., one irrigation at crown root initiation (CRI), two irrigation at CRI and heading stage and three irrigation at CRI, tillering, heading stage in main plot and five bio-inoculants treatments viz., recommended dose of fertilizers (RDF), *Arbuscular Mycorrhizae* (AM) with Azotobacter and PSB (75% of RDF), AM fungi with RDF, Azotobacter with PSB and RDF, AM fungi with 75% of RDF in the sub-plots with three replication. There was significant reduction in grain yield with increasing level of moisture stress. So, the physiological performance was directly associated with the seed yield and test weight. Highest water content of flag leaf was recorded under both conditions (irrigated and limited irrigations). Maintenance of higher flag leaf water content after anthesis correlated positively with seed yield in limited irrigations conditions. *Arbuscular mycorrhizal* (AM) fungi inoculation significantly enhanced plant growth, chlorophyll content, chlorophyll fluorescence, canopy temperature depression and the relative water content, while decreased stomatal conductance, electrolyte leakage indicating their abilities to alleviate the drought stress. Bio-inoculants regulate enzymatic activities and maintain water stress by antioxidants activities. Microbial activities irrespective of the microbial origin seem to be coordinately functioning in the plant as an adaptive response to modulated water stress tolerance and minimizing the stress damage.

Keyword: bio-inoculants, biofertilizers, test weight, seed yield

Morphological and Physiological attributes as a Screening Tool to Drought Tolerance in Barley (*Hordeum vulgare* L.) Under Restricted Irrigation Condition

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ABSTRACT

The field experiment was conducted during *rabi* season 2015-16 at Chaudhary Charan Singh Haryana Agricultural University, Hisar, to evaluate barley genotypes for drought tolerance on basis of morpho-physiological traits. The barley genotypes were screened under two irrigation levels (one irrigation at 40 days after sowing (DAS) and two irrigations at 40 and 80 DAS). Irrigation levels and genotypes significantly influenced plant growth and water relations, yield and its attributes. The interaction between genotypes and irrigation levels was also significant indicating differential behavior of barley genotypes at different irrigation frequencies. Under restricted irrigation *i.e.* one irrigation reduced plant growth parameters (such as plant height, number of tillers and dry matter accumulation), leaf water potential and relative water content. Grain and biological yield were higher under two irrigations over one irrigation. The average decrease in grain yield was 10.9% in one irrigation as compared to two irrigation treatment. The genotypes BH 14-05, BH 10-30 and BH 14-07 (4840, 4796 and 4767 kg/ha) respectively, produced significantly higher yield over check BH 902 and BH 946 under two irrigation growing environment. These genotypes BH 14-05, BH 10-30 and BH 14-07 (4500, 4391 and 4437 kg/ha) respectively, also produced significantly higher yield over checks under one irrigation condition. These genotypes grown under restricted irrigation have also been found to maintain higher total water potentials and relative water content to increase biomass production, and to be generally more drought resistant. Under restricted irrigation condition, minimum percent reduction in leaf water potential was found in BH 10-30 (18.0%) and BH 14-05 (19.5%) at anthesis. Maximum relative water content was recorded in BH 14-05 and BH 10-30 under both irrigation levels. However, the field data also indicated that considerable progress in yield under stress should be possible by selection for higher plant water status. Further study is needed to resolve these important issues.

Resource conservation techniques in rice – wheat rotation in India

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ABSTRACT

Conservation agriculture (CA) technologies are being developed for the cereal production systems of South Asia to address the multifaceted problems of decelerating agricultural productivity, resource scarcity, climate change, and negative environmental externalities generated by the conventional production system. The Rice-wheat (RW) cropping system is one of the major agricultural production systems in for Indo Gangetic Plains (IGP). India has made tremendous progress in agriculture over the past decades. Technological change with the introduction of new farm machinery and sowing practices,short duration high yielding varieties of wheat and rice in the sixties increased productivity of these crops manifold. Consequently, production of wheat and rice in India has increased from 23.8 and 42.2 million tonnes in 1970-71 to 95.8 and 106.3 million tonnes in 2016-2017. This translates into a growth rate of 2.82 and 1.86 per cent per annum for wheat and rice during this period. The excessive utilization of natural resource bases and changing climate are leading to the negative yield trend and plateauing of Rice-wheat (RW) system productivity. The conservation agriculture based efficient and environmental friendly alternative tillage and crop establishment practices have been adopted by the farmers on large scale. In the present study, InfoRCT (Information on Use of Resource Conserving Technologies), a excel based model integrating biophysical, agronomic, and socioeconomic data to establish input-output relationships related to water, fertilizer, labor, and biocide uses; greenhouse gas (GHG) emissions; biocide residue in soil; and Nitrogen (N) fluxes in the rice-wheat system has been validated for farmer participatory practices. The assessment showed that double no-till system increased the farmer's income, whereas raised-bed systems decreased it compared with the conventional system. The InfoRCT simulated the yield, water use, net income and biocide residue fairly well. The model has potential to provide assessments of various cultural practices under different scenarios of soil, climate, and crop management on a regional scale. But, farmers in agriculturally advanced states like Punjab and Haryana two landlocked states in northern India.

Keywords: Crops; Agriculture; Technology; Wheat; Rice

Sustainable Intensification of Wheat Production through Improved Resource Management

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ABSTRACT

Wheat is major crop District Sri Ganga Nagar, Rajsthan India. It is grown under diverse agro-ecological conditions from rainfed low nutrient to high input regimes. Wheat yield under limited irrigation conditions is generally low and hence calls for sustainable intensification of wheat yield through improved management and varietal selection. SKM Agriculture College is situated in agriculture belt with poor natural resource base like low organic carbon, low nutrient profile, limited water availability for canal irrigation. An experiment was conducted with the aim to identify wheat varieties suitable for limited water supply and medium input conditions in organic and normal whaet cultivation. The experiment was sown on 24 November, 2016 when the day and night temperatures were optimal. Three fourth doses of recommended N,P,K for wheat were applied in split doses so as to ensure nutrient supply at all cruitical stages. Likewise irrigations were scheduled in such manner that tillering, boot and grain filling stages are not deprived of water supply. One variety WH1080 was also grown under organic regime where 15 Tons of organic compost and two tons of Vermicompost were applied. Our results revealed that WH1080 recorded highest yield in normal and organic regime followed by bold seeded variety WH283 and WH1142. Variety WH 1105 and WH1124 also recorded good yield with smaller grains. Out of these five wheat varieties WH 1080 and WH 283 were selected on the basis of their performance grain yield, maturity and other ancillary traits like that plant height, plant biomass, grain characteristics and yellow rust resistance. Wheat variety WH 1142 exhibited long spike, higher grain number and higher gentic plasticity. The grain yield recorded at SKM Agriculture College Research Farm was much higher than the neighbourhood farms due to better management.

Keywords: bread wheat, rainfed and salinity, high grain yield and production management.

LOKHIT: A Society for Conservation of Environment at Rohtak (India)

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ABSTRACT

The protection of environment should be a serious concern for every citizen, organisation and institution. Environmental protection encompasses not only mitigation of pollution but also sustainable development and conservation of natural resources along with ecosystem. Today, the necessity of environmental awareness and enforcement is more challenging and critical than ever before. Despite provisions in local governance for Environmental protection and many statutory rights, the environment degradation continues. The main cause for environment degradation is lack of effective enforcement of various laws and taking charge by the people with daring and dedicated involvement.

LOKHIT meaning "Public Welfare" is a non-profit, non-governmental committed organization established in Haryana (INDIA) under a mission to save environment and sustainable development. The objective of the organisation is to outreach people for the awareness to protect the environment, the rights of the citizens to have clean water and fresh air and the promotion of sustainable development along with conservation of the cultural heritage of Haryana.

With the motto to aware people and to conserve local environment, a LOKHIT Society established in 1999, has been actively involved in creating awareness among Senior citizens, Farmers, Rural Youth, Academicians, Students through training and capacity building programmes, seminars, workshops, declamation contests in community centres and other grass roots level activities on environmental and social issues. It acts as a forum for concerned citizens, volunteers and activists working for the survival, sustainable development and social change. We pledge to create an interactive movement at the state level for environmental and social justice. This initiative to save the environment through green plantation drives and more clear intentions to adopt clean environment practices by public and private participation in support will help to reach our goal of nature Protection and Conservation. We believe in action at ground level and working logically, strategically, and practically with prevention and solution oriented approaches to give our children a better tomorrow.

In 2017 we have successfully implemented the tree plantation in city, suburbs, housing societies, sector, parks, schools, colleges, open grounds, barren lands and other available locations of Rohtak throughout the year. We are pleased to inform that at present more than 10,000 trees with average height of 10-15 ft. are growing and blooming. This is achieved with the dedicated support of volunteers, students, NSS students and individuals by providing financial support to some extent. Apart from plantation, a plant needs love and care like a baby until it is self-sustainable. As we found people forget about the plants after plantation and that is why their survival rate is very low. So the LOKHIT society is taking care of plants manually as well as through different technical methods such as installation of Tree Tags system which makes it easy to water the plants and save water and time. This has changed totally the look of the area from barren areas in outskirts of city to a green cover.

Our rural wing is also making farmers aware on organic and conservation agriculture. In conservation agriculture the farmers are convinced to adopting crop residue management practices. As the burning of crop residues creates and higher level of air pollution and increased particulate matter disturbs the ecology. These practices must be discouraged and utilized gainfully for conservation of natural soil biota for improving soil

health and reducing environmental pollution. The society generate awareness campaigns and training to adopt practices for conservation in agriculture and sharpen the skills of rural youth with support of social scientists and activists in order to strengthen environmental law and policy orders for protection the environment from burning crop stubbles.

We at LOKHIT also motivate the youth and citizens to donate blood for noble cause and are contributors to district red- cross society at large. We are organising blood donation camps every quarter under various social campaigns. Our volunteers are ready to help accidents victims and whenever required to cover emergency or immediate requirement or arranging donors in this vital sources for mankind. Our volunteers are actively working for the protection of environment and cultural heritage of Haryana. We implement community oriented programs in the area of public interest and sustainable development for social issues and communal harmony. This makes us to act as a nodal point to set up an information, resource, cultural centre to serve the society at large. The sincere dedication with consistent efforts are building "Rohtak" a green revolutionary, peace and prosperous district of Haryana with its global impact and contribution to sustainable development.

At LOKHIT we feel free to discussion, suggestions, support and review in regards to our involvement and foreign alliances.

Keywords: Environment, Pollution, Agriculture, Conservation, Rohtak

Theme

Plant – Microbe Interaction

9th International Seminar 2017

Sustainable Intensification of Agriculture Through Resource Management and Conservation

Role of Endophytic Bacteria in Sustainable Agriculture and its Intensification.

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ABSTRACT:

Development and use of microbial inoculants to protect the environment and soil health for sustainable agriculture is better option over use of chemical fertilizers. To explore the possibility of development of new efficient biofertilizers, the present attempt was made to isolate large number of endophytic bacteria from roots of legumes and non legumes as well as nodules of legumes. Since bacterial endophytes are better options as these live in plant tissues with intimacy without causing any harmful manifestation. However benefit the plants in multiple ways by mobilization of nutrients, growth promotion, nitrogen fixation and protecting the plants from plant diseases and environmental stresses. Keeping these in mind, endophytes were selected based on their molecular abundance, presence of multiple beneficial traits, better ability to colonize in the roots and nodules. Finally their effects were assessed under controlled conditions, in pots and under field conditions and then under different ecological zones of India.

A total of 136 nodule and 90 root endophytic bacterial isolates were obtained from roots of chickpea, field pea, Lucerne, wheat and oat and nodules of chickpea and field pea. Higher number of Gram positive bacteria was present in legume nodules than in its roots. In legume roots 47.8% and in nodules 56 % of bacterial endophytes were solubilizing P. Similarly the number of ammonia and organic acid producers in legumes nodules were higher than roots. Selected 143 endophytes were used to determine molecular diversity by RFLP of PCR amplified 16S rDNA. Seventeen bacterial genotypes in nodules, 7 bacterial genotypes in legume roots and 6 bacterial genotypes in non legume roots were present. Based on the presence all the beneficial traits 11 most efficient isolates were selected for detailed study. Extent of establishment in different host and non-host tissues was assessed in sterilized and unsterilized conditions. No host specificity could be observed. Identification of 11 endophytes by partial 16S r DNA sequencing showed that all were bacilli.

Two isolates *Bacillus subtilis* strain CNE 215 isolated from chickpea nodules and *Bacillus licheniformis* strain CRE1 isolated from chickpea roots having all the multiple beneficial traits were evaluated under field conditions. Chickpea was used as test crop with standard microbial inoculants recommended for chickpea crop *Mesorhizobium* sp strain 1233; Phosphate solubilizing bacterial strain PS 36 and Plant growth promoting rhizobacterial strain LK 884 as inoculated control. In two year experimentation *Bacillus subtilis* inoculation along with mesorhizobial inoculation could enhance chickpea productivity by more than 25%. The details of different evaluations leading to development of these endophytic bacterial inoculants will be discussed.

Diversity of soil microbial communities associated with Agro-ecosystems.

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ABSTRACT

Agricultural systems are the significant contributors to food, fibre and fuel, the basic necessities of mankind. The diversity of microorganisms associated with these agro-ecosystems not only influences the productivity but also performs ecosystem services like recycling of nutrients, control of local microclimate, regulation of hydrological processes, detoxification of toxic chemicals and keeping a check on the abundance of harmful invaders. The over exploitation of the soil resources and intensive use of agro-chemicals for increasing crop production during and post era of green revolution has led to deterioration of the physico-chemical and biological condition of the soil. Microorganisms are key players for sustaining the soil quality and the diverse microbial communities associated with various crops with potential of fixing nitrogen, solubilising phosphate and cellulose degradation play an important role in maintaining and improving the soil quality. This crop-microbial interactions needs to be energized for the sustainability of agriculture with considerable ecological stability and environmental soil quality. The study aims to explore the potential role of microbial communities in nutrient cycling under agricultural soils in Punjab, India, to evaluate the population dynamics of microbes in improving soil organic matter with focus on potent phosphate solubilising and cellulolytic bacterial strains.No chemical/organic fertilizer was added during this study. The three bacterial strains viz. MSK1, MSK13 and MSK24 were isolated from the same soil and characterized by partial sequencing analysis of 16S rRNA gene. The results showed that the microbes belong to the genera *Pseudomonas* (MSK13) and *Serratia* (MSK1 and MSK24).The bacterial isolates *Serratia* sp. (MSK1 and MSK24) and *Pseudomonas* sp. (MSK13) exhibited extracellular cellulase and phosphatase activity in the *in vitro* conditions. Further, these bacterial isolates were inoculated as mass inoculum in 1m X 1m plots of the chickpea. The results showed positive correlation ($r^2 = 0.853$) among soil phosphatase activity and inoculated bacterial population, which was also positively correlated ($r^2 = 0.730$) to concentration of available phosphorus in the soil. ERIC-PCR based fingerprinting technique was used to track the population of mass inoculated bacteria MSK1, MSK24, MSK13and the results showed a good survivability of introduced strains in soil, measuring about 40.2, 56.8 and 34.4 % after crop harvest, respectively. A significant enhancement in organic carbon and available phosphorus was observed in the soil of inoculated plots over the uninoculated control plot. The results obtained in this study concluded that the introduction of local isolates of both *Serratia* sp. and *Pseudomonas* sp. contributed significantly in the increase of soil organic matter and available phosphorus content. The present investigation indicated the necessity of detailed investigation during the cropping systems that are governed by the microbial communities. There is an urgent need for the sustainable intensification of agricultural production systems towards supporting productivity and income generation in order to ensure food security in developing countries.

Keywords: Agricultural soils, Chickpea, Phosphatase, Cellulase, Phosphorus, organic carbon, *Pseudomonas, Serratia.*

Effect of Municipal Solid Waste Compost Amendment n Enzymatic Activities of Soil

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ABSTRACT

Urbanization contributes enhanced municipal solid waste (MSW) generation and unscientific handling of MSW degrades the urban environment and causes health hazards. Considering the typical composition of wastes and the climatic conditions of India, composting is a highly relevant, cost effective and simple technology for treatment of organic biodegradable fraction of municipal solid waste. Composting is an environmentally beneficial waste recycling mechanism and the benefits of compost use include improved soil quality, enhanced water retention capacity of soil, increased biological activity, micronutrient content, and improved plant growth and yield of crops. The exposure of plant to unfavorable environmental conditions increases the production of oxidative stress and certain enzymes are released to deal with oxidative stress responses in plants. The addition of compost enhances the soil properties and secretion of soil microbial enzymes to control the stress developed in plants. This research work was conducted to investigate the effect of municipal solid waste compost on the enhanced soil enzymatic activity. The composting process was done in two sets; one set with only MSW (C1) and the second with MSW and cellulose degrading bacteria *Bacillus amyloliquifaciens* isolated from dumpsite soil (C2). The seeds were germinated in soil mixed in proportion with MSW compost in ratio 25% (compost):75% (soil) and the soil enzymatic activities as amylase, catalase, protease, urease were evaluated while the proline content was checked in the soil as well as germinated wheat seedlings. The results showed a more stable C:N ratio in C2 treatment set. The compost amendment in soil showed a significant increase in the soil microbial enzymatic activity as compared to control. Our findings indicate that the application of compost plus cellulolytic bacteria can immediately improve the microbial community structure and diversity of degraded cropland soils.

Keywords: Compost,Cellulose degrading bacteria, Municipal Solid Waste (MSW), Mineralization

An environmental sustainability concern due to exposure of Lambda cyhalothrin exposure on some hematological and histological parameters in non target organism - female mice

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ABSTRACT

The pesticides including Lambda cyhalothrin are used by the farmers in order to have high yield of the fodder, vegetables and grains to cater the needs of the population of the state. The study was conducted on female mice to determine the acute (24 h) effect of orally administered sub-lethal dose of Lambda cyhalothrin (LCT), a synthetic pyrethroid, - 13.25 mg/kg bw and distilled water (DW) as negative; and Cyclophosphamide (CP, 40 mg/kg/bw) as positive control on some blood parameters and histology of spleen. In LCT treated mice an increase in White Blood Cell (WBC) count, Mean corpuscular Hemoglobin (MCH) and Mean Corpuscular Hemoglobin Concentration (MCHC), Mean Corpuscular Volume (MCV) was observed. While a significant inhibition in Hemoglobin (HB, $p<0.01$), Red Blood Cell (RBC, $p<0.01$) count, and Platelets (PLT, $p<0.05$) count was observed. LCT treated spleen revealed vacuolization and megakaryocytes; hemorrhage; and abundance of megakaryocytes and necrotic areas were observed. LCT treated splenic tissues revealed invagination/disintegration of nuclear membrane, fragmented chromatin material and evaginated nuclear membranes under Transmission Electron Microscopic examination. This revealed that LCT exposure resulted in induction of toxicity in mice and possibility of toxicity induction in other non-target organisms including human can't be ruled out, which may adversely affect the environmental sustainability and quality of life of non target organisms. So pesticides must be used following precautions in order to minimize the toxic effect of pesticides by farmers of the agrarian state of Haryana, which is one of the major food bowl of the country.

Keywords: Environmental sustainability, Lambda cyhalothrin; Cyclophosphamide; Pyrethroid; Hematology; Histology; Hemoglobin; Mice, Non-target organisms.

Theme

Genetic Resource & Plant Breeding

9th International Seminar 2017

Sustainable Intensification of Agriculture Through Resource Management and Conservation

Crossing upland and lowland rice varieties: test for success rate of genetic recombination between drought tolerance and high yield genotypes

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ABSTRACT

Rice (*Oryza sativa* L.) is a staple crop in Indonesia. Despite its main importance for the Indonesia's food supply, the production is influenced by several factors. One of limiting factors which is influenced in rice yield is drought stress. The research to produce F1 seeds has been carried out in the field. The parent lines were upland and lowland rice types, namely "Sitobagendit" and "Towuti" for upland (dry land) rice varieties and "Ciherang" and "Cibogo" for lowland rice varieties. The upland rice varieties are drought tolerance rice but having low yield. In contrary, the lowland rice is high yield varieties but less tolerant to drought. Experimentally, each crossing set was prepared by 10 female parent plants and 420 male parent plants. The male parent plants were provided from 7 different seedling period. Every female parents plant was crossed at least by providing 20 flowers. The success rate of crossing were 85%, 68%, 67% and 47% for the crossing between Towuti and Ciherang, Towuti and Cibogo, Situbagendit and Ciherang, Situbagendit and Cibogo, respectively. Besides, the brown rice length for those 4 sets of crossing were 6,5 mm, 6,48 mm, 6,32 mm and 6,32 mm, respectively. The presence of variability in success rate and brown rice length traits among crossing sets highlighted the diversity of rice genetic resources which is potentially important for genetic recombination between drought tolerance and high yield genotypes, accordingly, would be useful for the rice breeding program.

Keywords: crossing, upland, lowland, rice

Molecular Diversity for Amylose Content and Aroma Traits in a set of traditional landraces of rice in Kashmir

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ABSTRACT

Landraces are morgues of genes. Assessment of genetic divergence among the traditional landraces of rice (*Oryza sativa* L.) with respect to the cooking quality traits is important to uncover their relevance in crop improvement programs. To revel the genetic diversity in term of cooking quality traits a study was conducted on a set of total 113 traditionally cultivated rice varities of Kashmir Valley. The revealed that majority of the landrace were possessing low amylose content, soft gel-consistency and ASV of scale 6. Aroma analysis revealed the presence of aroma in five genotypes *viz.*, *Mushkbudji*, *Kuch*, *Mehavan Green*, *Mushkandi*-I and Kamad. Further, the PCA revealed a significant level of studied attributes in genetic diversity among the genotypes.

Six simple sequence repeat (SSR) markers tightly linked with *Wx* and *fgr* genes were used for diversity analysis. All the markers were found significantly associated with all the traits under study and successfully revealed a substantial level of polymorphism in the experimental material. A total of 563 bands were produced by all six markers with an average of 93.83 bands per primer. The PIC value ranged between 0.064 and 0.849. The Jaccards dissimilarity indices which ranged from 0.0 to 1.08, with an overall mean of 0.646, revealed the presence of a significant level of molecular diversity among the genotypes. Further, the cluster analysis classified all 113 genotypes in three major clusters which further sub-divided into five sub-clusters. The highest numbers of genotypes were classified in major cluster II. The results obtained for cluster analysis were further confirmed by using PCA.

Keywords: Rice, Amylose Content, SSR, Aroma, Genetic Diversity, Polymorphism.

Anti-Tubercular Activity Towards Synergistic Effect of Ethanolic Extract of *Ocimum sanctum, Allium sativum, Adhatoda vasica* Using *M. tuberculosis* (H37Rv)

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ABSTRACT

In present study, we analyze the combinations of ethanolic plant part extracts (5% w/v) of *Ocimum sanctum, Allium sativum, Adhatoda vasica* were analyzed for colony forming units (CFU) and percentage inhibition of *M. tuberculosis* H37Rv after 42 days on L-J medium. The different combinations use for the present study was *Ocimum sanctum+Allium sativum+Adhatoda vasica, Ocimum sanctum +Adhatoda vasica* and *Ocimum sanctum+Allium sativum.* In present study the synergestic effect of *Ocimum sanctum, Adhatoda vasica* and *Allium sativum* was investigated and the combination of *Ocimum sanctum* and *Allium sativum* was found the best combination with the percentage inhibition of 81.82% followed by the combination of *Ocimum sanctum, Adhatoda vasica* and *Allium sativum* with the percentage inhibition of 77.12%. The results gave an indication that these medicinal plants could integrate the antitubercular activity in combination instead of using alone.

Keywords: Synergistic effect, *Mycobacterium tuberculosis,* CFU, Antimycobacterial ac

Theme

Technology

9th International Seminar 2017

Sustainable Intensification of Agriculture Through Resource Management and Conservation

Waste human hairs hydrolysate based Biofertiliser for Agricultural crops

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ABSTRACT

Biofertilizers are important keystone needs intensive research to improve the quality primarily to achieve food security for the growing population and restore soil fertility. Nature has provided countless avenues for research in these fields which needs to be explored. The search of new resources to develop novel biofertilizers to promote with multi-crop growth promoting activities are most important for sustainable global agriculture. The bid to explore the waste materials as novel sources to develop is biofertilisers is in need of hour. Human hairs are considered as of no use in most societies and therefore are found in the municipal waste in urban and rural areas around the world. In rural area with low population density, the hair is thrown away in nature where it slowly decomposes over several years, often accumulates in large amounts in the solid waste streams and chokes the drainage systems in urban, creates an issue and disposal problem. There is dire need to develop systems which utilize the waste material as a resource. Human hair is one of the highest nitrogen-containing (~16%) organic material in nature because it is predominantly made up of (nitrogen-containing) proteins. In India, hair has been used directly as fertilizer for many fruit and vegetable crops and in making organic manures, based on the same approach with the expertise and technical training from MGIRI, Wardha, we practised the chemical hydrolysis of waste human hair at high temperatures in acid or base solutions that leads to decompose them within a few hours of treatment. The resultant hydrolyzed solution (hydrolysate), is consists of amino acids with some fatty acids and nucleotides, which has good ingredient to act as a liquid fertilizer after neutralization. The developed formulation of waste human hairs hydrolysate was produced at Floritech Organo Industries, Nagpur and analysed for its composition. This was tested under field trail for *Cicer arietinum* Chickpea Var. Ankur Annagiri at Besur, Dist- Nagpur (Maharashtra). The trail experiments using this hydrolysate as foliar spray show enhancement of the chlorophyll content as well as biomass in the plants. The two foliar sprays were made with 30 days after sowing (initial branching) and 60 days after sowing (flowering stage). The result show the average increase in plant height by 25 cms and double the number of braching with 2 fold incresae in number of fruits which lead to higher yield of the crop. Fertilization with hair hydrolysate is also expected to protect the crops against fungal disease and strong resistance to plants. The commercial production of waste hair hydrolysed will be benefit of the farming society at large and make more sustainable application with biotechnological approach.

Keywords: Biofertilizers, *Cicer arietinum,* waste human hairs, hydrolysate.

Nutritional Evaluation & Shelf Life of Traditional Products Using Composite Flour (Pearl millet-Sorghum-MungBean-Marwa)

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ABSTRACT

The present study was conducted to develop value added products utilizing composite flour (pearl millet (WH-901-445) sorghum (HC-125) mung bean(MH-125) marwa leaves) evaluate the nutrient composition & acceptability of value added products. The most acceptable & storable value added products were analyzed for shelf life study. Six types of composite flours were prepared from blanched pearl millet: sorghum: germinated mung bean in ratio of 80:10:10(Type-1),60:20:20 (Type 2) & 40:30:30 (Type3) & with incorporation of marwa leaves powder in ratio of 75:10:10:5(Type 4), 55:20:20:5(Type5) & 35:30:30:5(Type6). The composite flours were utilized in development of value added products like traditional products viz-chapatti, parantha, ladoo, sev & matar. The result indicated that on the basis of nutritional evaluation Type3& Type4 composite flours had highest content of protein, crude fiber, ash, total sugar, reducing sugar, non reducing, total dietary fiber, soluble dietary fiber, insoluble dietary, calcium, *invitro* protein& starch digestibility, total phenolic content& DPPH free radical scavenging activity. On the basis of organoleptic evaluation, it was found that Ladoo, sev, chapati, matar, parantha developed from Type 3& Type4 composites flour were most acceptable products Chapati & parantha prepared from composite flours were in the category of" liked very much". Whereas other value added products fall in the category of" liked moderately". Nutritional evaluation of all the value added products exhibited that marwa leaves powder supplemented composite flour Type6 based products had significantly higher content of crude fiber, ash, total soluble sugar,non reducing sugar, total dietary fiber, soluble dietary fiber, insoluble dietary fiber, calcium, iron, zinc, total phenolic content & DPPH free radical scavenging activity as compare to unsupplemented &controls. Shelf like studies showed that storable value added products like ladoo, sev, mater, were organoleptidly acceptable during the storage period (0 -60 days) & fell in the category of" liked slightly," Fat acidity content & peroxide value stored products increased significantly from 0 day to 60 day, Products based onType3 composite flour contained significantly higher content of fat acidity& peroxide value, Supplementation of marwa leaves powder caused significant reduction of fat acidity& peroxide value in the all stored products during the storage period (0-60days), All the value added products supplemented with marwa leaves powder were found to have better nutritive value & better shelf life as compared to unsupplemented ones.

Process Parameters Optimization For The Production of Bioenergy Using Waste Water

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ABSTRACT

Water covers 75% of the earth surface, around 67% of our body and is essential for life. Water pollution is the main threat of present scenario due to human activities. The water discharged by the community is known as waste water or sewage. This study is generally aimed to optimization of various parameters such as pH, sugar, food stress for copper and graphite and food stress for zinc and graphite for the production of bioenergy. In this study we used, textile waste water as an industrial waste. pH 8.0 with Zinc & Graphite, dextrose as sugar, food stress for copper and graphite electrode with potassium acetate and food stress for zinc and graphite electrode with 50% solution of ferric citrate & wastewater were detected as optimized parameters of present study.

Keywords: Sewage, Bioenergy, Food Stress, waste water.

Effect of Germinated Triticale Based Products on the Glycemic Index of the Diabetic Patients

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ABSTRACT

Cereals are staple foods, and are important sources of nutrients in both developed and developing countries. Cereals and cereals products are important source of energy, carbohydrate, protein and fiber, as well as a range of micronutrients such as vitamins, magnesium and zinc. Increasing population demands increased food production, especially for cereal grains. Therefore production increases mainly come from enhancing the yield potential of new crops. Triticale, a man made cereal grass crop obtained from hybridization of wheat (Triticum) with rye (Secale cereale). The hope was that triticale would combine the high yield potential and good quality of wheat and resistance / tolerance to the biotic and abiotic stresses of rye. Triticale grains can be used for human food and livestock feed. Germination may be defined as an emergence of embryo from the seed by starting a variety of anabolic and catabolic activities, including respiration, protein synthesis and mobilization of food reserves after it has absorbed water. Glycemic Index is a measurement carried out on carbohydrate-containing foods and their impact on our blood sugars. The Glycemic Index is a numerical index that ranks carbohydrates based on their rate of glycemic response. Glycemic Index uses a scale of 0 to 100, with higher values given to foods that causes the most rapid rise in blood sugar. An indicator of the ability of different types of foods that containing that break down most quickly during digestion have the highest glycemic index also called Glycemic Index. Sprouted cereals has the low glycemic index and does not cause blood sugars spikes and germinated sprouts contribute easier digestion because their starches have already been broken down by enzymes. The aim of this research was to evaluate the effect of germinated triticale based products on the glycemic index of the diabetic patients. The triticale based products are Non- Medicated Supplementary Drink, Medicated Supplementary Drink and Chapati spread - which are made from germinated triticale grain, germinated wheat grain, germinated pearl millet, ashwagandha and safed musli. The result of the nutritional analysis indicated that nutritional composition of Non-Medicated Supplementary Drink are moisture- 8.4 gm and ash- 1.76 gm. Nutritional composition of Medicated Supplementary Drink are moisture- 8.2 gm and ash- 2.02 gm. And nutritional composition Chapati Spread are moisture- 8.6 gm and ash- 1.2 gm. Regarding sensory properties, this product evaluated on sensory parameters using nine point hedonic scale. Sensory score for Non-Medicated Supplementary Drink for tatste and colour 7.8-8.8. Mouth feel(texture) 8.0-9.0 overall acceptability 8.0-9.0. Sensory score for Medicated supplementary for taste and colour 7.5-8.5, texture 7.2-8.2 overall acceptability 7.5-8.5. Sensory score for Chapati Spread for taste and colour 7.0-8.0, texture 7.5-8.7, overall acceptability 7.5-8.5. Sensory qualities of three of products (Non-Medicated Supplementary Drink, Medicated Supplementary Drink, Chapati Spread) was monitored during storage which was stable for three months. Non-Medicated Supplementary Drink and Medicated Supplementary Drink are recommended for Diabetic patients and in chronic heart disease. And Chapati Spread is recommended for all age groups.

Keywords: Cereals, Triticale, Germination, Glycemic Index, Nutritional composition, Sensory qualities.

Scope of Food Processing Market in India

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ABSTRACT

The Indian food industry increasing its contribution in world food trade every year as the Indian food market is the world's sixth largest, with retail contributing 70% of the sales. It is projected to grow at the rate of 104%, touching US$ 482 billion by 2020. In India, the food sector has emerged as a high-profit sector and offers for value addition, particularly with the food processing industry. About 32% of the country's total food market, the food processing industry is one of the largest industries in India and is ranked fifth in terms of production, consumption, export & expected growth. The total food production in India is likely to double in the next 10 years with the country's domestic food market estimated to reach US$ 258 billion by 2015. The government of India through the Ministry of Food Processing Industries (MoFPI) encourages investments in the sector. The market size of India is also very promising as the Indian gourmet food market is currently valued at US$ 1.3 billion and is growing 20%. It is expected to cross US$ 2.8 billion by 2015. Indian food brands are increasingly finding prime shelf space in retail chains abroad.

Keywords: Food industries, food processing, food market, MoFPI.

Indian Kinnow (Tangerines) Production and export Potential

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ABSTRACT

India is well known as Kinnow (Tangerines_ fruit (family citereace) producing country for domestic consumption and international eport as fresh fruit which is rich source of vitamin c, mineral matters, and energy. This particular citrus fruit is registering good progress in export as compared to oranges. In view of its production potential few provincial l governments in India are taking keen interest for its enhanced production in view of emerging export potential. For example the state governments of Punjab, Hayana, Rajasthan and Himachal Pradesh. Punjab produced 9.88 lak tonnes of Kinnows over an area of 46000 acres, while Haryana produced, 2.31 Lakh tonnes of Kinnows over an area of 19402 acres, Rajasthan produced 1.82 Lakh toones of Kinnows over 14612 acres and Himachal Pradesh produced 80 Lakh tonnes of Kinnows over an area of 20,000 acres. Thus the qualiy of fruits and quantity of produce varies from state to stae.

Approximately over 200 containers of Kinnows are being exported from Haryana and Punjab to Russia, Ukraine, England, USA with a good positive response. The Indan Railway Ministry is providing refrigerated wagons to support export of Kinnows from India. Besides, the Coca Cola company is targeting to export its juice. Although tere is a great scope to enhance export of Indian Kinnows, yet there are major challenges associated with export process particularly its transportation in cardboard containers. Fungal infection during passage is a main challenge theat needs to be addressed by better packing material and conditions. This is to explored with cooperation from scientists and engineers in western hemisphere.

Abstracts

of Intended Presentations

9th International Seminar 2017

Sustainable Intensification of Agriculture Through Resource Management and Conservation

Australia towards sustainable agriculture production

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ABSTRACT

Sustainable farming is the adoption of farming practices that minimize tilling and water use; encourage healthy soil by planting fields with different crops year after year and integrating croplands with livestock and minimise pesticide use by nurturing the presence of beneficial organisms that control crop-destroying pests. It is aimed to increase farm production without the use of more land and water. Food production needs to be increased at much faster rate than it is currently to feed the growing population. Today's major challenges are securing future global food security and achieving environmental sustainability simultaneously. But the question is whether sustainable agriculture has ability to meet such needs.

Australia is relatively a dry continent and summer is harsh to grow crops in many parts of Australia placing doubt in intensification of broad acre farming. Australian farming is mostly rainfed where only less than 1% of arable land is under irrigation. In the past Australian farms faced with problems, such as loss of crop diversity leading to mono culture that made crops vulnerable to biotic and abiotic stresses; degradation of land and water quality by excessive use of fertilizers and pesticides; loss or contamination of ground water in areas where water is pumped out for irrigation; dryland salinity; acid soils and so on. To mitigate this situation and make agriculture production more sustainable, Australian farmers and scientists have significantly changed the farming practices, such as inclusion of diverse crops in the cropping system, minimum tillage, stubble retention to conserve soil moisture, use of controlled traffic farming with the use of modern farm machineries and GPS technology, adoption of more grain legumes and pasture legumes in the cropping system to improve soil fertility and break disease cycles, making more dams to harvest rain water, use of more renewable energy, like solar and wind power in the farm and integration of sheep and beef cattle in grain farming. These measures are coming in to fruition. Today, Australian farms are more sustainable than they were 20, 30 years ago with more production without adding more land. Farmers represent less than 1% of total population in Australia, but they produce more than three times food needed by the country.

Keywords: Cropping system, food production, resource conservation, sustainable agriculture

Stability in Bread Wheat Genotype for Grain Yield, Zinc and Iron Concentrations under Different Environments

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ABSTRACT

The objectives of this study were to estimate genotype × environment (GE) interaction effects and testing stability of their performance and range of adaptations to determine the stable bread wheat (*Triticum aestivum* L.) genotypes for grain yield and its components with reference to Zn and Fe in different areas of Punjab (India). Where, development of any crop genotypes with wider adaptation is one of most important goal of breeding program. Grain yield and its components with quality traits were assessed in 21 wheat genotypes with 3 checks using analysis of variance and regression analysis at three different locations: Bathinda, Gurdaspur and Ludhiana during 2015-16 in Punjab (India). The stability parameters are useful in characterizing genotypes according to their relative performance across locations. The experiment was grown in a plot size 1.20 x 4 m with randomized complete block design with three replications at each location. The combined analysis of variance for environment (E), genotype (G) and (GxE) interaction was highly significant for all studied traits, suggesting differential responses of the genotypes and the need to stability analysis. Results revealed that high yielding genotypes can also be stable. The check HD 3086 and PBW 725 and genotypes BWL 6011, BWL 6064, BWL 6068 and BWL 6069 for grain yield/plot had desired performance in term of high mean, unit regression coefficient (bi) and least deviation from regression (S^2d), indicating the role of linear portion of GxE interaction in the performance of these genotype. The value of regression coefficient (bi) of genotypes BWL 6008, BWL 6013, BWL 6005 and PBW 725 for days to heading; BWL 6007, BWL 6008, BWL 6009 and PBW 725 for plant height; genotypes BWL 6008, BWL 6062, BWL 6063 and PBW 725 for grain Fe concentration; BWL 6001, BWL 6002 and PBW 725 for grain Zn concentration; BWL 6005 BWL 6008 and PBW 725 for 1000 grain weight and genotypes BWL 6008, BWL 6033, BWL 6062 and PBW 725 for grain yield/plot were less than one (bi<1), indicating that these genotypes were considered specially adopted to unfavorable environments. Meanwhile, the value of regression coefficient of genotypes BWL 6001, BWL 6002, BWL 6003 for days to heading; BWL 6007, BWL 6064 and BWL 6065 for plant height; genotypes BWL 6007 and BWL 6009 for grain Fe concentration; HD 3086 and WH 1105 for grain Zn concentration; BWL 6011, BWL 6064 and BWL 6066 for 1000 grain weight and genotypes BWL 6011, BWL 6063, BWL 6064, BWL 6065 and check HD 3086 and WH 1105 had bi values more than unity (bi>1) and could be adapted to optimum environment.

Keywords: wheat, stability parameters, Fe, Zn, grain yield.

RNA interference technology: new forms of resistance against Root Lesion Nematodes

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ABSTRACT

Plant parasitic nematodes (PPNs) reduce crop yields and account for crop losses of estimated at US$ 125 billion worldwide. PPNs damage host plants by disrupting water and nutrient uptake in plant roots and divert nutrients for their own growth and reproduction. The damage causes by root lesion nematodes is more severe under water limiting or drought conditions. The symptoms cause by root lesion nematodes are typical of plant suffer water stress and nutrient deficiencies, including wilting, leaf yellowing and premature senescence.

PPNs are amongst the five most important groups of plant pest in terms of economic losses in agriculture, the others being viruses, fungi and bacteria and insects. Root lesion nematodes (*Pratylenchus* spp.) are important migratory PPNs that attack the roots of more than 400 plant species including economically important crops such as wheat, barley, banana, sugarcane and horticultural crops. They cause losses of 7-15% in wheat in low rainfall agriculture. Techniques used to manage nematodes rarely effective and genetic resistance is usually lacking. This makes it difficult to manage/control nematodes using traditional breeding approaches.

Plants respond to pathogen invasion in a complex manner including changes in structure, metabolism, gene expression and/or physiological defences which can prevent invasion, development and/or reproduction of an invading organism. To combat host defences, nematodes have developed a battery of 'effectors' which enable them to establish successful parasitism.

In this research we have identified a series of effectors of root lesion nematodes that are required for successful parasitism. These are being characterise using molecular tools such as and use RNA interference technology to understand their function, It is expected that this research will provide important new molecular and genetic information on root lesion nematode – host interactions which could be exploited to develop new forms of resistance in major staple crops such as wheat.

Heterosis and Inbreeding Depression of Linseed (*Linum Usitatissimum L.*) in few Early Hybrids

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ABSTRACT

The major thrust in plant breeding strategy has been to evaluate heterosis in the hybrids of common crops. The extent of heterosis as evidenced by the superiority of the F1 hybrid over mid parental value and better parent has been of great economic importance in exploiting hybrid seed production at commercial scale.The inbreeding depression of the hybrid is of great significance because it provides the information as to how long heterotic behavior of the F1 hybrid can be retained. Genetic significance of inbreeding depression help us to identify the genes responsible for the character and their mode of segregation.Early flowering and seed setting has several advantage over normal crop which may be further utilized if their hybrids are of good quality.

Twelve Divergent genotype of linseed along with their F1 and F2 of a diallel set consisted the experimental material which were grown in a randomized block in three replications during crop season of 2016-17. Five plants for F1 and ten for F2s were selected for recording data at harvest.

For a lot of 132 hybrids five earliest flowering hybrids were chosen for study. Heterosis was observed in either direction. The range of heterosis for Plant height ranged from 20.43 to 84.60 percent. Hybrid L-27 x LC-1010 exhibited maximum curtailment (-24.28%) in number of days to flower. A high magnitude of positive heterosis was observed in cross combinations L-27xLC-1010 and SPS-2310xLCK-152 for seed yield. Late maturing plants of Linseed pose many difficulties like bird damage. Lower seed set and seedfilling. Breeding behavior of some early hybrids from a twelve parental diallel set is present here.

Keywords: Linseed, Heterosis, inbreeding depression, early maturing hybrids.

Promoting Livelihood opportunities through integrated agriculture

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ABSTRACT

In India, Agriculture and allied sector provides livelihood support to about two third of the population and still continues to be the main stay employing and feeding most of the rural mass. In Haryana about 60 % of the farmers are considered small and marginal with an average holding size of less than 2 acres, the other farm land being owned by the medium and large farmers. Integrated Farming System can be defined as integration of more than one different types of agriculture and allied enterprises based on the sound principles of scientific agriculture for optimum utilization and management of available resources, recycling of waste / bi-products, engagement of family labour, decrease in cost of cultivation and increase in input use efficiency to maximize production, productivity, income generation and provide gainful employment from unit land area over stipulated time period. Integrated Farming System can be broadly categorized as a blend of crop agriculture+ Livestock and Poultry husbandry +Horticulture including fruits, vegetables and flower cultivation + Aqua culture and fisheries + other small scale enetrprizes like mushroom, bee keeping, vermicomposting etc depending upon agro-ecological regions. The byproduct / waste of one system/ enterprise are used directly in another system. With this enterprise is expected to maximize production and minimizing the cost of cultivation as well as environmental pollution. Emphasis is given for optimum utilization of the available land/space rather than by-product / waste utilization. Both By-Product / Waste and Space Utilization. Integrated Farming System approach not only fulfills the household needs but enrich diet of human being and animals both for nutritional security. Further, diversified nature of the model provides employment opportunity for unemployed rural youth. Economic and livelihood analysis of the system revealed that beside household food, feed, fodder and fuel security, the system generates a sizable amount of savings which will assist to meet other liabilities of the family including education, health and social obligations and overall improvement in livelihood of small farm holders. Integrated farming system (IFS) is considered as one of the best option towards intensification of small holder farm income to ensure sustainable livelihood. Integration of resources is made through a combination of land, water and animal resources of a farm through careful planning including recycling of bio-resources. Governments and development agencies have designed projects/programmes in promoting integrated agriculture through demonstration of successful models and other means. Integration of resources is a process which involves great thought in investing in one of the resource combined and gaining benefits. This paper examines income generated by different components in an integrated agriculture model. Being from Bishnoi community where animal slaughter and meat eating is not religiously permitted, we follow blend of crops, vegetables, fruits, dairy and using and selling their byproducts to attain sufficient gross income of Rs 1.5 lacs per acre to ensure satisfactory living for a family.

Role of Remote Sensing in the Field of Forestry

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ABSTRACT

Remote Sensing' was coined in the late 1950s and formally defined by Parker in 1962 at the first Symposium on the Remote Sensing of the Environment in Michigan, USA. During the last two decades, scientific advances in remote sensing have produced a number of techniques that can retrieve information for various management areas ranging from strategic to operational forestry. Emerging systems such as Radar, LiDAR or the different optical sensors of high resolution data ranging from kilometers to sub centimeters has opened an altogether new vista in the mapping of natural resource management. The advantages of these methods are rapid data acquisitions, easy integration to GIS datasets, automated data processing and large area sampling. This paper describes the possibilities and scope of Remote Sensing for collecting recent, reliable information on precious forest resources as an aid to National Forest Inventories (NFIs).

Keywords: Remote Sensing, Optical, Radar, Lidar, VHR

Improvement of elite rice variety PAU201using marker assisted selection resulting delayed flowering due to intergenic waxy locus interactions

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ABSTRACT

PAU 201, a very high yielding variety (10 tonnes per ha) was released for cultivation during the year 2007 in Punjab State, India. Despite its very high yielding potential, it was withdrawn out of cultivation in the year 2010 due to its red aleurone colour and low amylose content (13%). Due to consistent demand from farmers, Under Accelerated Crop Improvement Programme supported by DBT, we initiated a programme to improve red grain colour, bacterial blight resistance (BB) to new pathotypes, and amylose content using marker assisted selection (MAS). The red aleurone is due to single gene on chromosome 7, designated as *Rc7*. The amylose content is governed primarily by a single waxy locus *Wx*. Both these genes were cloned and gene based primers were designed. Through MAS, we simultaneously transferred three genes *rc7* for white pericarp, *xa21, Xa38* for resistance to BB and a waxy locus allele of PAU201 introgressed from a variety having high amylose content (22%). Among these *rc7, xa21* and *Xa38* are successfully transferred while, amylose content linked gene resulted in intergenic interactions of *Hd* genes of donor and recipient parents that delayed flowering. The three genes (*rc7,xa21 and wx*) in homozygous state delayed flowering of plants by 10 to 15 days (recipient parent flowers in 98-105 days). To overcome this hurdle, 21 closely linked primers were designed from the waxy locus *wx* region on the 6S chromosome. Out of these, five markers RM19406, RM19527, RM19511, RM19610 and RM19422 showed good polymorphism among the donor (RYT3148) and recipient parent (PAU201). More than 2200 plants of BC_2F_3 progenies, homozygous for both white aleurone colour, resistant to BB pathotype genes and heterozygous for waxy locus, were planted at PAU, Ludhiana. More than 1000 plants were selected based on flowering date as that of donor and recipient parent and these were analyzed for homozygosity at desired loci along with analysis of background markers.

Keywords: Amylose content**,** bacterial blight, delayed flowering, marker assisted selection, waxy locus,white aleurone colour.

New Disruptive ICT Models for sustainable grass root development: Case study of effective use of ICT for digital empowerment of Agro and allied Sectors by Mahatma Gandhi Institute for Rural Industrialization

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ABSTRACT

With the announcement of Digital India Program and with the cheap, handy tools like smartphones ICT has now finally reached the door steps of Rural India. Such untapped section of the population (almost 27% of total population of India) had started realizing the opportunities that were presented by connectivity. There is a need to have a methodical knowledge-sharing system which ensures that users do not loose themselves in the vast jungle of the internet. The Atma (Soul) of Rural India is of course Agriculture and today many applications like MKisan, MyRML are available for Agri. Extension, Rural development

Mgiri (Mahatma Gandhi Institute For Rural Industrialization) has started working in this direction eight years back even before the launch of Digital India Program. The success story of Digital Platforms created by MGIRI for holistic Rural Empowerment and how we are reaching Stakeholders through our Digital Rural Empowerment Program is shared in this paper.

For getting real benefits of Digital India Program for the Farming Community in India it is essential to have such integrated programs. The program will design/combine all relevant ICT platforms useful for Farming Community comprising of their Direct Marketing/Networking/Skill Enhancement needs and it should be truly interactive. Digital literacy drive should also be conducted for Farming Community /Rural Stakeholders for effective use of all such relevant platforms beneficial for Farming Sector.

Can Sustainable Intensification of Agriculture be Achieved Using Agrochemicals

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ABSTRACT

The Green Revolution in India started in the late 1960s and with its success India attained food self-sufficiency within a decade. The role of adequate irrigation facilities, HYV seeds, farm mechanization, improved fertilizers and use of agrochemicals cannot be neglected behind its success. There is no doubt that India has attained near self sufficiency in feeding over 135 billion peoples today. But it is also true, that we are more concerned toward enhancing food productivity. As far as food safety in term of food quality is concerned, we are still lagging far behind. Our food products are not meeting the world trade organization (WTO) guidelines for food quality/safety. Every year, lots of our food consignments are returned back from international market on ground of food safety issues and particularly agrochemicals residues. India is meager consumer of pesticides, consuming only 2% of the total world pesticides consumption. But still we are facing the harmful impacts of pesticide residues in different food products and water resources. Who can ignore the famous 'Kasargod' episode in Kerala, where endosulfan spray in early 1990's over cashew nuts renders thousands of people with harmful impact over their lives. Still infants are born with genetical disorders in that region. Another example is the famous 'Cancer Express' running between Bhatinda of Punjab and Bikaner of Rajasthan carrying a number of patient to famous cancer treatment charity hospital in Bikaner. The credit goes to indiscriminate use of pesticides in 'Malwa' region of Punjab where almost every home is having one or more patients suffering from cancer and other cardiovascular diseases. Presence of organo-phosphate (OP) and organo-chlorine (OC) pesticides residues above MRL in mothers' and bovine milk shows the level of threat which infants are facing (Kaushik et al. 2014). Persistence of OP, OC, carbamate and synthetic pyrethroids residues in fruits, vegetables, butter/ghee, spices, tea, wheat, rice, meat, fish and other poultry products to a concentration above MRL shows the ultimate contamination and negligence for food safety (Kumari et al. 2005, Kumari 2008, AINP Report 2008-09, Charan et al. 2010). Contamination of water resources with persistent insecticides and herbicides have been reported in last decade. Residues of pendimethalin, pretilachlor and some other photosystem-II inhibitors (PS-II) have been reported in food grains, straw and water resources. Under these circumstances, is it right to say that sustainable intensification of agriculture in India has been achieved using agrochemicals?

Role of biofertilizers in sustainable intensification of agriculture

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ABSTRACT

Agriculture in developing nations is in transition from conventional monoculture cropping system often supported by high inputs of pesticides and chemical fertilizers to sustainable agriculture. The definition of sustainable agriculture varies; one of the key aspects is reduction in agro-chemicals with a shift to alternative crop protection strategies such as cultural practices, organic amendments, biofertilization, resistant or tolerant crop varieties and biological control. Biofertilization and biological control can be achieved by the introduction of biological agents such as microorganisms. In all living organisms, nitrogen is essential for growth, since it is a constituent of amino-acids and bases which are building block of proteins and nucleic acids, respectively. Although dinitrogen (N2) is a major component of air, most living forms, except certain microorganisms, fulfill their needs for nitrogen by using combined form of N. Most plants take up their N from soil. Therefore, availability of fixed N in soil is a major determinant of soil fertility and thereby crop productivity. Major contributors of fixed nitrogen in the soil are diazotrophs and among these diazotrophs *Rhizobium, Azotobacter, Azospirillum* and *Gluconacetobacter diaztrophicus* are of prime importance because of their potential benefits to agriculture.

Biofertilizers or the bioinoculants are the biological entities which can help in crop productivity and also remediate the soil to regain its fertility. Biofertilizers have been recognized in Indian agriculture since last three decades in view of their low cost, effectiveness, contribution in crop productivity, soil sustainability and eco-friendly nature. Biofertilizers are now recognized as an important component of sustainable intensification in agriculture. To sustain agriculture it is necessary to establish a production system that is efficient, profitable, environmentally beneficial and capable of conserving / enhancing the natural and renewable energy source. As a useful biofertilizers for the cereals, oilseeds, vegetables and economically important non- leguminous crops, *Azotobacter* has occupied an important place over the years in many countries including India. A number of gainful characters are present in *Azotobacter* which can be responsible for better crop yields when used as biofertilizer. These are known to assist in expansion of root system, better seed germination and better integrated nutrient management.

In modern agriculture, due to heavy usage of chemical fertilizers and harmful pesticides on the crops, sustainability of the agriculture systems collapsed, cost of cultivation soared at a high rate, income of farmers stagnated and food security and safety became a daunting challenge. Indiscriminate and imbalanced use of chemical fertilizers, especially urea, along with chemical pesticides and unavailability of organic manures has led to considerable reduction in soil health. Biofertilizers/ bioinoculants hold vast potential in meeting plant nutrient requirements while minimizing the use of chemical fertilizers. These, bio-inputs or bio inoculants, which on supply to plants improve their growth and yield, are the products containing living cells of different types of microorganisms which have an ability to mobilize nutritionally important elements from non-usable form through biological stress.


Mahatma-Gandhi-Haus