AmbujaNeotia
THE NEOTIA UNIVERSITY
ज्ञानम् आत्म प्रदीपाय UGC Enlisted & Recognised

Krishi Parasar

Department, School of Agriculture and Allied Sciences

Issued: **April, 2021**

Forewords

I am very happy to learn that the School of Agriculture and Allied Sciences of our University in going to publish its first e-magazine, 'KrishiParasar' on the eve of the 'DNA Day', 25th April-2021.

It is projected that by 2050 the world's population will probably reach to the level of9 billion which will demand for 60% of more food, 55% of more water and 80% of more energy than that of present day consumption. Rapid urbanization is converting the usable cultivable land into habitat places which isdirectly putting constraint in agricultural activities. Thus, the yields of crops and productivities of agriculture must be increased in reduced land areas to meet global rising demands. To fill up the projected gap, there is a need for another green revolution and this can possibleonly by introducing genomics-assisted breeding throughgenetic engineering. This calls for the development of techniques for DNA structure manipulation needed for high yielding productivities.

To promote this new venture,there need for the participations from the farmers, scientists, politicians, the public at large, and specially the students to go for the 'DNA-Revolution' of agriculture in order to add value to agriculture, and the societies for enabling a peaceful life.

To this context the e-magazine will play a big role in bridging the emerging ideas in between our University communities with local and regional farmers in enhancing the products and services in agricultural sectors. We further hope that this e-magazine will;

- Provide a platform to interact with the academicians fordeveloping professional networking, and translating knowledge for innovation as well as developing novel products and services.
- Enhance the quality of teaching, learning and thought process in the multidisciplinary areas of agriculture, food processing and allied sciences.
- Encourage the aspiring researchers to disseminate their research results through outreach activities.

The publication of such a e-magazine will not the possible without the strong support from the entire academic community of our University in general and the Dean, School of Agriculture and Allied Sciences in particular. Thus, I would like to express my gratefulness to all our colleague for their untiring efforts in publishing this first issue.

I personally hope that this e-magazine will publish regularly containing new ideas and thoughts.It will emerge as a useful media towards the pursuits of knowledge in agriculture and allied sciences.

Dr. Biswajit Ghosh

Vice Chancellor

The Neotia University

Dean's Message

I am extremely happy to know that agriculture students of School of Agriculture & Allied Science are coming out with an e-magazine "Krishi Parasar" on the eve of World DNA Day on 25th April. The day is celebrated across the world as "International DNA Day" or "World DNA Day". It commemorates the day in 1953 when James Watson, Francis Crick, Maurice Wilkins, Rosalind Franklin and colleagues published papers in the journal Nature on the double helix structure of DNA and completion of Human Genome Project in 2003. The goal of World DNA Day is to offer students, teachers, researchers and the public an opportunity to learn about and celebrate the latest advances in genomic research, explore how those advances might impact their lives and highlight critical importance of DNA in life sciences.

In India green revolution in the early seventies was led by development of high yielding dwarf genotypes of rice and wheat in the early seventies by geneticist and plant breeders and development of complete agronomic package of practices involving different disciplines of agriculture. I humbly salute all of them because of their contribution in making India self sufficient in food production and providing livelihood to millions of farmers. However, with growing threats of global warming, climate change, pollution, etc. new challenges are emerging that threatens sustainable basis food production and livelihood of millions of people across the globe and India in particular. The catastrophic losses because of super cyclonic storm Amphan in Eastern India specifically in West Bengal and also Bangladesh on 20th May 2020 are still fresh in our memories. I am sure we shall overcome the challenges related to mitigating ever growing food demand, conserving valuable natural resources & environment, augmenting farmers income, etc. with promotion of new generation of entrepreneurs in agriculture. The use of information and communication technology in decision-making, precision farming, crop monitoring, value addition, marketing and logistics are the key new areas to focus in the near term.

I am informed that the e-magazine would have 4-segments (agriculture science vision, animation & drawing, students corner and photography) and biannual in nature. This would provide our students opportunity on continuous basis to think on the subject as a whole / topic of their choice and apply their creative mind in developing / expressing it. I congratulate our agriculture faculty members, mentors and digital initiative team for encouraging young minds and providing them an opportunity to present their ideas on e- platform. I am sure this will not only benefit the participating students but the entire students of the The Neotia University in pushing forward a new way of learning during COVID19 pandemic. I wish a grand success of this e-magazine to all our all beloved agriculture students and faculty members.

Prof. (Dr.) Sushil Kumar Kothari
Dean
School of Agriculture and Allied Sciences
The Neotia University

Departmental Message

The history and evolution of agriculture is intricately tied to human civilization itself. What began as a means of survival, has today emerged as a significant economic activity around the world. Agriculture has transformed in various ways from subsistence to affluence, from traditional to technological, from unrefined shifting cultivation to precision farming, and the pace has rapidly accelerated in the past few decades with globalization and technological advancements. In this journey of transformation media has played critical roles. Still there is a long way to go in making the planet free from hunger and malnutrition.Increasing population, changing climate, diminishing resources and increasing disposable incomes have put agriculture worldwide under tremendous pressure. While the developed countries have moved up in food, nutrition and health chain through technological advancements, second and third world countries are grappling with challenges in farming and food production.

In a country like India, which pulled out millions of people from the jaws of hunger and malnutrition through Green Revolution and is currently in the process of rapid industrialisation, agriculture is still the primary source of livelihood for about 70 per cent of the rural households. The agriculture gross value added (GVA) growth stood at 4% in FY20 and is likely to be 3% in the second quarter of FY21.The Indian food industry is poised for huge growth as well, increasing its contribution to world food trade every year due to its immense potential for value addition, particularly within the food processing industry. Indian food and grocery market is the world's sixth largest, with retail contributing 70% of the sales. India is among the 15 leading exporters of agricultural products in the world. Agricultural export from India reached US$ 38.54 billion in FY19 and US$ 35.09 billion in FY20. The total agricultural export was US$ 10.40 billion between April and October 2020. India is expected to achieve the ambitious goal of doubling farm income by 2022.

The agriculture sector in India is expected to generate better momentum in the next few years due to increased investment in agricultural infrastructure such as irrigation facilities, warehousing and cold storage. Furthermore, the growing use of genetically modified crops will likely improve the yield for Indian farmers. Going forward, the adoption of food safety and quality assurance mechanisms such as Total Quality Management (TQM) including ISO 9000, ISO 22000, Good Manufacturing Practices (GMP) and Good Hygienic Practices (GHP) by the food processing industry will offer several benefits. The agri-export from India is likely to reach the target of US$ 60 billion by the year 2022.

In light of these rapid changes and new developments happening all over the country, it is imperative that we focus on creating a conducive environment for our brilliant young minds to come forward, generate and share new ideas and creative new approaches to ensure the future potential of Indian agriculture is fully realised and the benefits reach all the stakeholders at grass root level. On the occasion of **World DNA Day**, April 25th 2021, we are extremely glad to launch our first ever agriculture e-magazine **"Krishi Parasar"** on behalf of the Faculty of Agriculture. This initiative of ours aims to create a dynamic platform for experts, students and enthusiasts to share their knowledge, experiences, information and creative ideas on latest developments, policy issues, scientific advancements and technological breakthroughs in the field of agriculture. I and my fellow board members sincerely hope that this small undertaking of ours, blossom into a vibrant creative space for our dear students, without whose active participation such an endeavour would not have been possible.

Dr. Abhishek Ghosh
Assistant Professor & Editorial Board member

Department School of Agriculture and Allied Sciences
The Neotia University

25th April is celebrated every year as World DNA Day

Content

Editorial Board

Convenor and Chief Editor:

Prof. (Dr.) Sushil Kumar Kothari

Associate Editors:

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Assistant Professor

School of Agriculture and Allied Science

The Neotia University

Agriculture is, indeed, one of the most ancient professions known from the beginning of civilization. However, it has taken unprecedented prominence today due to a progressive increase of world population- reaching more than 7 billion people- that makes necessary to improve our ability to supply food in view of assuring food security.With an increasing population comes an increasing demand for land for residential, commercial, and recreational uses. Sometimes, farm lands are converted to other uses. The subject Genetics and Plant Breeding play an important role in this context. Plant breeding is a deliberate effort by humans to nudge nature, with respect to the heredity of plants, to an advantage. The changes made in plants are permanent and heritable. The professionals who conduct this task are called plant breeders. Breeders aim to make the farmer's job easier and more effective in various ways. Keeping all this in mind, our first departmental E-magazine "KrishiParasar" will be dedicated to cover a wide spectrum of themes related to agriculture and allied sciences. The different section of magazine, tackles important topics on agriculture as well as students' curriculums. As an editorial board member, I sincerely wish the grand success of the magazine. We hope to be extent this magazine for more helpful to farmers and students in upcoming days. Finally, I would like to thanks our all collaborators, specially our students, who are the backbone of this magazine. Without their whole hearted support, we could not beable to launchthis E-magazine.

Dr. MadhurimaBanik
Assistant Professor

School of Agriculture and Allied Science

The Neotia University

Soil science is the science dealing with soils as a natural resource on the surface of the Earth including soil formation, classification, and mapping; physical, chemical, biological, and fertility properties of soils; and these properties in relation to the use and management of the soils. Soil Science plays an important role in the life of a human being. It is not only the resource for food production, but it also helps us on waste disposal, to maintain playgrounds, to distribute and store water and nutrients, and support our environment. Soil Science is awell-defined and developed discipline whichstudies the physical, chemical, biological and mineralogical composition of soil by conducting research in soil classification, tillage,irrigation and drainage, plant nutrition,soil fertility and other areas related to agriculture that benefit agribusiness. Advances in watershed, natural resource, and environmental sciences have shown that soil is the foundation of basic ecosystem function. Soil filters our water, provides essential nutrients to our forests and crops, and helps regulate the Earth's temperature as well as many of the important greenhouse gases.Soil is our life support system. Soils provide anchorage for roots, hold water and nutrients. Soils are home to myriad micro-organisms that fix nitrogen and decompose organic matter, and armies of microscopic animals as well as earthworms and termites. Soil plays a vital role in the Earth's ecosystem.The agriculture graduates can get jobs in public and private organisations, environment consultancies, research establishments, commercial and industrial enterprises, higher education institutes and many more. Various job opportunities for students pursuing the course of Soil science may be designated in the position of a Scientist, Professor, Soil Pedologist, Ecologist, Environmental Scientist, Geologist, Hydrologist,Scientific Laboratory Technician, Soil Conservation Technician.The Students of soil science learn to identify, interpret, and manage soils for agriculture, forestry, rangeland, ecosystems, urban uses, and mining and reclamation in an environmentally responsible way. This E-magazine will enrich the students regarding various aspects of agriculture and its prospects in different fields which will in turn help them to achieve great pillars of success in their future.

Editorial Board

Convenor and Chief Editor:

Prof. (Dr.) Sushil Kumar Kothari

Associate Editors:

Dr. Shraddha Bhattacharjee
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Agricultural Extension
School of Agriculture and Allied Science

The Neotia University

Agriculture is the main source of national income for most developing countries like India Agriculture plays vital role in generating employment. Due to the excessive pressure of population labour surplus economies like India and rapid increase in the demand for food, food production increases at a fast rate. Agricultural extension plays a crucial role in boosting agricultural productivity, increasing food security, improving rural livelihoods, and promoting agriculture as an engine of pro-poor economic growth. Agricultural extension officers are intermediaries between research and farmers. They operate as facilitators and communicators, helping farmers in their decision-making and ensuring that appropriate knowledge is implemented to obtain the best results with regard to sustainable production and general rural development. Our 1st E-magazine “KrishiParasar” will be helpful for both students, agricultural scientist, Farmers for up gradation of knowledge and also helpful for agricultural development. I wish a grand success of the magazine

Dr Shankha Koley
Assistant Professor

School of Agriculture and Allied Science

The Neotia University

Agriculture has been our prime economical source of livelihood from time immemorial. It has been a cultural practice through which we can maintain a sustainable source of food supply. As all other practices, agriculture has all evolved with the growing time. Modernization and new scientific approaches are applied for its development. Agricultural engineering is one such scientific aspect through which modern agricultural systems are adopted to achieve sustainability. The subject of agricultural engineering has not only been important to the farmers but also to the students, through which they can develop a career out of it. Keeping this outlook to provide more information on the modern agricultural practices, our first departmental E-magazine “KrishiParasar” will be of great value to all personals related to agriculture. I whole heartedly wish a grand success for the magazine and thank all the collaborators, without whose contribution this was not achievable.

Editorial Board

Convenor and Chief Editor:

Prof. (Dr.) Sushil Kumar Kothari

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School of Agriculture and Allied Science

The Neotia University

The agriculture sector plays a vital role in our country. It is the backbone of our economy. In future we need to produce more crops per unit area to provide food for the increasing population. In this regard, our first ever E- Magazine "Krishi Parasar" will help the students, teachers and farmers to understand the development, adaptation and implementation of new technologies in agriculture sector. I wish a grand success of this magazine.

Dr. Abhishek Ghosh
Assistant Professor

School of Agriculture and Allied Sciences

The Neotia University

On the occasion of **World DNA Day**, April 25th 2021, we are extremely glad to launch our first ever agriculture e-magazine **"Krishi Parasar"** on behalf of the Faculty of Agriculture. This initiative of ours aims to create a dynamic platform for experts, students and enthusiasts to share their knowledge, experiences, information and creative ideas on latest developments, policy issues, scientific advancements and technological breakthroughs in the field of agriculture. I and my fellow board members sincerely hope that this small undertaking of ours, blossom into a vibrant creative space for our dear students, without whose active participation such an endeavour would not have been possible.

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Scientific Articles

Scope and Career Opportunities in Agricultural Sciences

Mr. Koushik Sen
Co-ordinator, Placement Committee, School of Agriculture & Allied Sciences,
The Neotia University

"Agriculture is the backbone of Indian economy"- this famous quotation describes the importance and prospects of agriculturein India.Agriculture and its allied activities are the single most important sector in the Indian economy which contributes around 27% to the GDP (Gross Domestic Product) and more than 65% of the total work force is employed in this sector. Almost all rural as well as urban India is directly or indirectly dependent on agriculture and allied activities like crop production, beekeeping, sericulture, animal husbandry, dairy, poultry, fisheries etc. It provides various kinds of agricultural produces which areessential raw materials for a large number of agro-industries in the form of sugar, tea, coffee, fruits, vegetables, flowers, cotton textiles, jute goods, vegetable oil, silk, honey, beewax, shellac etc. All these sectors combinedly forms as a primary source of income generation by the involvement of people in different occupation. To boost the agricultural activities, knowledge and research for sustainable development of our society, the Indian Council of AgriculturalResearch (ICAR), the apex body has taken severalinitiatives to promote and encourage agriculturaleducation in the country. This style is common in flood affected areas and river bunks where the soil is washed out by water flow and the plant root system is exposed. This style of bonsai is very difficult to maintain.

B.Sc. in Agriculture (Bachelor of Science in Agriculture)

B.Sc.in Agriculture is a four years undergraduate professional course offered by various central government and state government universities as well as manyprivate universities in India. The demand for agri-graduates is increasing every day in India and abroad. More interestingly, the course fees for completingthis particular professional course are also considerably lower compared to other professional degrees, while rewarding with good jobs and a better package.A student pursuing B.Sc. in Agriculture course will study a wide variety of subjects including agronomy, soil science, horticulture (fruit science, vegetable science, floriculture and landscaping, post-harvest management), plant breeding and genetics, entomology, plant pathology, animal sciences, extension education, plant biochemistry, agricultural economics, plant biotechnology, statistics etc. The syllabus is as per the guidelines of ICAR (Indian Council of Agriculture Research) and is designed to train students to understand ways of improving the crop production in a sustainable manner without disrupting the environment and to provide overall knowledge related to agriculture and related disciplines.Eligibility criteria for admission to B.Sc.in Agriculture (Hons) require completion of 10+2 with 60% marks either with a subject combination of Physics, Chemistry & Biology or with Physics, Chemistry &Mathematics combination. The total course is divided into 8 semesters and the first six semesters are offered with different subjects which are comprised of theories and practicals. Remaining last two semesters are offered with student internship to different agro-industries, academic institutes, research institutes, Krishi Vigyan Kendras (KVKs) etc. followed by Rural Agricultural Work Experience (RAWE) programme and project submission.The main focus or aim of this fouryear program to provide hands on training through a variety of learning assignments with related knowledge, practical skills, and competencies in agriculture. This degree prepares students for a wide range of careers

related to the government, public and private sector agriculture industries and other allied industries.

Scope & Opportunities for Higher Education

After B.Sc. in Agriculture, students have the opportunity to pursue further study by joining M.Sc. andPh.D. degree programmes. In India, a student has the choice to pursue Post-graduation on 95 courses and Ph.D. on 80 courses inagriculture and allied subjects. During pursuing these programmes, plenty of scholarships and fellowships are available and offered by the University Grants Commission (UGC), ICAR, BARC, DST, DBT etc. Both these higher education programmesaims to elevate thelevel of thinking of students in theconcerned discipline and are focused to specificaspects of that field. Through these academic endeavour, students acquire and develop a specialized and comprehensiveknowledge and skill about a specific subject which are helpful for them to get better pay packages. In addition, students have the option to go for MBA in Agri-business offered by various IIMs across the nation.It is also worth mentioning that, ample opportunities are available for pursuing higher studies in abroad like in Germany, U.K., Sweden, U.S.A., Canada, Australia, Japan etc. These countries offer plenty of scholarships and fellowships like Erasmus-Mundus by the European Union, DAAD Fellowship by Germany, Humboldt Fellowship, Nehru-Fulbright Fellowship etc. and many more to attract meritorious students from across the globe. To get selected in these various institutes abroad, good score in examinations like TOEFL, GRE, IELTS etc. is essential.Gaining a Master's or Ph.D. degree from an Indian university or abroad will open more job avenues in agriculture sphere.

Career Opportunities and Future Avenues

Government sector:

In India, plenty of job opportunities are available for the agriculturalgraduates in various central and state government departments of agriculture to join as AgricultureOfficer (AO) or Assistant Director of Agriculture (ADA) or Agriculture DevelopmentOfficer(ADO). Also, they can go for the Block DevelopmentOfficer(BDO). In certain states, agri-graduates have the opportunities to join as Assistant Director of Horticulture (ADH) or Horticulture Development Officer (HDO) in the statedepartment of horticulture and asSoil Conservation Officer in soil andwater conservation department. Thesepostsare recruited by the State Public ServiceCommission or concerned department by conducting competitive examination. After B.Sc. Agriculture, job seekers can also join as an Assistant Teacher in Agriculture or Work Education in different schools through School Service Commission as in West Bengal. Many nationalized banksas well as private sector banks offerjobs for agriculture graduates as Field Officers,Rural Development Officers andAgricultural and ProbationaryOfficers.Job opportunities also exist in National Seed Corporation, State Seed Corporation, Food Corporation of India, Warehouse Corporation of India, Fertilizers Corporation of India etc.as Seed Officer, Scientist,Management Trainee, Trainee Agriculture, Technical Officer, etc. Placement opportunities are also available for agri-graduates in the areas offarm or tea garden management, landscaping and beautification, agricultural grading,packaging and labeling etc. After post-graduation, there is also ample opportunities in government sector jobs like Plant Quarantine Officer, Research Assistant, Agricultural Consultant etc. Those students who wants to build their career in research and development may get placement as Agricultural Research Scientist (ARS) which is conducted by the Agricultural Scientist Recruitment Board (ASRB) through ARS/NET examination. Apart from these, Doctoral degree holders are eligible for the Assistant Professor jobs offered by various central and state agricultural universities in India.Agriculturalgraduates are also eligible to apply for the technical posts in various ICAR institutes. Technical posts like Technical Officer (Level T-5), Technical Officer (Level T-6), Senior Technical Officer and SubjectMatter Specialist (SMS) in different KVKs (KrishiVigyanKendras) are the better career opportunities for Master's and Doctoral degree holders. M.Sc. degree holders during pursuing their Ph.D. may also get a position of Junior Research Fellow (JRF), Senior Research Fellow (SRF), Research Associate (RA) etc. in different research projects or schemes funded by ICAR or government organizations or private organizations. Master's and Ph.D. holders can also get appointed as Consultants, Scientists, Research Officers etc. in various international organizations around the world like the Food and AgricultureOrganization of the United Nations,ICRISAT, ILRI, IBPGR, IRRI, IAEA and some otheragencies related to agricultural development.

Corporate Sector:

In India, a large number of agri-graduates may get placement in different agro-based industries which are recognized as potential sectors like sugar, cotton, tea, silk, seeds, fertilizers and pesticides industries. To meet the growing demand both in processed and unprocessed food sectors, many retail markets expanding their business associated with food industries such as Reliance Fresh, Aditya Birla Group,Walmart, Amazon, ITC, Nilgiris, Pantaloons,Q shops, Food Bazaars, etc. which offers plenty job opportunities for agriculture graduates.Various sales and marketing jobs related to agricultural produces, pesticides, seeds, fertilizers etc. along with their transportation and storage from warehouses to markets and vice-versa are also offered by many private and public sector industries to the agriculture graduates.

Entrepreneurship:

There is good opportunities are available for the agri-graduates to become a well establishedentrepreneurs. Agri-graduates may open various start-ups related to vermicompost, hydroponics, protected cultivations, agri-clinics, post-harvest management, organic farming,precision agriculture, value addition to processed as well as raw food materials, mushroom cultivation, soil testing kit development, kitchen garden, roof gardening, innovation in technologies related to pesticide appliances, irrigation, seed sowing, drone technology etc., sericulture, beekeeping or apiculture, fruit production, lacculture, bio-pesticides, bio-fertilizers, application of solar energy in agriculture, farm machinery, bio-plastic, bio-sensors etc. To promote these various kinds of agri start-ups, the central government offers different schemes like Pradhan Mantri Kaushal Vikash Yojana, Pradhan Mantri Mudra Yojana, ATAL Innovation Mission,The Venture Capital Assistance Scheme, Software Technology Park, Credit Guarantee Trust Fund for Micro & Small Enterprises etc. and providing various start-ups loans, MSME loans etc. through NABARD and other public sector banks.

Conclusion

Agriculture is the multidisciplinary sector in India which have a diverse scope and creates opportunities for better future among the young generation. Agriculture and Agro-based sectors not only provide ample job opportunities to the students but is a powerful tool utilized in the income generation of major population of the country especially for the upliftment of the weaker section of our society. The Government of India taking several initiatives to make agriculture more profitable, more attractive occupation by implementing various schemes, innovation and transfer of technology,farm mechanization, sustainable use of resources etc. for overall development of agriculture and allied sectors. Therefore, agri-graduates have the greatpotential to improve their livelihood through developing agricultural technologies.

Student Ready

Dean
School of Agriculture and Allied Science, The Neotia University

School of Agriculture & Allied Sciences, TNU is introducing experiential learning program in fourth year (semester 7 & 8) of undergraduate agriculture education. It is a philosophy and methodology in which educators (faculty members) purposefully engage with learners in direct experience and focused reflection in order to increase knowledge, develop skills, entrepreneurship, and inculcate values.The main objectives are:

- To promote professional skills and knowledge through hands on experience.
- To build confidence and ability to work in project mode.
- To acquire enterprise management capabilities

Five components of student READY are:.

- Rural agricultural work experience (RAWE)
- Internship
- Skill development
- Experiential learning both with and without business mode
- Students project

Rural agricultural work experience (8 weeks training)

The RAWE provides exposure to agricultural students to the natural setting of the village situations, work with the farm families, identify their problems and make use of various extension tools for transferring the latest agricultural technologies. The students also get opportunity to study the various on-going schemes related to agriculture and rural development and participate in their implementation. The students were given rigorous orientation and familiarization on various issues and problems expected on farmers' field and hence gain competence and confidence for solving problems related to agriculture and allied sciences. It has been implemented in adopted villages under the supervision of scientists. Activities focused on intensive observations/ analysis of socio-economic and technological profile of the farm families in rural areas, participatory extension approach and acquaintance with farming situations, farm practices and interaction with progressive farmers. Soil testing has become the integral part of RAWE. This helps orient our agricultural graduates for participation in various rural developmental programs. The students also gained first hand information on industries during attachment with identified agro based industries. The key programme components are given hereunder:

- Orientation & survey of village
- Agronomical interventions
- Plant protection interventions
- Soil improvement interventions
- Fruit & vegetable crop production interventions
- Food processing and storage interventions
- Animal production interventions
- Extension and transfer of technology activities

Agro industrial and cottage industries or commodities board or nursery attachment / plant clinic or soil – plant testing labs attachment / agriculture university or college or research station or KVK or NGO attachment (10 weeksinternship)technology and globalization are ushering an era of unprecedented change. The need and pressure for change and innovation is immense. To enrich the practical knowledge of the students, in-plant training is mandatory. In this training, students will have to study a problem in industrial perspective and submit the reports to the university. Such in-plant trainings will provide an industrial exposure to the students as well as to develop their career in the high tech industrial requirements. In-Plant training is meant to correlate theory and actual practices in the industries with the following objectives:

- To expose the students to Industrial environment, this cannot be simulated in the university.
- To familiarize the students with various Materials, Machines, Processes, Products and their applications along with relevant aspects of shop management.
- To make the students understand the psychology of the workers, and approach to problems along with the practices followed at factory
- To make the students understand the scope, functions and job responsibility-ties in various departments of an organization.

- Exposure to various aspects of entrepreneurship during the program period.

Skill development (20 credits in semester 8)

A student has to register any of two modules given below:

- Production technology for bio-agents and bio-fertilizers
- Seed production and technology
- Mushroom cultivation technology
- Soil, plant, water and seed testing
- Commercial bee keeping
- Poultry production technology
- Commercial horticulture
- Floriculture and landscaping
- Food processing
- Agriculture waste management
- Organic production technology
- Commercial sericulture

Experiential learning both with and without business mode

Experiential Learning (EL) with business mode helps the student to develop competence, capability, capacity building, acquiring skills, expertise, and confidence to start their own enterprise and turn job creators instead of job seekers. This is a step forward for "Earn while Learn" concept. Experiential Learning is an important module for high quality professional competence and practical work experience in real life situation to Graduates. The module with entrepreneurial orientation of production and production to consumption pattern is expected to facilitate producing Job Providers rather than Job Seekers. The EL provides the students an excellent opportunity to develop analytical and entrepreneurial skills, and knowledge through meaningful hands on experience, confidence in their ability to design and execute project work.

All the above mentioned components are interactive and are conceptualized for building skills in project development and execution, decision-making, individual and team coordination, approach to problem solving, accounting, quality control, marketing and resolving conflicts, etc. with end to end approach. It is observed that this programme is quite useful and beneficial to the students/ graduates in gaining the competency for entrepreneurship, in building confidence, skill and acquire Indigenous Technical Knowledge (ITK) of the locality and thereby, preparing the pass-out graduates for self-employment. This programme will play the key role in overall personality development of our coming Agricultural Graduates. It is believed that ICAR efforts will help in improvement of Agriculture Education and sustainable development of the rural India.

Student projects

There are number of students interested for higher education and study abroad. Keeping in view their future requirement a component of Student Project is placed to understand and identify problems of his/ her interest and field, experimental set up, taking observation and writing and documentation in the form of thesis. Project work provides several opportunities to students to learn various aspects that cannot be taught in a classroom or laboratory. In order to provide such opportunities to the graduates of agricultural science, Students Project is proposed as one of the components of the Student READY. It may be adopted based on the interest of student and expertise and facilities available with the College. The Students Project is proposed with the following objectives:

- To impart analytical skills and capability to work independently.
- To conceptualize, design and implement the proposed work plan.
- Learn to work as a team- sharing work amongst a group, and learn leadership
- Learn to solve a problem through all its stages by understanding and applying project management skills.
- Learn to do various implementations, fabrication, testing and troubleshooting.
- Learn communication report writing skills.

Artificial Milk

Paramita Karmakar
B. Sc. (Agriculture), 3rd year

The Dairy industry is destructive to animals, people and the environment. Now days many people are becoming vegetarian and continue to consume dairy products as it seems a complete harmless process. We are assuming that cows produce milk just to feed us, but this is not supposed be their job. But the reality of dairy industry is really shocking and we are still unaware of this. The existing dairy industry isunsustainable. It's putting out 37% of the methane and greenhouse gases and causing such a large impact withclimate change. It is also consuming a vast amount of resources.A Singapore start-up called Turtle Tree is growing mammary cells from different animals to lactate milk in the laboratory. They are thefirstcompany in the world that can actually use cells to create raw milk.The company Turtle Tree able to create raw milk using cells from mammals i.e. cows, bovine, goats, sheep, camels etc.When an animal produces milk, some of her mammary stem cells end up in the liquid. The technology used by Turtle Tree can able to actually identify the cells right from the milk itself. So they can be easily extracted without hurting thoseanimals.

By putting the cells in the environment where they are able to mix with this lactation media we can produce the raw milk in controlled environment. Lactation Media is a mixture that contains nutrients which found in milking-animals.

These cells adhere outside of the long tubes, which look like tiny little straws. The straws are able to pass the media through them and thousands of these straws inside of a giant tank contributes to a continuous milk flow that we're getting from the other end.

One of the things that we have realized through this COVID period is just how sensitive supply chainsare.

By using this new technology of Turtle Tree we can easily produce the fresh milk with the bioreactors or those giant steel tanks, fresh water and electricity.

Regenerative Agriculture

Avirup Saha
B. Sc. (Agriculture), 3rd year

Abstract:

Food security of the exploding population is expected to cross 9.7 billion mark globally and in India 1.7 billion by 2050 compounded with a global declining GDP. High external input agriculture (HEIA) exploited Soil Organic Carbon (SOC) level to a great extent. Adverse impacts of SOC loss are reported in soil fertility, soil eco-system, drought, disease and pest resilience and agricultural productivity with an implied effect on food security and the quality of life. Restoration of SOC pool in agricultural soils occur through adoption of recommended management practices which increase carbon input in soils. Regenerative agriculture(RA) synonymously called as Carbon Farming targets to maintain a high percentage of organic matter in soil with reduced tillage, minimum use of chemical fertilizers, increased application of organic manures, adoption of mulching, cover crops and crop rotation with minimum soil disturbance to avoid SOC loss.

Key words- Carbon Farming, SOC.

Introduction:

Agriculture plays a pivotal role in the overall development of a country. Moreover, it is the primary source of livelihood for about 58% of India's population. From the Green Revolution of 1960s, there is an adoption of modern technologies such as the use of HYV seeds, tractors, irrigation facilities, pesticides and fertilizers. The excessive use of these modern methods supported well enough the growing population of our country but simultaneously deteriorates the condition of natural resources like soil and water to a large extent and due to this the life of present and future generations are at stake.

Today, therefore, to cope with the present situation, modern scientists are finding new and alternating concepts of using these chemicals (fertilizers, pesticides) in a judicious manner so that it does not create any adverse effects on environment (soil health and quality) and harness agriculture in a sustainable way. One of such concept is Regenerative Agriculture.

Definition of RA- It is a conservation and rehabilitation approach to food and farming systems. It focuses on topsoil regeneration, increasing biodiversity, improving the water cycle, enhancing ecosystem services, supporting bio sequestration, increasing resilience to climate change and strengthen the health and vitality of farm soil. So, in a word it is a holistic management.

ALLAN SAVORY is considered as "FATHER OF REGENERATIVE AGRICULTURE".

Principles of RA - It includes five principles such as –

- Keep the soil covered
- Minimize soil disturbance
- Maximize crop diversity
- Maintain living root in the ground year-round
- Integration of planned livestock grazing into cropping systems

Keep the soil covered: The soil should be covered with crop residues, organic mulches, cover crops, etc. in order to provide more organic matter to soil and enrich soil fertility and productivity and also to reduce soil moisture through evaporation and soil erosion.

Minimize soil disturbance: At least 50% of the soil surface is covered with living plants or crop residues year-round including no-till system which will make the soil less prone to wind and water erosion.

Maximize crop diversity: Over a 3 year period, field include at least 5 different species of plants of all categories- grasses, legumes, non-legumes, fruits and vegetables. This will reduce insect pest attack as well as take nutrients and water from different layers of soil.

Maintain living root in the ground year-round: Do not uproot the plant entirely from soil. Keep the living roots inside the soil year-round which will help in staggered harvesting and also increases the microbial population in the soil.

Integration of planned livestock grazing into cropping systems: Producer or farmer should integrate livestock into cropping area and at least 30% of the crop residue and vegetation should be remained in the field after grazing. This will prevent the situation of overgrazing and soil desertification.

Advantages of RA

- It is an eco-friendly method.
- It makes the use of chemicals in a judicious manner.
- It increases the availability of both native and applied soil nutrient.
- It maintains soil health and quality by crop diversification
- It improves the physical, chemical and biological condition of soil by increasing soil microorganisms' population.

Disadvantages of RA

- Requires immense knowledge and skills in respect to soil management.
- Since it follows no-till approach there is a chance of growing many weeds which lead to increased use of herbicides.

Conclusion:

RA is an alternative to current conventional, large-scale agriculture. However, it's equally clear that it is a source of important ideas and influence. For farmers, it can offer new profitable and nature-friendly economic models. For policy makers, it offers alternative ways of thinking about sustainability. And for change makers, itreduces the negative impacts of farming. So, in a nutshell, RA support and develop a unique and resilient farm ecosystem.

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Family Farming

Subhadip Mondal
B. Sc. (Agriculture), 2nd year

Abstract:

At present, family farming is a subject of great importance for sustainable development of rural communities and promotion of healthy lifestyle. According to FAO Policies, family farming is a means of organizing agricultural, forestry, fisheries, pastoral and aquaculture production which is managed and operated by a family and predominantly reliant on family labour, including both women's and men's. Family is the predominant form of agriculture in the food production sector for both in developing and developed countries. Family farming is not only important for food security, rural development, developing new employment and management of natural resources but also, give the opportunity to encourage research that improves food security and supply, sustainable rural development, safeguards cultural heritage, protects the environment and maintains biodiversity.

Introduction:

At present, family farming is a subject of great importance for sustainable development of rural communities and promotion of healthy lifestyle. According to FAO policies, family farming is a means of organizing agriculture.

What is family farming?

Family farming is defined as a means of organizing agricultural, forestry, fisheries, pastoral and aquaculture production which is managed and operated by a family and predominantly reliant on non-wage family labour, including both men's and women's. Family farmers produce most of the food consumed in developing nations and use over 80% of the land and Africa.

Globally family farming is one of the most predominant forms of agriculture, both in developing and in developed nations. Worldwide 1.5 billion people are estimated to be involved in family farming. There are approximately 500 million small family farms across the developed and developing world, of which 280 million are in China and India alone. Family and small-scale farming are inextricably linked to world food security. Family farming sector comprises a wide spectrum of farm sizes and types regarding from very large holdings in high income economics that are easily by one or two family members with the use of labour saving machinery and hired labour to the small holdings of a few hectares or less in low-income economics.

Concept of Family Farming:

The concept of family farming covers various elements. From a sociological perspective, family farming is associated with family values such as solidarity, continuity and commitment. In economic terms, family farming is identified with specific entrepreneurial skills, business ownership and management choice and risk behavior, resilience and individual behavior. Family farming is often more than a professional occupation because it reflects a lifestyle based on beliefs and traditions, living and work.

Importance of family farming:

- It meets up the demand of food and nutrition and plays role while guest received in house.
- It creates employment for unemployed family members.
- Family farming preserves traditional food products, while contributing to a balanced diet and safeguarding the world's agro-biodiversity and sustainable use of natural resources.
- It utilizes properly the leisure period of family members and creates opportunity for extra income for family.
- Family farming represents an opportunity to boost local economics, especially when combined with specific policies aimed at social protection and well being of communities.
- It generates food and income for hundreds of millions of rural people, including the poor and marginalized.

Challenges faced by Family farmers:

- Climate change and climate variability.

- Limited access to financial resources, inputs, technology, training, research, and advisory, services and education.
- Lack of tenure security in a context of increasing competition for land and water and inadequate governance of land tenure.
- Price volatility and limited access to market.

International Year of Family Farming:

2014 was designated as the International Year of Family Farming (IYFF) at the 66th session of the United Nations General Assembly. Led by the Food and Agriculture Organization (FAO), it has the objective of raising the profile of family farming by focusing world attention on its role in alleviating hunger and poverty, providing food security and improving livelihoods, while protecting the environment and biodiversity. It has been announced that family farming and smallholder farming were important for sustainable food production to achieve food security. The year focuses on solutions to combat poverty and hunger.

The International Year of Family farming aims to promote new development policies, particularly at the national but also regional levels, that will help smallholder and family farmers eradicate hunger, reduce rural poverty and continue to play a major role in global food security through small-scale, sustainable agricultural production.

The International Year of Family Farming provides a unique opportunity to pave way towards more inclusive and sustainable approaches to agricultural and rural development that:

- Recognize the importance of smallholder and family farmers for sustainable development.
- Place small-scale farming at the centre of national, regional and global agricultural, environmental and social policies.
- Elevate the role of smallholder farmers as agents for alleviating rural poverty and ensuring food security for all.

The International Year of Family Farming presents a window of opportunity for policy makers to act responsibly to both presents and future generations in a way that will reduce poverty and eradicate hunger in their respective countries. International Fund for Agriculture Development (IFAD) believes that smallholder and family farmers can and should be at the forefront of the transformation of world agriculture. International Fund for Agriculture Development is committed to success of the International Year of Family Farming. It calls on national and global policy makers to:

- Fully support the International Year of Family Farming and its objectives, acknowledging the contribution of smallholder and family farmers to food security, rural development, employment and management of natural resources.
- Encourage policy changes that will make family farming a more secure, profitable and attractive livelihood, including for rural women and youth.
- Support programmes that enables smallholder and family farmers to invest in their businesses, link to markets and overcome poverty and vulnerability.
- Promote incentives to family farmers to manage their land, water, biodiversity, and other natural resources in a more sustainable way.

Objectives of the International Year of Family Farming:

- To support the development of policies that will foster sustainable family farming.
- To increase knowledge and public awareness on the vital role that family farmers play in agricultural and development sectors.
- To raise awareness of the needs and potential of family farmers, along with the constraints that they face, and ensure that they have access to technical support.
- To create synergies for sustainability.

Conclusion:

Finally family farming is more than a professional occupation- it is a lifestyle based on beliefs and traditions. It provides food security, community wellbeing, strengthens regional economics, conservation of land, sustainable use of natural resources, and climate resilience.

Family farms thus represent an important resource that may help:

- Reducing the unemployment rate in rural areas.
- Tackling the demographic challenge of European farming.
- Maintaining and improving the social, economic and cultural sustainability of rural areas.

To keep alive the economic and social potential of family farms and to face the main societal challenges like “Ageing and succession” a key factor is to provide young farmers with the tools and knowledge needed to face the succession process.

Farm Bills 2020

Debojyoti Modak
B. Sc. (Agriculture), 2nd year

Abstract:

According to M.K.Gandhi, India is "LAND OF VILLAGES" and approximately 58% people of this countrydirectly and indirectly depends upon agriculture for their livelihood. Agriculture is a major contributing sector in India's GDP (19.9% of GDP in 2020-'21 according to GOI) hence modernization of agro sector is the need of today. According to FAO of UNs, world's population will rise to 8 billion from 6.3 billion in 2030 and India is second populous country in the world. In spite of occupying first position in milk, pulses and jute production, second in rice, wheat, sugarcane production, the day by day rising demand for food may draw a question mark on its sufficiency in future. For this reasons, Indian government introduced 3 new farm bills that will change the face of agriculture in every dimension.

Introduction:

Agriculture is the backbone of India and food sufficiency is the prior need of every civilian of the country. Gandhiji said," To forget how to dig the earth and tend the soil is to forget ourselves", so forgetting about the farmers is as dangerous as to forget about their development comparing with present scenario of mechanization and modernization. So government have launched various programs,schemes, land and financial development programs to strengthen the agriculture sector.

What is Farm Bill 2020?

Farm bill 2020 is a way of the government to transform Indian agriculture in a new shape. The set consists of three acts passed in the parliament in the monsoon season of 2020. The farm bills were passed on 17 September 2020 in Lok Sabha and 20 September 2020 in Rajya Sabha. The three bills are:

1. The Farmer's Produce Trade and Commerce (Promotion and Facilitation Act, 2020)
2. The Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Act, 2020
3. Essential Commodities (Amendment) Act, 2020

What is The Purpose of Introducing Farm Bills?

According to MS Swaminathan,"If agriculture goes wrong, nothing else will have a chance to go right", that means if we will not update the status of our agriculture with the day by day updating world , it will serve a lot of problems in future. In the pre independence era,Zamindars were there and they had supreme control on the farming system by getting taxes from the farmers as well as farmers were rewarded with very small amount of money against selling their produce to the landlords or Zamindars. The zamindari system was also prevalent after the British era extinguished from India after independence.

Many times, farmers had to take loan from the landlords for cultivation purposes and the landlords usually took the advantage as they charge high interest rate against the loan and as most of the farmers were illiterate, their lands were captured forcefully if any delay in repayment happened. Later the government of independent India dismissed Zamindari system. To strengthen financial aspect specially farm financial aspect in India, Reserve Bank of India (1935), later NABARD was established. To ease the trading of agriculture, produce from the fields to the hands of wholesaler –retailer and consumer government introduced APMC(Agriculture Produce Market Committee) or mandis. This was introduced for the benefit of the farmers but the real picture is something different, the middle man is taking profit in a large proportion and the farmers are not getting the deserved amount. To overcome the dysfunctions of the system, Government introduced three farm bills in 2020.

Pros and Cons of Farm Bill 2020

Pros:

- The new three farm bills will enable the farmers to sell their produce to anywhere in the country rather than selling to only the nearby mandis.
- This will on the other hand increase the flexibility of market and can generate additional income also.

- Farmers can now sell their produce in online mode also where the farmers will get a large exposure for selling their goods.
- The new farm bills will remove pulses, cereals etc from the essential commodities list so it will on the other side stop the stock holding.
- One of the most golden face of the new bill system is when the private party investment occur, farm mechanization will be there that will lead to more productivity per unit time and per unit space. In present days, farm mechanization is about 40-45% in India according to government of India, comparatively very less to US (95%), Brazil (75%), and China (57%). For this reason, in spite of having large arable land, India has less productivity per unit time and space than many of the developed countries.
- In India, most of the farmers are laggards, they adopt a new technology when it is near to abolish so taking the fact in mind, private investment will lead to introduce new technologies fast and will increase the farm production as well as income of the farmers.
- There will be no tax charged on the farmers by the state government for interstate trading.
- There is a provision of contract farming, and by this system farmer can get to know the price of their produce before getting the production as well as they may get some advances that will help them to do farm activities and house hold tasks.
- In agriculture, post harvest management is a very crucial part. For lack of expertise and infrastructure,post-harvest management technology like cold storage, ware house etc are not there in adequate number to preserve the produce in proper way. So private investment interference will help to make this type of infrastructure that will improve the present scenario of agriculture.

Cons:

Every coin alwayshas 2 sides, similarly this bills also have demerits from various angles.

- Farmers from various part of the country are protesting against this new bills saying that the bills are anti farmer bills.
- Farmers are tensed about getting MSP (minimum support price) for their crops as large corporate bodies will come to deal with the farming community.
- As the corporate organization will have supreme control, they may dominate the farmers with their money muscles.
- The bills are passed by voting voice without discussing with farmers and opposition.

Why the farmers are protesting? Are the farm bills good or bad?

With the growing day by day population and food demand, redesigning the agro sector is necessary to full fill every stomach of the country in near future.

When the question why farmers are protesting comes in mind, the answer is very simple. For the sudden introduction of new bills, farmers become tensed thinking that they may be dominated by corporate organizations and many small and local farms like local bread factory, small rice mills may get hampered. They also have fear about getting MSP disappear for their crops and they will get very less amount of money against selling their produce. In fear of various factors, farmers have chosen the path of protesting against the laws claiming them “anti farmer laws”. Though, in some states farmers have large acreage per head, and they have doubt in their mind that this laws may bring down their supremacy from the agro sector of the country.

The answer of second question is much more important. Every new change will bring some positive and negative impacts on the society. Talking about positive impacts, private party investment will improve the current agro technological scenario in a standard floor. If we will take into account the latest agriculture scenario of developed countries like USA, Japan etc they have more productivity per unit time and space in spite of having less cultivable land. According to the 2012 US census of agriculture, 5.06 percent of US farms are corporate farms, that means new technology will improve the farming procedure tremendously and as a result, agriculture –food and related industries contributed $1.109 trillion to the US GDP in 2019. That means more developed technology will boost farm output as well as economy and farmers will get freedom from the middleman system.

But there are negative impacts also. In the developed countries where corporate farms are pre dominant in farming have very much strong economy as well as adequate secondary and tertiary sectors to give ample amount of placement and alternative source of income. But the real picture of Indian agriculture is different. According to the Situation assessment survey of agricultural household 2013, an average Indian farming household earns just Rs 77,124 in a year which is very less comparatively to the developed countries. In many states of our country, average farm income per month is as low as rupees 3980, rupees 166 per day (NSS 70TH roundsurvey, 2013). A farmer can cultivate three crops in a year

hardly, so now question comes suppose their income will get doubled with the introduction of new bills, will they be able to run their households by purchasing costly foods and vegetables sold to the corporates that are cultivated by themselves?In India, most of the farmers are small and marginal who have less than two hectares of land accounts for 86.2% of all farmers according to 10th agriculture census 2015-16 and rest of the people depends upon farming for their survival don't have own lands for cultivation. So when farm mechanization will be done, where will the landless farmers go? Moreover, the small and marginal farmers may be dominated by the corporate organizations. One of the most important factor is literacy rate of farmers in India in case of doing contract farming with private investors as by determining price of the produce and paying small advances, they will do legal procedure with the farmers by signing in any petition with applicable terms and condition and it is not easy for the farmers to read all the terms and condition. Furthermore, as agriculture is a risk bearing job and the factor of nature is always variable and as the farmers have to take loans for doing their farming activities, if any anomaly happens then it will be tough for the farmers to repay the loans as well as to fulfill the agreement of investors due to low budget of family, crop insurance is not always possible and sufficient as well. Due to poor literacy rate, it is difficult for them to get knowledge about transportation to anywhere in the country to sell their produce. The government has only fixed MSP for 23 crops then how the price of other crops will be determined as the private investors have prime control to fix the price by their own? As the APMC system will be deactivated, question of properly getting the MSP of crops is raising by the farmers.

Conclusion:

The present picture of the farmers of India is not very good. They have been subject to injustice for many years even after introduction of various projects, schemes in agro sector. The present government has introduced this new bills to push up the farming community in India. The massive protest of the farmers and state government to withdraw the bills are great concern and the current issue of the entire country. On view of the current scenario International Monetary Fund's (IMF) Chief Economist Gita Gopinath said, "India's new farm laws have the potential to increase farmers' income, but there is a need to provide a social safety net for vulnerable cultivators".

Futuristic Farming with AI- I am a Believer

Sreema Debnath
B. Sc. (Agriculture), 2nd Year

Abstract:

While artificial intelligence (AI) seemed until recently to be science fiction, countless corporations across the globe are now researching ways to implement this technology in everyday life. AI works by processing large quantities of data, interpreting patterns in that data and then translating these interpretations into actions that resemble those of a human being. Scientists have used it to develop self-driving cars and chess-playing computers, but the technology has expanded into another domain: agriculture. AI has the potential to spur more efficient methods of farming in order to combat global warming, but only with expanded regulation of its development.

Agriculture plays a significant role in the economic sector. The automation in agriculture is the main concern and the emerging subject across the world. The population is increasing tremendously and with this increase, the demand of food and employment is also increasing. The traditional methods which were used by the farmers were not sufficient enough to fulfill these requirements. Thus, new automated methods were introduced. These new methods satisfied the food requirements and also provided employment opportunities to billions of people.

Introduction:

Artificial intelligence is based on the principle that human intelligence can be defined in a way that a machine can easily mimic it and execute tasks, from the simplest to those that are even more complex. The goals of artificial intelligence include learning, reasoning, and perception.

"We're at beginning of a golden age of AI. Recent advancements have already led to invention that previously lived in the realm of science fiction – and we have only scratched the surface of what's possible"

– JEFF BEZOS, Amazon CEO

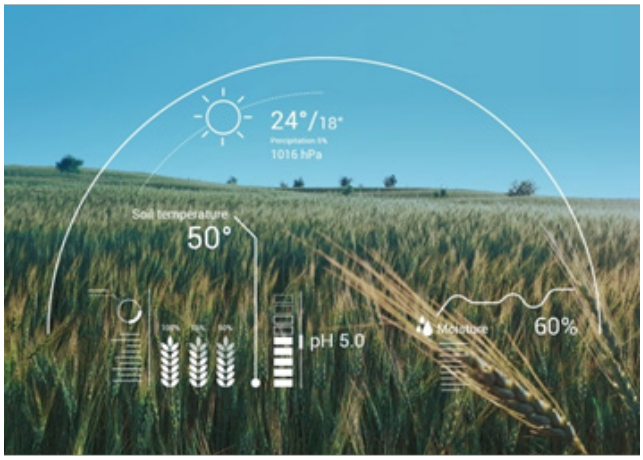
Some examples, vision-recognition systems on self-driving cars in the recommendation of engines that suggest products you might like based on what you bought in the past, speech and language recognition of the Siri virtual assistant on the Apple iPhone.

Implementation of AI in Agriculture

Use of weather forecasting:

With the change in climatic condition and increasing pollution it's difficult for farmers to determine the right time for seed sowing. With the help of Artificial Intelligence, farmers can analyze weather conditions by using weather forecasting which helps them to plan the type of crop can be grown and when should seeds be sown.

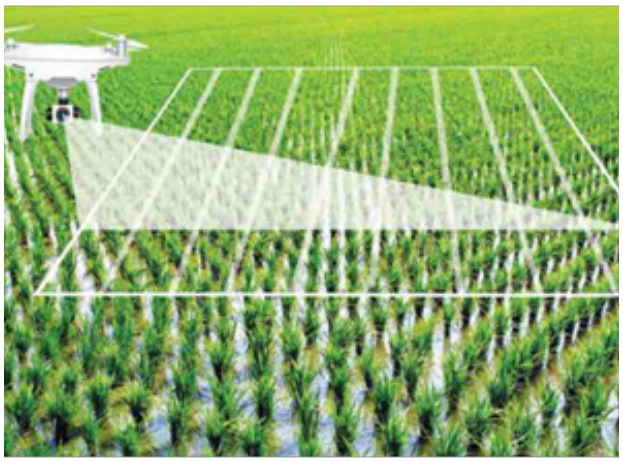
Example: Government policy think tank NITI Aayog signed a deal with IBM India Pvt. Ltd to develop a prediction model for crop yields using artificial intelligence (AI). As part of the first phase, the organizations are jointly developing this predictive model for 10 "aspirational" districts across the states of Assam, Bihar, Jharkhand, Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh. While IBM will be using AI to develop the technological model for improving agricultural output and productivity for various crops and soil types for the identified districts, NITI Aayog will use the data insights generated through these AI models to help farmers and other stakeholders.



Soil and crop health monitoring system:

The type of soil and nutrition of soil plays an important factor in the type of crop is grown and the quality of the crop due to increasing deforestation and soil quality degradation and it's hard to determine the quality of the soil.

Example: A German-based tech start-up PEAT has developed an AI-based application called Plantix that can identify the nutrient deficiencies in soil including plant pests and diseases by which farmers can also get an idea to use fertilizer which helps to improve yield and quality. This app uses image recognition-based technology. The farmer can capture images of plants using smart phones. We can also see soil restoration techniques with tips and other solutions through short videos on this application.



Agricultural Robotics:

AI companies are developing robots that can easily perform multiple tasks in farming fields. This type of robot is trained to control weeds and harvest crops at a faster pace with higher volumes compared to humans. These types of robots are trained to check the quality of crops and detect weed with picking and packing of crops at the same time. These robots are also capable to fight with challenges faced by agricultural force labor.

Irrigation

No.	Algorithms	Method of evapotranspiration / desired calculation	Other Technologies	Advantages/ Results
1	PLSR and other regression Algorithms	Evapotranspiration model	Sensors for data collection, IOT Hardware Implementation	Increased efficiency and economic feasibility
2	Artificial Neural Network based control system	Evapotranspiration model	Sensors for measurement of soil temperature, wind speed etc.	Automation
3	Fuzzy Logic Controller	Penman–Monteith method	Wireless sensors	Drip irrigation prevents wastage of water and evaporation

Weeding

No.	Application	Crop	Algorithms for Weed Detection	Weed Removal Methods	Accuracy
1	Weed Detection	Sugarcane	Color Based and Texture Based algorithms; Greenness Identification; Fuzzy Real Time Classifier	Robotic arms for mechanical removal	92.9%
2	Weed Control System	Lettuce	Machine Vision	Electrical Discharge	84% (detection)
3	Robotic Weed Control	Cotton	Machine Vision algorithm based on Mathematical morphology	Chemical spraying	88.8% sprayed

Drones in Agriculture

No.	Application	Technologies / algorithms used	Results
1	Crop Monitoring, Mapping, and Spraying	DJI Phantom 3 Advanced UAV and other software's	UAVs could be used in order to detect abnormalities and identify potential problems.
2	Crop Monitoring	Multispectral sensor	Linear regressions between NDVI and plant nitrogen, aerial biomass, etc. were significant. This has the potential to provide insight to good management practices and techniques.
3	Pesticide Spraying	Spray motor	Worked satisfactorily when tested on groundnuts and paddy crops

Self-driving Combines

Self-driving combines are automated tractors that can function autonomously and most commonly known as **'Driverless Tractors'**. They are programmed to be self observant, decide speed and avoid obstacles such as people, animals or objects in the field while performing their task.

Some of the driverless tractors work on supervised autonomy. They are automated tractors but with a supervisor and they use Vehicle-to-Vehicle (V2V) technology for communication and control. AI implementation into these self driving combines ensures safety in applications and to ensure they learn constantly through self observational data they collect. This reduces accidents related to unmanned vehicles and increases productivity through technological intervention.

Example: Mahindra Research Valley, the Group's hub of innovation and technology located in Chennai, the driverless tractor is all set to redefine the mechanization process for the global farmer.

Agriculture plays a significant role in the economic sector. The automation in agriculture is the main concern and the emerging subject across the world. The population is increasing tremendously and with this increase, the demand of food and employment is also increasing. The traditional methods which were used by the farmers were not sufficient enough to fulfill these requirements. Thus, new automated methods were introduced. These new methods satisfied the food requirements and also provided employment opportunities to billions of people.

Conclusion:

Artificial Intelligence in agriculture is not only helping farmers to automate their farming but also shifts to precise cultivation for higher crop yield and better quality while using fewer resources.

Companies involved in improving machine learning or Artificial Intelligence-based products or services like training data for agriculture, drone and automated machine making will get technological advancement in the future will provide more useful applications to this sector helping the world deal with food production issues for the growing population.

Impossible Food

Souvik Roy
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IF or “Impossible Foods” is a producer of plant-based alternatives to meat and dairy products, has a mission to transform the global food system by providing the taste and nutritional benefits of meat without the negative health and environmental impacts of animal product consumption. Since beef is one of the most resource intensive components of global diets, Impossible Foods needed robust internal understanding of the environmental impacts of food ingredients and processes on water, land and the climate, for both their product and that of beef.

Their flagship product is a plant-based burger madefrom ingredient such as coconut oil, textured vegetable protein and potato protein.The result is a type of food, claimed by the company that tastes like real meat, without any cholesterol, antibiotics, and hormones which are increasing as a by-product of the traditional food chain. The process requires fewer resources than the traditional farming process. The Impossible Burger uses 75% less water, generates 87% fewer greenhouse gases and requires 95% less land than conventional ground beef from cows.

“Impossible Foods” uses only six ingredients for making their plant-based meat products. Except Soy Protein, Potato Protein, Cellulose based culinary binder (to hold everything together), Coconut and Sunflower Oils, water and a secret ingredient called ‘Heme’ (short for Haemoglobin) an iron containing molecule that makes meat red and also responsible for bloody taste of raw meat and the incrediblyintense flavour of cooked meat. After a long research, Stanford University Professor Dr. Patrick O. Brown had found this key ingredient ‘Heme’ from the plant. It is an essential molecular building block of life, one of nature’s most ubiquitous molecules. It is very familiar to us since it carries oxygen in your blood. ‘Heme’ is present in virtually all the foods that people eat, and it’s particularly abundant in animal muscle. It’s the abundance of ‘heme’ that makes meat (both meat from animal carcasses and ‘Impossible Foods’ i.e., meat from plants) uniquely delicious and craveable. ‘Heme’ is totally safe to eat and is in factrequired for life. To produce ‘heme’ a massive quantity the company extracts DNA from the soya plants which have a bundle of ‘heme’. That DNA is inserted into genetically modified yeast which is fermented to produce lots of ‘heme’.

Even though its focus is on beef as of now, Impossible plans to commercialize plant-based chicken, fish, pork, dairy and cheese products as well in the near future which can revolutionise the meat industry and the consumption of meat by people all over the world. The company debuted the impossible burger in 2016. The Impossible Burger 2.0 followed in early 2019. Impossible sausage hit the market in 2020. The company wanted to start with a beef alternative.

Cattle industry alone accounts for nearly 9% of global human caused emissions & cows expel estimated 160-320 litres of methane per day. Their target is not to make products for the vegans or vegetarians but to convert the meat eaters and try to revolutionise their food choices. Such a feat is made possible by the ingredients that are used in making the Impossible Foods products.

Agriculture in red soil in india

Souvik Mahapatra
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Introduction:

Redsoilisaveryimportantsoilresource,whichbearssubstantial implications for the sustainable development of agriculture and the healthy growth of the economy. Red soil develops in a moist climate under deciduous forest and having thin organic-mineral layers overlying a yellowish-brown leached layer. Red soils are normally derived from crystalline rock. They are generally poor growing soils, low in nutrients and difficult to be cultivated because of its low water holding capacity. Red soil grows under the deciduous forest in a tropical environment and has thin organic mineral layers that cover a yellowish-brown leachedbase.

Categories of Redsoil:

red soils divided into the following two categories. They are;

Red Loam | Soil Sandy | Red Soil

Red Loam Soil

These red loam soils have been formed by thedecomposition of granite, gneiss, and diorite rocks. This soil is cloddy, porous and deficient in concretionary materials. Red loam soil is poorer in nitrogen, phosphorus and organic materials but rich in potash and leaching aredominant.

These soils have thin layers and less fertile. These red loam soils are mainly found in Karnataka (Shimoga, Chikmaglur, and Hassan districts), Andhra Pradesh (Rayalaseema), Telangana, eastern Tamil Nadu (especially Tiruvannamalai and Cuddalore district), Orissa, Jharkhand (Chotanagpur),

Uttar Pradesh (Bundelkhand), Madhya Pradesh (Balaghat and Chhindwara), Rajasthan (Banswara, Bhilwara, Bundi, Chittaurgarh, Kota and Ajmer districts), Meghalaya, Mizoram, Manipur, and Nagaland.

Sandy Red Soil

These sandy red soils have formed by the disintegration of granite, quartzite, and sandstone. These are one friable soil with a high content of secondary **con**cretions of sesquioxideclays.

Due to the presence of haematite and limonite its color ranges from red to yellow. Sandy red soils have been rightly leached occupying parts of former eastern Madhya Pradesh (excluding Chhattisgarh region), neighboring hills of Odisha, Andhra Pradesh, and Tamil Nadu (the Eastern Ghats and Sahyadris.

Advantages of Redsoils

- Red soils have better drainage capacity than other soils and they are porous, fine-grained and fertile.
- Red soil is that type of soil which develops in warm, moist and temperate climatic condition and is produced by weathering of metamorphicrocks
- Red soils have higher iron, aluminum and lime content and contain high acidic nature also.

Crops Suitable for Red Soil

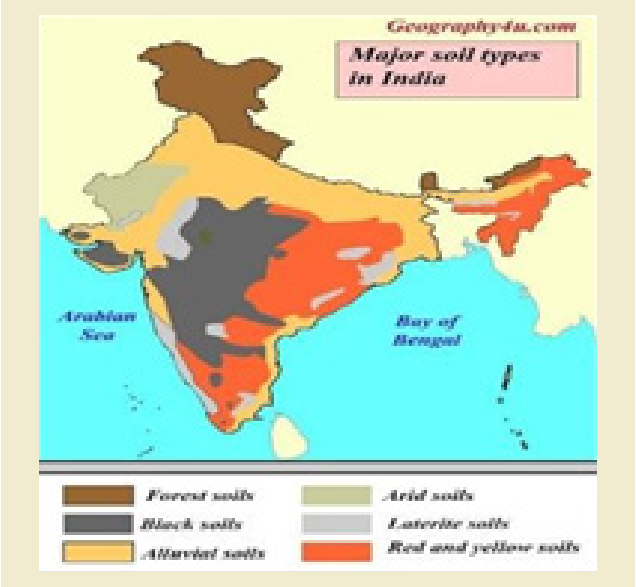
Under Good managemental practices in red soil can be used profitably for different variety of crops such as Cotton, wheat, Rice, Pulses, millets, tobacco, Oil seeds, Potatoes Fruits (Banana, Grapes, Papaya, Mango, Cashew nuts etc), Pigeon Pea, Castor seed, Green Gram, Red Gram, Bengal Gram etc. The Red soils are mostly loamy and therefore cannot retain water

like the black soil.

Red Soil in India

The Red soil occupy a vast areaabout

3.5 lakh sq km which is 10.6 % of the total geographical area of the country. Red soil are spread almost the whole of the Tamil Nadu , parts of the Karnataka, south east of Maharashtra, eastern parts of Andhra Pradesh , Chhattisgarh , Madhya Pradesh , Orissa and Chota-Nagpur Region of Jharkhand and Birbhum, Bankura, Midnapur districts of West Bengal.



Most commonly used organic fertilizers in the red soil region

Commonly used organic fertilizers in the red soil region come mostly from green manure, farmyard manure, and crop residues. In this area, rice and rapeseed are the major field crops covering 55 and 11% of the total cropped area, respectively. The amount of rice straw and rapeseed stalk accounts for 70 to 75% and

8.5 to 11% of the total crop residues in this region.

Conclusion

red soil not suitable for agriculture. Red soil might not be suitable fit for agriculture because it might not contain the suitable minerals which are necessary for the growth of the crop on which it is grown. Red soil has the least water holding capacity and has very much amount of iron and phosphorus which is very harmful for the crops. India is a diverse country with several varieties of relief features, landforms, climatic realms, and vegetation types. These have contributed to the development of different types of soils in India. India is mainly an agricultural country. Whar are we waiting for? Let’s get into the details of best crops suitable for redsoil.

Application of Reverse Genetics by Tilling for Crop Improvement

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Abstract:

Conventional breeding is widely implemented to improve crop plants.Alternative methods such as marker-assisted breeding and reverse genetics approaches have also proved to be efficient in developing crop cultivars. In this article, we present detailed description of a non-transgenic and reverse genetics technique called TILLING (Targeting Induced Local Lesion IN Genomes). The method was originally optimized in the model plant Arabidposis thaliana and subsequently applied to crops such as maize, wheat, and rice.

Keywords: TILLING, Crop improvement, Reverse genetics, Mutation

Introduction:

Over the last century, the global population has quadrupled. In 1915, there were 1.8 billion people in the world. Today, according to the most recent estimate by the UN, there are 7.3 billion people — and we may reach 9.7 billion by 2050. Food demand is expected to increase anywhere to 98% by 2050. This will shape agricultural markets in ways we have not seen before. Farmers worldwide will need to increase crop production, either by increasing the amount of agricultural land to grow crops or by enhancing productivity on existing agricultural lands through conventional breeding and modern breeding approaches like revere genetics techniques and marker-assisted breeding methods.

In this century, there has been a dramatic increase in the amount of genome sequence data available for world major food crops, their pests and pathogens. Complete genome sequences have been reported for rice) and sorghumand also for several crop crops. However, the exploitation of these sequence data for crop improvement is limited by the complexity of many of the traits that determine agronomic performance. In this situation, reverse genetics approaches allow progress to be made on the major challenge of linking sequence information to the biological function of genes and on determining their contribution to important characters and traits. Typically, these approaches rely on the disruption of candidate genes by mutagenesis, transposons, and T-DNA tagging or RNA interference (RNAi).

TILLING (Targeting Induced Local Lesions INGenomes) is a non-transgenic reverse genetic technique that is suitable for most plants (McCallum et al. 2000a). For TILLING, mutations are created by treatment with the same chemical mutagens that have been successfully employed in mutation breeding programs for decades. Mutations can also be induced by physical and chemical mutagens and are applicable to all plant and animal species. By using chemical mutagens that induce primarily random point mutations at high density, allelic series of missense mutations can be discovered with TILLING. Thus with only a small population, multiple alleles may be obtained regardless of the size of the gene. Gene regions are targeted for mutation discovery using PCR and standard SNP discovery methods. The use of general techniques for the generation and discovery of mutations means that the method should be applicable to a wide variety of organisms.

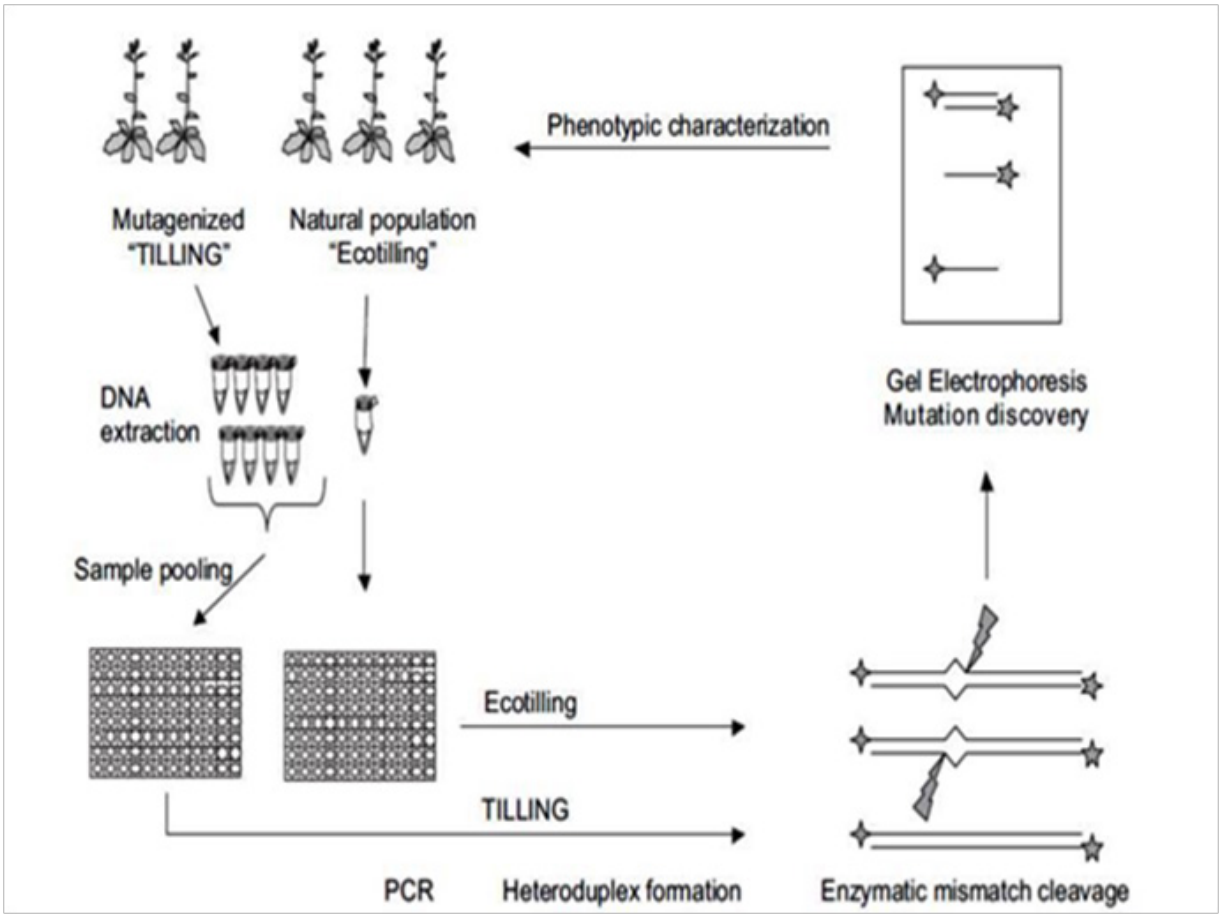
Mutations may be gross, resulting in large-scale deletions of DNA, or only involve point mutations. Mutation can be induced by irradiation with non-

ionizing (e.g. UV) or ionizing radiation (e.g. X and gamma rays, alpha and beta rays, fast and slow neutrons); such physical mutagens often result in the larger scale deletion of DNA and changes in chromosome structure. By contrast, chemical mutagens most often only affect single nucleotide pairs. For plants, some of the more widely used mutagens include ethylmethanesulphonate (EMS), methylmethanesulphonate (MMS), hydrogen fluoride (HF), sodium azide, N-methyl-Nnitrosourea (MNU), and hydroxylamine. The degree of mutation is dependent on the tissue and degree of exposure. Mutations at single nucleotide pairs are generally of the most interest to breeders because large-scale changes to chromosome structures usually have severely negative results. However, the use of mutagens that alter chromosome structure to increase the number of recombination events and break undesirable linkages is also extremely valuable. Critically, mutations in important traits or genes (e.g. in nutritional quality, resource use efficiency, architecture or phenology) can be readily exploited by plant breeders without the legislative restrictions, licensing costs, and societal opposition applied to GM approaches. This is despite the fact that transcriptomic analyses have shown that large-scale plant mutagenesis may induce greater changes in gene expression patterns than transgene insertion. This article briefly discusses advances in the detection of mutations and the potential of this approach for crop improvement.

TILLING for mutations

TILLING consists of three main steps: 1) Development of a mutagenized population,2) DNA preparation and pooling, and 3) mutation discovery

Development of a mutagenized population



Source: Techniques of TILLING (Bradley et al., 2007)

Fig. 1: Outline of the basic steps for typical TILLING and Eco TILLING assays.

DNA is collected from a mutagenized population (TILLING), or a natural population (EcoTILLING). For TILLING, DNAs from up to eight individuals are pooled. Typical EcoTILLING assays do not use sample pooling, but pooling has been used to discover rare natural single-nucleotide changes (Till et al., 2006) (Fig 1). After extraction and pooling, samples are typically arrayed into a 96-well format. The target region is amplified by PCR with gene-specific primers that are end-labeled with fluorescent dyes. Following PCR, samples are denatured and annealed to form heteroduplexes that become the substrate for enzymatic mismatch cleavage. Cleaved bands representing mutations or polymorphisms are visualized using denaturing polyacrylamide gel electrophoresis. Plants with mutations predicted to affect protein function can be carefully analyzed for phenotypic abnormalities.

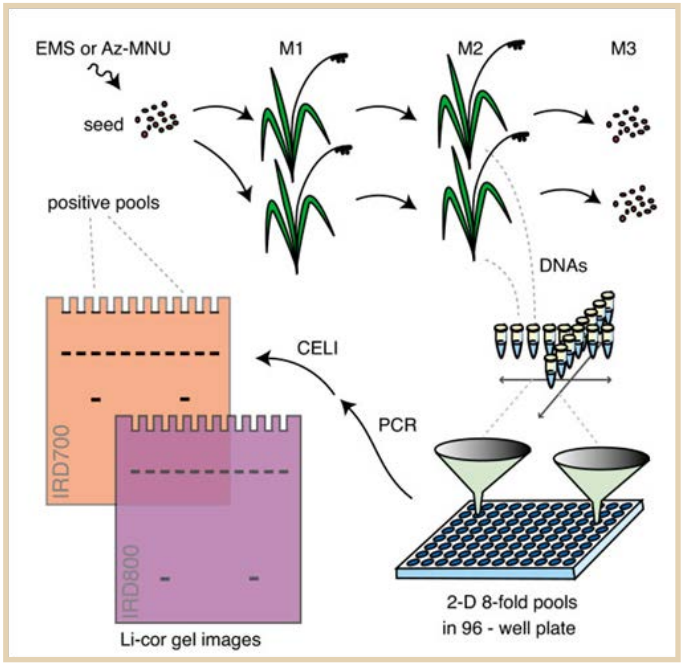


Fig. 2: Seed mutagenesis strategies used for TILLING.

For seed mutagenesis, a single M2 plant per line is typically included in the TILLING population (Fig 2). The M1 generation is chimeric for mutations and is unsuitable for TILLING. DNA and seed are collected from the M2 generation. When mutations are identified, the M3 seed can be germinated for phenotypic analysis Seed from a self-cross of the M1 is collected for subsequent phenotypic analysis.

2.2. DNA Pooling

In addition to the density of mutations, sample pooling will directly affect theefficiency and cost of mutation discovery. With similar false positive and falsenegative discovery rates, screening four samples pooled together will take approximatelytwice as long and cost twice as much as screening a pool of eight samples. Factors that affect the ability to pool include the quality of genomic DNA, theaccuracy of sample quantification, and the method used for SNP discovery. Blindlyscreening samples in various sized pools will allow an unbiased determination ofthe optimal level of pooling. Various TILLING groups have performed screensutilizing two-, three-, four-, six-, and eight-fold pooling. At the STP, allsamples are currently pooled eight-fold.

Two basic pooling strategies have been most often used by the STP. For largescale services, we typically use a one-dimensional pooling strategy where eachindividual sample is represented in only one pool. When a mutation is identified ina pool of eight individuals, each member of the pool is then screened independentlyto identify the individual harboring the. The otherapproach is to pool samples two-dimensionally such that each sample is presentin two unique pools. The STP has used a two-dimensional pooling strategy for smaller scale projects and for the larger scale Maize TILLING service. Although duplicating each sample reduces the throughput of detection in pools by half, the sample harboring the mutation is unambiguously determined in the pool screening step, so that there is no need to screen individual samples as is done in the one dimensional strategy. Also, because two-dimensional pooling involves screening each sample with two-fold coverage, potential false positive and false negative errors are minimized at the initial screening step, rather than when individuals are screened in the second step with one-dimensional pooling. The current approach for STP is to perform small scale pilots using two-dimensional pooling, where error rates are unknown. Before moving to a large-scale operation such as a public TILLING service, the advantage of higher throughput using one-dimensional pooling is weighed against the advantage of one-step determination and a decision is made on a case-by-case basis.

2.3. Mutation Discovery

SNP discovery technologies include array-based methods, denaturing HPLC, mass spectroscopy, denaturing gradient capillary electrophoresis and enzymatic mismatch cleavage (Comaiet al., 2006). In theory, any accurate SNP discovery method can be used for TILLING. In practice, the method must be both robust and cost effective. The most common method used for TILLING has been enzymatic mismatch cleavage and resolution on polyacrylamide gels to detect the cleaved fragments. It is noteworthy that the choice of enzyme and readout platform can potentially affect the optimal level of sample pooling. Once muta-

tions are discovered, they are sequenced to determine the precise base change. An important advantage of the mismatch cleavage system is that the location of each mutation is determined within a few nucleotides, unlike methods such as denaturing HPLC, which can detect a mismatch but does not identify where it lies in the sequence. By pinpointing the location of the putative mutation, the mismatch cleavage method allows for confident identification of each mutation, whether heterozygous or homozygous, with a single sequencing run, priming with the nearer of the amplifying primers.

TILLING the plant kingdom

Arabidopsis thaliana

TILLING was first applied to Arabidopsis thaliana (McCallum et al. 2000a). A mutagenized population was created by treating seed with EMS, using the single seed descent strategy described in section 2.1. This initial work was done using a denaturing HPLC readout platform and five-fold sample pooling. To facilitate gene modeling and primer design, a computational tool termed CODDLe was developed. CODDLe obtains genomic and protein-coding information from public databases or from the user, constructs gene models, and analyzes them to determine the region that has the highest density of predicted deleterious nucleotide changes. With the success of the basic TILLING system, the goal became to develop a large population and offer TILLING to the Arabidopsis community as a public service. To meet the expected demand, the STP explored alternative SNP discovery methods and decided on the use of the single-strand specific nuclease CELI and the Li-Cor readout platform. Throughput was increased by lengthening the PCR amplicon size (currently at 1.5 kb), and by increasing the sample pooling from five- to eight-fold. Throughput was also increased as machine run time per sample was decreased approximately four-fold compared to denaturing HPLC. These improvements allowed the creation of the first public TILLING service known as the Arabidopsis TILLING Project.

Lotus japonicas

Perry and colleagues adapted the TILLING method for the model legume Lotusjaponicus(Perry et al. 2003). Seeds were treated with EMS similar to what was done for Arabidopsis. Samples were pooled three-fold and CEL I was used to digest SNPs followed by readout using the ABI377 denaturing polyacrylamide slab gel system. Their work showed that a different readout platform can be used for mismatch cleavage-based TILLING. They also introduced a phenotypic enrichment strategy to reduce the amount of screening to find mutations of interest. A database was created containing the phenotypes of M2 plants. For the pilot screen, a target gene was chosen that was known to give non-nodulating phenotypes (SYMRK). A population of 288 plants with nodule and root-specific phenotypes was selected for screening, and 15 mutants were identified with homozygous missense changes plus one mutant with a homozygous splice site acceptor mutation. Some M2 individuals included in the screen were siblings and a total of 6 novel alleles were identified. While the density of induced mutations is not easily inferred, it is clear that this approach will be more efficient for finding functional alleles than blindly screening the entire population, provided of course that one assumes the correct phenotype.

Zea mays

Samples were screened in four-fold and eight-fold pools using CEL I and the Li-Cor platform. Seventeen EMS-induced mutations were identified in six gene target regions of approximately 1 kb. Maize mutations could be discovered as easily as Arabidopsis mutations by simply increasing the amount of genomic DNA in PCR reactions to maintain the proper ratio of primer to target molecules.

Wheat

The feasibility of TILLING in a polyploid species was first observed in wheat. Starting with seed mutagenized with EMS, they developed TILLING populations in tetraploid and hexaploid wheat. To target genes, the group designed homeolog-specific primers. Samples were pooled 2-, 4- or 6- fold, mismatches were cleaved using CEL I, and fragments were visualized using a Li-Cor DNA analyzer. Over 200 mutations were discovered in the pilot screen and the estimated mutation densities were exceptionally high: 1 mutation / 40 kb in tetraploid and 1/24 kb in hexaploid wheat. The 10-fold increase in density compared to other TILLING populations is likely attributable to the protective effects against mutation by increased ploidy. As with maize, the large genome size of polyploid wheat did not have an effect on the ability to TILL it. As with Arabidopsis, >99% of EMS induced mutations were G:C->A:T transitions. Importantly, Slade and colleagues were able to use TILLING to generate a wheat variety with reduced amylose production, which demonstrates the utility of the method for breeding programs, especially those where polyploids are used.

Other Plant Species

The number of plant species in which TILLING has been successfully applied continues to grow; in barley, rice, soybean, tomato, peanut, and castor worldwide. There are many groups working toward establishing TILLING projects in important crops, and in the near future more successful applications

of TILLING will undoubtedly be reported.

Conclusion

TILLING is high-throughput and low-cost methods for the discovery of induced mutations and natural polymorphisms. The methods are general and have successfully been applied to many plants, including crops. Now that successes have been reported in a variety of important plant species, the next challenge will be to use the technology to develop improved crop varieties. The utility of induced mutations and natural polymorphism has already been established for crop breeding and so the task is mostly one of implementation.

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Agri Vision

Bonsai- A living art

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What is bonsai?

The word “Bonsai” is a Japanese term which means potted (bon) plant (sai). This art is a form of ancient Chinese horticultural practice of cultivating miniature versions of plants and trees.

But the art of bonsai has its roots in India. Ancient ayurvedic physicians often grow medicinal plants in miniature to conveniently move them around. In ancient India, the art of bonsai was known as “Vamanatanu vrikshadi vidya”, which means the science of dwarfing trees. The practice moved to China and onto Japan, where the art was refined. Genetically bonsai is not a dwarfed plant but is a technique to make a plant dwarf by pinching, pruning, root cutting, wiring branches and carefully restricting plant nutrients.

Bonsai classification

On the basis of size, bonsai may be classified into 10 categories. The classification is originally based on the number of person needed to lift the tree.That is why it is much more essential to prevent diseases than to recover them. The effective preventive treatments are to be applied above all in specialized fish culture units with a closed warm water system, in early fish fry rearing, hatcheries, trout farms, wintering ponds, and storage reservoirs.

- Keshitsubo: 1-3” (3-8cm)
- Shito: 2-4” (5-10cm)
- Mame: 2-6” (5-15cm)
- Shohin: 5-8” (13-20cm)
- Komono: 6-10” (15-25cm)
- Katade-mochi: 10-18” (25-46cm)
- Chumono / Chiu: 16-36” (41-91cm)
- Omono / Dai: 30-48” (76-122cm)
- Hachi-uye: 40-60” (102-152cm)
- Imperial: 60-80” (152-203cm)

Bonsai styles

Bonsai styles are important to gain a basic understanding of shapes and should serve as guidelines to successfully train miniature trees.

Broom style

Broom style is a very common style of bonsai which is suited for deciduous trees with fine branches. The trunk is straight and upright and does not continue to the top, the branches come out from all directions at about 1/3 the height of the tree. The leaves and branches create a round-shaped crown which is very attractive during winter months.

Formal upright style

This is very common bonsai style. This style is visible in nature where there is plenty of light and absence of competing trees. The trunk is upright and clearly visible. The trunk must be thicker at base and thinner towards top. Branches will start form 1/3 height of the tree alternatively at left and right side.

Informal upright style

In this style the trunk grows upright roughly in the shape of a letter ‘S’ and at every movement branching occurs. Tapering of the trunk must be clearly visible, with the base of the trunk thicker and thinner at top.

Slanting style

When a tree grows in the shade, it must bend toward the sun to get sunlight. The tree will lean in one direction. The bonsai should grow at 60 - 80 degree angle relative to the ground. The roots are well developed on one side.

Cascade style

This style is very common in nature on hill slope or falling rocks where the tree grows downwards. In bonsai it is very difficult to maintain a downward-growing tree because the trees have natural tendency to grow upright. Cascade Bonsai are planted in tall pots.

Semi cascade style

Just like cascade style, this style is found in nature on the river banks and Rocky Mountains. The trunk grows upright for a small distance and then bends downwards/ side wards.

Literati style

This style is common in densely populated forest lands where competition is more among the trees. In forest lands the competition for sunlight is so strong that the tree can only survive by growing taller then all others trees around it. The tree grows upright without any branching and then bent towards sunlight

Windswept style

In this style the tree trunk and the branches grow to one side due to blowing wind constantly in one direction. The branches grow out from all direction of the trunk but all the branches bent to one side.

Double trunk style

In this style both trunks of a tree will grow out of one single root system. The length and thickness of the two trunks will vary. The main trunk is thicker and upright and the second trunk is weaker.

Multi-trunk style

In this style, the tree contains 3 or more odd number of trunks. All trunks grow out of a single root system and the thickest and most developed trunk forms the top.

Forest style

This style looks like multi-trunk tree but it consists of several trees rather than one tree with several trunks. The most developed trees are planted at the middle

Broom style bonsai

Formal upright style bonsai

Informal style bonsai

Slanting style bonsai
(Source:pinterest.com)

Cascade style bonsai
(Source:pinterest.com)

Semi Cascade style bonsai

Literati style bonsai
(Source:pinterest.com)

Windswept style bonsai

of a large shallow pot and smaller trees at the side. In this style, the trees are planted on the pot in a staggered pattern.

Root over rock style

On Rocky Mountains, trees grow naturally in cracks and holes. The roots need to reach to the ground for taking nutrients and water. In this bonsai style, the roots are clearly visible on the rock.

Growing in a rock style

In this bonsai style the roots of the tree are growing in the cracks and holes of the rock and there is not much space for the roots to develop and absorb nutrients. In this style, it should be visible that the tree is struggling for survival.

In this style, it is important to water and fertilize the bonsai on regular basis.

Raft style

This style is visible in nature, if the main trunk is broken by storm or heavy wind. The tree can survive by developing upright branches and new roots from the broken trunk. These new trunks contribute to one single canopy.

Exposed root style

This style is common in flood affected areas and river bunks where the soil is washed out by water flow and the plant root system is exposed. This style of bonsai is very difficult to maintain.

Double trunk style bonsai

Multi-trunk style bonsai
(Source:pinterest.com)

Forest style bonsai
(Source:bonsaiempire.com)

Root over rock style bonsai

Growing in the rock style bonsai
(Source:pinterest.com)

Raft style bonsai
Source:amadofutebolclube.blogspot.com)

Exposed root style bonsai
((Source:pinterest.nz)

Landscape style bonsai
(Source:theculturetrip.com)

How to start a bonsai?

Beginners can start bonsai by collecting trees from nature (Yamadori), from old buildings, regular saplings from nursery, from seed or from cutting/ layering. Bonsai from seed takes more time to develop (8-10 years or more) but looks very attractive as compared to the bonsai developed from cutting or layering. If you start bonsai from seed, you have more control over the tree as bonsai is developed from a normal seedling by training, brunch pruning, root cutting and limiting water and nutrients.

Steps to be followed

Material collection

The easiest way to collect bonsai material is yamadori (collect from nature), from road sides, from old buildings and you can get a good material as free of cost. You can purchase regular old looking seedlings from nursery.

Planting for developing roots

In bonsai, always we need fine surface roots. So after collecting a material your first job is to cut tap roots and thicker roots. After cutting roots, put a mixture of rooting hormone and fungicide on the cut surface. Prepare the potting mixture by mixing 50 percent sand (construction sand) and 50 percent well decomposed compost and plant the material. Water it properly and keep the plant in partial shade.

Training

Bonsai training is done in two ways: Growing plant in large container/ growing plant on ground. Growing plant in large container takes more time to make a bonsai whereas growing plant on ground takes less time to make a bonsai. While growing plant on ground, you need to prune and wire the tree branches time to time. Otherwise you will lose control over the tree.

Soil mixture for bonsai training

Prepare a soil mixture by mixing the following ingredients Normal soil 30%+ Sand 20%+ Compost/ FYM/Vermi-compost 30%+ Broken brick chips (brick bites) 10%+ Neem cake 2.5%+ Bone meal 2.5%+ 5% wood ash. This soil mixture is very effective for bonsai training in Indian climate. Change this bonsai soil every year preferably in spring.

Branch arrangement and pruning

Except cascade and semi- cascade bonsai the branch arrangement is almost same in all bonsai styles. If we divide the total height of a bonsai tree in 3 parts, we need not to keep any side branch in first 1/3 height form the tree base. In middle 1/3 height, we have to keep 3 branches (2 side branch and 1 back branch). If we keep the first branch at left side then the second branch will be at right side and back branch will be in between the first and second branch. All the remaining branches will appear at the top 1/3 height of the bonsai tree. Bonsai branches can grow naturally in its own way, but pruning and wiring is necessary for arranging the branches in proper place and to give a proper shape. The commonly used tools for bonsai pruning are knob cutter, concave cutter, pruning shear hand saw etc.

Root pruning

Root pruning is very essential in making bonsai. Bonsai plants are kept in shallow container with very less soil, so there is very limited space for root growth. During repotting, 1/3 of the root needs to be pruned to keep a bonsai tree healthy.

Repotting in shallow pot

A bonsai artist needs to finish 90 percent of his work during bonsai training. When 90 percent of bonsai transformation is over, the artist can repot the bonsai in a final shallow pot.

Making the bonsai more realistic

Bonsai is a copy right of nature. A bonsai artist can grow some natural small vegetation or green moss to make the bonsai more natural. In landscaping bonsai, a bonsai artist can create artificial mountain, water fall, river bank and sea beach to make the bonsai more natural.

Suitable tree species for Indian climate

India is naturally blessed with the ideal climate for bonsai creation. India has as much as 15,000 species suitable for making bonsai. Some of the important species are listed below-

Indian species: Ficus bengalensis, Ficus riligiosa, Ficus rumphii, Ficus racemosa, Ficus glomerulata, Ficus virens, Ficus infectoria, Lantana camara, Streblus asper, Tamarindus indica, Terminalia arjuna, Pithocolobium dulce, Cassia fistula, Delonix regia, Psidium guava, Punica granatum, Acacia Nilotica, Prosopis cineraria, Carissa carandas, Pinus wallichiana, Commiphora mukul, Cocos nucifera, Morus alba, Limonia acidissima, Portulacaria afra, Lagerstroemia indica, Citrus etc.

Foreign species: Ficus microcarpa, Ficus long island, Ulmus parviflora, Bougainvillea, Carmona retusa, Juniperus chinensis, Premna microphylla, Adansonia digitata, Buxus microphylla, Casuarina equisetifolia, Malpighia emarginata, Bursera microphylla, Wrightia religiosa

Conclusion

Growing bonsai can make us more energetic and active. It can also reduce our everyday stress. Due to population pressure and urbanization, we are losing valuable old trees. Making bonsai is the best possible solution to keep the miniature version of a large tree in a small space. The price of good bonsai is very high, so there is a huge market for bonsai in India and abroad.

Agri Graduates Get Employed

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Agriculture is the only discipline which cultivates diverse source of employment. It is all along an employment generating disciplineunlike other branches of education. Starting from seedling to harvesting each stage is of employment generating diversity. One must not have unidirectional approach.—it desires to be multidirectional. Each stage of activity of agricultural operation generates scope of employment. --cultivation of crop including manufacturing of agri implements and maintenance thereof.

An agricultural graduate enjoys immense scope, scopes for employment -starting from employment in public sector/ governmentsector, private sector so also the areas of self employment. One must not be saddled with aspiration for jobs in public sector, private sector only. With the ramification of job potential now-a-days, potentials of employment in various sectors multiply. Pass outs get various scopes to go for setting up agro service centres / enterprises. Such centres invite scope for both sale and services. They may go for setting up of entities-individual / proprietorship, partnership,companies, trusts, NGO etc.. Prelude to aspire for such establishment the students must also have the knowledge and procedures for setting up of such establishments. It, therefore, implies that our students have adequate knowledge of formation and functioning of such aspired set up.

Let us have an example ; all competitors are not winners , losers most not suffer from despair or complexes ; mind set must be self management driven by the sense of accepting of the challenges driven by sense of motivation . Motivational forces must play a significant role in discerning the acceptance of probabilities of self employment aiming at businesses,any type of businesses - to call as agribusiness. This concept of agribusiness may vary from types of business, place of business, potentials to potentials, structure of organisation and acumen for entrepreneurship which has to be developed from within. The main and integral issue of entrepreneurship must be self generating so also the acumen to accept the challenges. Above all, the concept of management of such business plays supreme which in totality students will have to go for.

The self employment driver the agribusiness though a challenging job ushers new sphere of employment generation dovetailing with various types of businesses based on multiple agricultural activities sponsored by both state governments and central government—only important issue is awareness which needs to be created by the students community in desired perspective.

Above all the concept of management as a whole plays the pivotal role in stimulating the process of business. It comprises of clarity of achieving the philosophy of four important issues – what to do, why to do, when to do and how to do— the crux of agribusiness. The philosophy forms the basis of principles of management as a whole, formulation of business plan, its implementation, fund management,man management, leadership,sales and marketing,investment, return on investment (ROI), policy and technique of change over, identification of business – its modification / ramification and above all the spirit of accepting the challenges. Students aspiring for jobs either in government sector / private sector have to satisfy themselves with the up to date knowledge of science of agricultural practices and operations--its theory and practices in keeping with recruiters' aspiration and objective. Special emphasis has to be laid on path of economy government is approaching for.

With the growth of economy rather based on agricultural growth there has been diversification and consequent to that there develops multiplication of developmental activities based on agricultural and rural sciences which we may call agro economy contributing to GDP and GNP of the country. Students have to update their knowledge to equip themselves to identify the avenues and scope to venture for upcomingeconomic activities for employment.Aspire, strive and achieve must be the 'mantras'.

Hybrid TPS Production at Tripura, India

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True Potato Seed production is an art. To learn and experience in this area I went straight to the Horticultural Research Complex at Nagicherra, West Tripura. The scientist in charge of this project Mr Pulak Chowdhury along with his two other colleagues helped me to understand their production system and provided information on technology. At a glance the photograph is self-explanatory on their activities.

- Target is to produce 150-200 kgs of hybrid TPS.
- Male parents are TPS 67 & TPS 13 and female parents are MF I, MF II & TPS 7. Male parents are Solanum tuberosumsspandegena
- Female parents TPS 7 & MF II are pollinated with male parents TPS 67 and MF 1 with TPS 13.
- Therefore only three hybrids of TPS are available here.
- Seeds were procured for all three hybrids: (1) 7/67-30g; (2) I/13-35g; (3) II/67-35g
- TPS parent TPS-67 (male parent) has a better combining ability with TPS parents MFII and TPS-7,hence TPS hybrids MFII x TPS-67 and TPS-7 x TPS-67 are better. TPS-13(male parent) has better combining ability with TPS parent MF I (female parent
- A single berry produces approx. 300 seeds and one female potato plant produces 6 to 7 berries.
- 100kg seeds can be produced in a ha of female plants

Sri Pulak Choudhury and Dr.S.K.Samanta in front of the station and the banner describes the programme adopted during 2013-14.

Light Arrangement for Artificial Illumination

Sodium vapour lamps are arranged over the crossing block area in such a way that the extra illumination can be provided so as to have more than 14 hours light period in a day cycle with a minimum light intensity 45 - 50 lux, which is essential to bring all the plants to come to flowering. HRC, Nagicharra have shown that light intensity of 45 – 50 lux produces the maximum flower buds per unit area.

Staking

Since, in long day situation the plants become taller, therefore, to provide necessary support to plant, half – split 1m long bamboo sticks are fixed 1.5 m apart and tied with 3 –tier longitudinal bamboo splits at 25, 50, and 75 cm height along the side of plant lines. This keeps the plants erect and in line, also and to facilitates pollination work. It also prevents the flowers and berries from touching the soil.

Trimming

After emergence, the plants in the female block are trimmed to retain only 30 stems per Sq.mt. In addition side branches of individual plants are trimmed regularly. Trimming of flower bunches is done to retain 8 -10 large sized buds per bunch.

Irrigation

A drip irrigation system is being used in the TPS programme. The flow of drip irrigation and the time schedule are maintained as per optimum requirement of soil moisture and crop growth. Two laterals are drawn in between three rows on a bed and apertures are at 60cm apart.

Pollen Collection and Pollination

Flowers from the male parents are harvested in the morning and spread over blotting paper in shed house for drying. Other lobes are separated from the flowers and again spread over blotting paper. The dried anther lobes are sieved through specialised sieves to collect the pollen grains in clean glass petri dishes. Immediately after extraction the pollen grains are dried sufficiently at room temperature and stored in small air – tight plastic vials placed in desiccators in refrigerated condition. On the day of pollination the desiccators are brought to room temperature and taken out for pollination.

The optimum time for pollination is from 8am to 10am. Pollination technique adopted is simple and the emasculation process is avoided.

Harvesting, Seed Extraction and Store

After about 45- 50 days of pollination, the berries turn dull green. The well matured berries are harvested, collected in plastic trays and stored in shed for softening. The berries are allowed to ripen at room temperature for about 10 -12 days. Soft, ripe berries are crushed with the help of a berry pulper.

Female Plants' block ready for pollination

Illumination at night

Package & Practices for Production of Seedling Tubers Using T.P.S

Bring to good tilth mixing with finely powdered well rotten cowdung. Apply Urea, Single Super Phosphate &Murate of Potash @ 20gm, 60gm & 25gm per square meter respectively. Two to three seeds are sown 4 cm apart in a line and row to row distance is 10 cm. In between two double rows distance is 30 cm.

Top dressing with 5 gm. Urea per Square meter at 30th, 40th and 60th day followed by earthing up so that two lines can be covered by a single furrow and the distance between two double rows becomes a furrow to be utilized for irrigation. Withhold irrigation at around 75th to 80th day after sowing. Cut the haulms at ground level after a week of withholding irrigation. Allow the crop for skin hardening for about seven days. Harvest with care without making injury to the tubers. Discard any tubers which are cut or infected ones. Spread on a dry floor for further curing under diffused light condition. Rogue out any rotten tubers and spray with 3% Boric acid solution for disinfection. Dry the produce with the help of electric fan. Pack in new gunny bags and store preferably in cold store for the next year planting.

Raising of basic tubers of parents from tissue culture cuttings

Two row method of producing tuberlets from Hybrid TPS

Using True Potato Seeds

- 100 gm. is sufficient to cover one hectare area instead of planting 2-2.5 tons of potato seed tuber.
- Absolutely diseases free seed material.
- No cold storage facility is required for storing T.P.S.
- Practically no cost is involved for transporting TPS unlike seed tubers.
- Comparatively more resistance to pests and diseases.
- Net profit is more as cost of cultivation is less and also as the per hectare production is more.
- The seed tubers being utilised could be otherwise used for consumption.
- Cost of production of potato using TPS is approximately 55 % lees in comparison to cost of production of potato using seed tuber.

Conclusion

Extending photoperiod by 4 -5 hours a day using sodium vapour lamps to induce flowering during short days in the plains is required for flowering in order to undertaking hybrid TPS production. For positive manifestation of heterosis in TPS progenies, crosses between ssp. tubersumas a female parents (MF I, MF II, and TPS 7) and ssp. andigenaas male parents (TPS 67 & TPS 13) nay be used. Pollination of each flower at least thrice and no emasculation is suggested for obtaining higher berry and seed set. Fermentation of crushed berries with pulp for 24 -28 hours followed by treatment of seeds with 10% HCL for 20 minutes and 0.5% NaOCL for 10 minutes is suggested. Seeds should be dried to a moisture level to below 6% and stored in sealed plastic containers with silica gel as a desiccant at room for subsequent use. Prior to distribution to the farmers these produced TPS need to be analysed for its ability to germination & vigour.

The Recent Advances of Functional Genomics and Its Contribution to Crop Improvement Programme

Dr.Bidisha Mondal
Assistant Professor, School of Agriculture and Allied Sciences, The Neotia University

The basics of plant improvement lies solely in the observation capacity of the grower. A skilled scientist, grower, breeder, farmer or a nursery-man, who is willing to be a part of plant improvement programme should have the ability to demarcate phenotypes. This demarcation of phenotypes is the fundamental requirement of any crop improvement programme. In agriculture, exposure of a genotype to different habitat, soil, physiological condition or agronomic techniques leads to development of unique characteristics or obliteration of the same. The performance of a crop mainly depends on thegenetic architecture deep-seated inside the cellular boundary. The unlocking of that hidden information of plant genome is the basis of functional genomics. The functional genomics approach deals with the genome, epigenome, transcriptome and metabolome analysis and interplay of genetic and epigenetic factors along with nurturing of a genotype.

Cisgenic over Transgenic:

While the transgenic development is a very delicate and controversial area of plant science evoking critical questions on bioethics, the cisgenic approach is more viable, acceptable and feasible for application in crop improvement programme. The plant genetics also evolved from cytological studies to marker assisted selection (MAS) and currently emerging into the level of third generation sequencing. The transformation of classical genetics to modern era is signified by sequential change of techniques from karyotyping to whole genome sequencing (WGS). In the last two decades the advancement of molecular marker techniques were reflected by conversion of costly, diligent Restriction Fragment Length Polymorphism (RFLP) into high throughput sequence based marking such as Simple Sequence Repeat (SSR) or Single Nucleotide Polymorphism (SNP). Cisgenic is the most dependable approach that could be integrated in Fruit or plantation crop improvement. Crop plants showing complex reproduction, juvenility, self-incompatibility, apomixis, recalcitrant trait are promising subject of cisgenic experimental system (Mondal, 2020).

Role of Structural Variants (SV):

In recent times it is being observed that SNPs are not able to track the genomic variation related to a phenotype. Structural Variants (SV) plays an important role in capturing significant variations. The copy number variation (CNV), structural chromosomal aberrations, occurrence of transposons, presence of repetitive sequences may give rise to SVs. This new marker SV having a size more than 1 kb is abundantly detected in humans diseases. In plant species rice (Oryzasativa), wheat (Triticumaestivum), maize (Zea mays), sorghum (Sorghum bicolor), barley (Hordeumvulgare), foxtail millet (Setariasp), soybean (Glycine max), Arabidopsis thaliana, structural variants were detected and their association with phenotypic variation was also confirmed (Saxena et al. 2014). The extreme contribution of structural variants (SVs) is detection of PAV. The presence absence variation (PAV) is the extreme form of Copy number variant (CNV)was copious in maize inbred lines. The identification of 1270 PAV variants in maize lines confirms the role of SV in ancestral evolution and domestication of maize.

Pan-Genome as genetic resource:

Agricultural genomics shows the presence and integration of a number of plant genomes and re-sequencing information. In Pan-genomics the wide range of genome information was assembled from different species as only the reference genome study may not lead to optimum result in genetic research.

Genome information of multiple lines were assembled in crops such as rice (Zhao et. al. 2020) and tomato (Gao et. al. 2019). The same Pan-genomic approach was taken for Corn Belt genome and Cotton Belt genome and continual effort was given incorporation of more data in this field.These high quality reference genomes will provide understanding of polyploid genome evolution, epigenetic signals and largely contribute towards perception and inheritance of agricultural traits.

Contribution of Multi-OMIC study:

Fine mapping of traits using different approaches such as genomic, transcriptomics, metabolomic studies could assist in crop improvement programme. In tomato, analysis of comprehensive transcriptome and metabolite data of skin trait helped in the mapping of genomic region allowing co-ordinated regulation of metabolism, development and fungal defence system (Fernie et. al., 2020). A novel perspective of multi-OMIC study is the use of information related to DNA, RNA, protein or pathway of one plant species for application in a new species producing same type of phenotype or compounds. Novel study design could assemble multiple layers of OMIC data to generate robust output in biotic and abiotic stresses (Hasin et. al. 2017).

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Students Corner

" मजबूरी "

बड़े खुश थे चाचा
बता रहे थे
वर्षों बाद
इस बार
धान रोपनी के समय
पानी नहीं पटवाना पड़ा बोडिंग से
बहुत पैसा लग जाता था
बरसात के पानी से ही
धान रोपनी हुई है बेटा।
इस बार फसल की भी
उम्मीद अच्छी है।
अबकी बार समय समय पर
हो जा रही है बारिश।
धान बेचके बनवानी है
चाची की आँख
मोतियाबिंद से
परेशान है बिचारी।
पर चाचा का सपना
सपना ही रह गया
कोरोना की मार
झेल ही रहे थे
अब बाढ का पानी
फसल को ले डूबा है।

कल ही मिले थे चाचा
बात करते करते उनकी
आँखें डबडबा आई
मुझ से पूछ रहे थे
बेटा! तू तो मास्टर है
बताओ न !
हम किसानों के साथ
ऐसा क्यों होता है?
कभी सुखार तो कभी बाढ में
फसल बर्बाद क्यों होता है ?
फिर क्षतिपूर्ति के नाम पर
ठगा हमें ही जाता है।
जब अन्नदाता भूखे सोता है
तब क्यों नहीं उसके लिए
कोई रोता है ?
तब क्यों नहीं उसके लिए
कोई रोता है ?

Aditi Poudyal
B. Sc. (Agriculture), 2nd year

Students Corner

Farmer Consoles A Farmer

We feel the pitter patter on the ground,
Kids enjoy, teens fondly recall their love; so sound
The adults loose their work, they struggle
The countrymen and farmhands have mixed feelings, some laugh and some cry

We find delightment in all seasons
Carefree and contented with no reason
They cope with the seeds, the plants of all seasons
Some are pleased and some grieve

Yes you consider yourself rich
So, you curl up on your couch with equipments and instruments .
How often do you fall ill!
And they have wealth in health wins all arguments!!

Have you cursed this lockdown and Covid 19?
Yes! Your choice is not encouraging but appreciating ..
Our country is profuse, farmers are significant
The food, the raw materials our exuberant country is all of them!!

Aditi Poudyal
B. Sc. (Agriculture), 2nd year

Students Corner

Agri glimpse

Let me show you farming India
Drowning in its beauty.
This is a mark of blood and sweat
farmers doing their duty.

From Kaashmi red apples
To rich coconut of Kerala.
From fresh groundnuts of Gujarat
To expensive pineapples of Tripura.
From Bengal's unalloyed Jute
To prehistoric sugarcane of Uttar Pradesh.
From white well worn cotton of Maharashtra
To essential grams of Madhya Pradesh.
From Assam's orthodox tea
To earthy coffee of Karnataka.
From successful wheat of Punjab
To Odisha's fragrant kewra.

Planting to harvesting
serene beauty of this culture.
May you thrive and florish,
OUR AGRICULTURE.

किसान

कई मुद्दे है लिखने को ,
पर ये मुद्दा तो भूल गए हम,
हज़ारों किसानो की मौत पर,
चर्चा करना तो भूल गए हम|

हर पहलु समाज का,उभर रहा है धीरे धीरे,
लोकतंत्र का देश है, ये समझ रहा है धीरे धीरे,
हर तथ्य तो याद है पर इनके तथ्य को भूल गए हम,
उन किसानो की मौत पर शोक करना तो भूल गए हम|

वैसे तो हर चीज़ पर चर्चा होती है,
छोटी छोटी बात पर पर मोर्चा होती है,
रोये,चीखे या चिल्लाएं ,या
यूँ फांसी लगा,अपनी संख्याएँ बढ़ाएं?

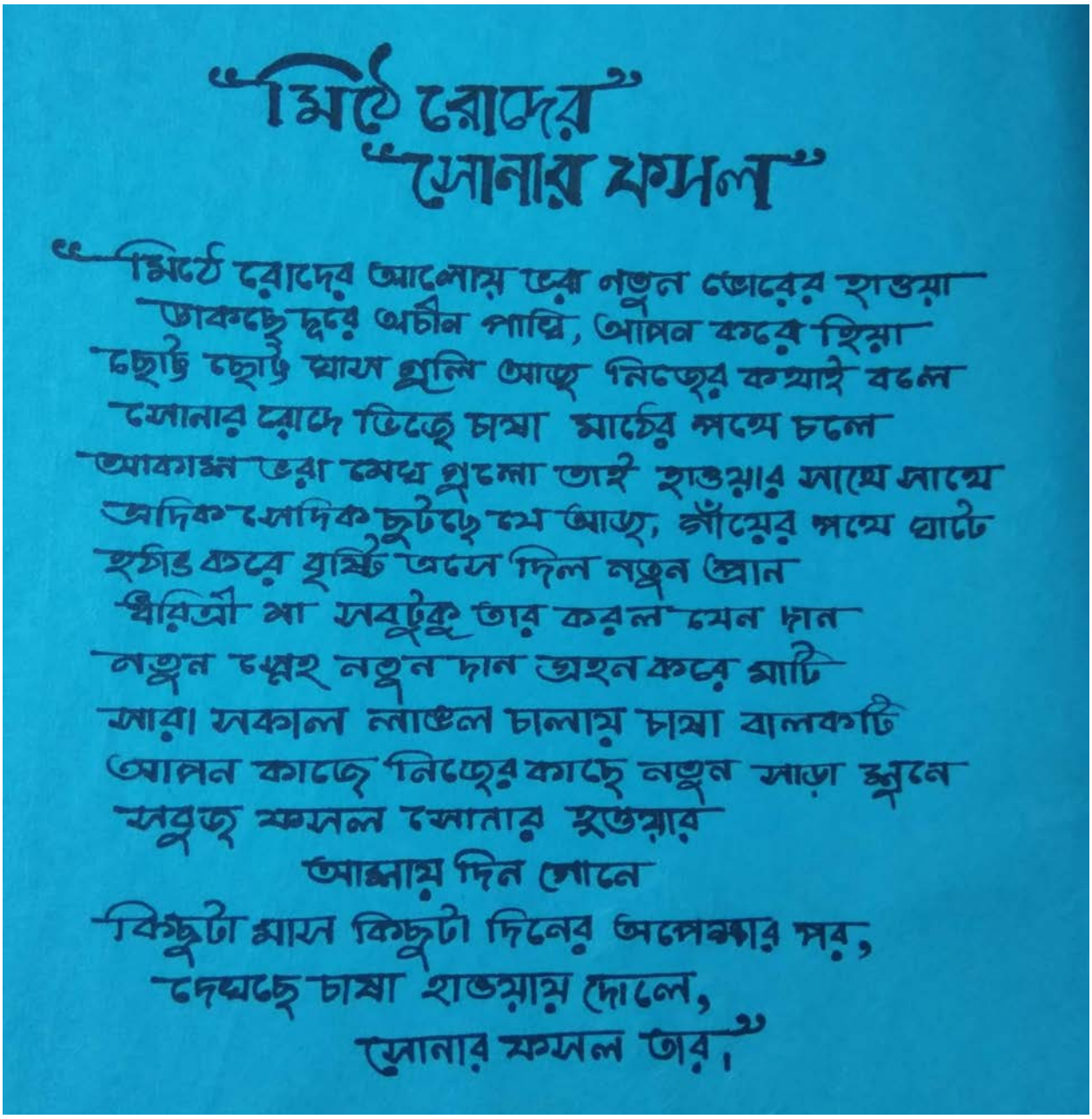
दुःख उनका हम समझ पाएंगे क्या ?
हर एक एक अन्न का क़र्ज़ चूका पाएंगे क्या?
या,यूँ ही किसान लगाते रहेंगे,
इनका कोई हल हम निकल पाएंगे क्या ?

Deepika Digal
B. Sc. (Agriculture), 3rd year

Students Corner

Moulami Pal
B. Sc (Agriculture), 1st Year

Students Corner



"মিঠে রোদের সোনার ফসল"

"মিঠে রোদের আলোয় ভরা নতুন ভোরের হাওয়া
ডাকছে দূরে অচীন পাখি, আপন করে নিয়া
ছোট্ট ছোট্ট ঘাস গুলি আজ নিজের কথাই বলে
সোনার রোদে ভিজে চাষা মাঠের সঙ্গে চলে
আকাশ ভরা মেঘ গুলো তাই হাওয়ার সাথে সাথে
অদিক সেদিক ছুটছে যে আজ, গাঁয়ের সঙ্গে ঘাটে
হঠাৎ করে বৃষ্টি এসে দিল নতুন প্রাণ
ধরিত্রী মা সবটুকু তার করল যেন দান
নতুন স্নেহ নতুন দান গ্রহন করে মাটি
সারা সকাল নাঙল চালায় চাষা বালকটি
আপন কাজে নিজের কাছে নতুন সাড়া শুনে
সবুজ ফসল সোনার হবে
আমায় দিন গোনে
কিছুটা মাস কিছুটা দিনের অপেক্ষার পর,
দেখছে চাষা হাওয়ায় দোলে,
সোনার ফসল তার।"

Moumita Bug
B. Sc. (Agriculture), 2nd Year

Students Corner

BEYOND TOMORROW

This is 2061. My name is MahiruhaBasu. I am an agriculturist. It is not that I have studied agriculture just to go farming. The desire was to take the farming system to another level through research. But it did not happen. I am now a farmer. The world has now turned into the Arctic Antarctic. Often the whole country is locked down for 6 or 7 months due to the unknown viruses. So, farming seemed so much better than a job in a government or private company. Moreover, the population of India is now almost 175 crores. The abundance of natural resources is decreasing day by day. Therefore, it is very important to work in agriculture so that India will not suffer from food crisis in the future. I always try to use technology to grow more and quality crops in less time.

I cultivated the paddy, wheat and parly in crop rotation on my land. In 2035, a Bengali scientist discovered a new crop 'Parly' through an inter-specific cross of barley and peas. This meets the demand for cereals as well as leguminous crops. In the CRISPR-Cas9 method, genetic engineers have already enhanced grain quality and quantity as well as increased immunity through genetic mutations or modifications with the help of the cas-9 enzyme in CRISPR.Now the amount of groundwater has decreased and as much as there is hardly filled with heavy metals such as arsenic lead. So, I use the sea water in the farmland by ionizing and desalination. Let me say my control room at the back of my house. And that's where I control weed and pests with the help of IOT technology. There are some small robots that use fungicides or pesticides only on infected areas of the plant through water jets. And for weeding there is 'weed control laser'. Total irrigation system is totally automatic. The whole crop monitoring is now computerized which means in a word 'autonomous farming'. And I have two power machines that can do all the operation like tillage planting harvesting and so on. And these machines are completely remote control. But I didn't spend all of my days just sitting in the control room. I also have to visit to the kitchen garden on the right side of the house. My kitchen garden is completely vertical. In this vertical garden I cultivate carrots, cucumbers, cauliflower, cabbage, beans, radishes, spinach, garlic, onions, tomatoes, peppers and even potatoes. I use organic nano-fertilizers on all of my lands. It does not cause environmental pollution at all, but the demand for trees is met very quickly at a very low cost. And I don't do just farm work but also raise some animals which mean the integrated farming system. These include high quality milk breed cows, dual breed chickens, goats and sheep. And all the animals are tagged with IOT technology. They all graze on the green roof or living roof of my house.

Oh yes, you were not told about my research. Currently the amount of CO_2 in the air has increased drastically due to global warming and my thoughts are like 'blessings in disguise'. I am trying to bring about some kind of changes in the genome of plants so that the rate of photosynthesis increases many times over. It will be too much helpful for us. On the one hand, the polluted carbon-di-oxide in the air will be converted into pure oxygen very quickly. On the other hand, as the rate of biological activity increases, the plant will grow rapidly and the yield will be much higher. Already 70% of the work has been completed and I am working day and night for the remaining.

I have done MSc. I also have done PhD. Now I am farming in this small village. I am far away from this advanced world, not only for myself, but also for the world, for future generations because no other organism in the world has the ability to stop the destruction that has started except a single plant. I hope I can make a small contribution to build a pollution-free bright future world.

Mrinmoy Das
B. Sc (Agriculture), 3rd Year

Students Corner

-কীরে কি নিয়ে পড়ছিস?

-B.Sc Agriculture

-টাকা খরচা করে কলেজে চাষবাস পড়তে গেছিস শেষে!

এখনও লোকে agriculture পড়ছি শুনে উড়িয়ে দেয় হেসে।

ফসল ফলাতে যেমন প্রয়োজন দক্ষ চাষী,

তেমনই উন্নত ফলনে বিজ্ঞানও দরকার পাশাপাশি।

কৃষি জমি নষ্ট করে আজ করছো তোমরা শিল্পের আয়োজন!!

ছোটো বড়ো শিল্পের কাঁচামালের জোগান দিতেও সেই কৃষিকেই কিন্তু প্রয়োজন।

অভুক্ত মাটির বুকে কৃষকরাই টানে লাঙলের ফলা,

ফসল ফলায় জমিতে বুঝে রোদ-বৃষ্টির খেলা।

মহামারীর সময়ও অর্থনীতি ধরে রেখেছিল কৃষি,

তবু কৃষকরা আজ অনাহারে মরে, কেউ গলায় দেয় ফাঁসি।

ফসল যদি বিক্রি হত ন্যায্য দামে,

তবে সৌরভ ছড়াতো কৃষকের পরিশ্রমের ঘামে।

এখনও কতশত শিক্ষিত মানুষের কাছে চাষীরা পেশায় খাটো।

চাষীরা তবে কাজ বন্ধ করুক, দেখি কোথা থেকে খাবার আসে মুঠো মুঠো!

কৃষিভিত্তিক দেশেও Agriculture পড়ছি শুনে যাদের মুখে এখনও অবজ্ঞার মুচকি হাসি,

তাদের সামনে মাথা উঁচু করে আমরা বলি-'আমরা গর্বিত আমরা ভবিষ্যতের শিক্ষিত চাষী'।

Papri Pal

B. Sc. (Agriculture), 2nd Year

Students Corner

The Hydroponic Man

১৯৩৬ সালের সেপ্টেম্বরের সকাল, সিয়াটেলের ফার্মে মিঃ জেরিকে তার গাছ গুলোর দেখাশোনা করতে ব্যাস্ত। পঁচিশ ফুটের টমেটো লতার গায়ে হাত বোলাচ্ছেন , ছবি তোলার জন্য নিজেকে প্রস্তুত করে নিচ্ছেন মিসেস জেরিকে।

ততদিনে ফ্রান্স, সুইডেন, ইংল্যান্ড সফরে বক্তৃতা দেয়ার সুবাদে প্রদর্শিত হয়ে গিয়েছে তার অত্যাধুনিক আবিষ্কার - কোনরকম মাটি ছাড়া শুধু মাত্র জল এবং সঠিক পুষ্টি দিয়ে গাছের বৃদ্ধি।

সখ ফটোগ্রাফি হলেও, মিঃ পিলসবারি নেহাৎ মন্দ তোড়জোড় করেননি বিশ্বের কাছে এই বিস্ময়কে পৌঁছে দেবার জন্য। সকাল সকাল স্ক্রিপ্ট লিখে তাই চলে এসেছেন সিয়াটেলের ফার্মে, নাটকীয় ভঙ্গিমায় বলে চলেছেন হাইড্রপনিক্সের যাত্রাপথ -

খ্রীষ্ট পূর্বাব্দ ৬০০ বছরের সেই ব্যাবিলনের ঝুলন্ত উদ্যান কিংবা ১১০০ (খ্রীঃ পূর্ব) এর চীনের চোখ ধাঁধানো সৌন্দর্যে ভরা চিনম্পাস, ইতিহাসের বুক চিরে হাইড্রপনিক্সের সাক্ষ্য বহন করে যাচ্ছে এরা যুগের পর যুগ ধরে। পর্যটক মার্কো পোলো পর্যন্ত বিস্ময় প্রকাশ করেছেন চীনের পথে হাইড্রপনিক্সের ব্যবহার দেখে কিংবা লিও নার্দ দ্যা ভিঞ্চির মৃত্যুর পর তার সেই বিখ্যাত উক্তি কোথাও গিয়ে হাইড্রপনিক্সের সূত্র রেখে যায় আমাদের সামনে -

" all the branches of a tree at every stage of its height when put together are equal in thickness to the trunk ".

উইলিয়াম এফ জেরিকে, নেব্রাস্কার এক ছোট পরিবার থেকে উঠে আসা ছেলের গল্প। মাটির অতিরিক্ত ভার বহন করা দেখে যার প্রথম মাথায় এসেছিল মাটি বিহীন গাছের পরিকল্পনা। ক্যালিফোর্নিয়া ইউনিভার্সিটির এই প্রফেসরের প্রথম জার্নাল " On the phisiological balance in nutrient solution for plant culture. " প্রকাশিত হয় ১৯২২ সালের ১৩ ই অক্টোবর আমেরিকান জার্নাল অফ বোটানি'তে।

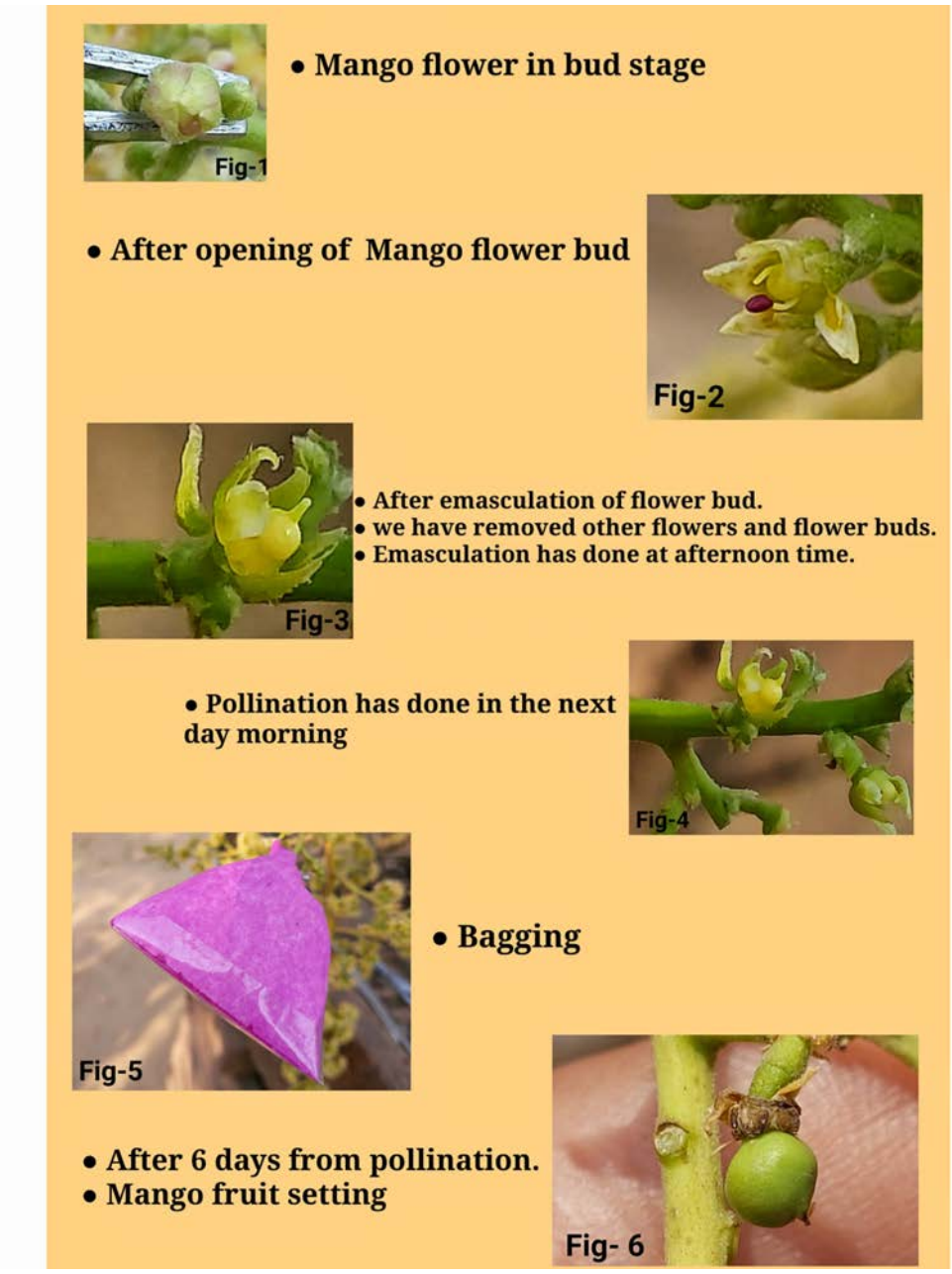
সেই যাত্রা শুরু। তারপর ধীরে ধীরে ১৯২৯ এর " Aquaculture" এর জার্নাল, ১৯২৮ সালের " The San Bernardino Country Sun" এর মাধ্যমে ফুড পিলের ধারণা প্রস্তাব করা। অ্যাসোসিয়েটেড প্রেস দ্বারা প্রকাশিত তার মত - " মাটিবিহীন পদ্ধতিতে উৎপাদিত ফুলগুলি রঙীন এবং সাধারণ অবস্থার তুলনায় বেড়ে ওঠা গাছেদের তুলনায় কম রোগের শিকার হয়। " সবই এগিয়েছে তার হাত ধরে।

২৫ শে মে এবং ২ রা জুন আলাবামার দ্য অ্যানিস্টন স্টার এবং ক্যালিফোর্নিয়ার সান্তা আনা রেজিস্টারে (Alabama's The Anniston Star and California's Santa Ana Register)

দেখিয়েছিলেন কিভাবে ৩০০ টি আর্গন পূর্ণ বাল্ব উদ্ভিদের বৃদ্ধি ঘটিয়েছে।

Anindita Mondal
B. Sc. (Agriculture), 3rd Year

Students Corner



Shuvajit Karok
B. Sc. (Agriculture), 3rd Year

Students Corner

ফসলের দাম

অর্নব দাস

দিবা রাত্রি সন্ধ্যা সকাল

লাঙ্গল ছুটে খামার ক্ষেতে,

একদিনও কি ভেবেছ দেখে!

কত ঘর্ম রক্ত ঝড়ে?

বোঝনি তোমরা বুঝবেও না

তাই তো দাও না ওদের ফসলের ন্যায্য দাম

ভোগের থেকে দুরে এসে,

কৃষক পায়ে ধুলো মেখে

নেই ধুলোর চন্দন কপালে

বাঁচছি আমরা বাঁচবো আমরা

নতুন দিশা জাগায়ে

করছি পণ আমরা কৃষিছাত্রদল

রুখব এই আগ্রাসন।

Arnab Das
B. Sc. (Agriculture), 3rd Year

Image Gallery

Anindita Mondal
B. Sc. (Agriculture), 3rd year

Aenika Mandal
(B. Sc Agriculture), 3rd year_2

Aenika Mandal
(B. Sc Agriculture), 3rd year_3

Anwesha Charan
B. Sc. (Agriculture), 3rd year

Image Gallery

Aenika Mandal
B. Sc. (Agriculture), 3rd year_1

Akash Das
B. Sc. (Agriculture), 2nd year

Anik Bhattacharjee
B. Sc. (Agriculture), 3rd year

Arghyadeb Ghosh
B. Sc (Agriculture)_3rd Year

Arijit Chowdhuri
B. Sc. (Agriculture) 3rd year_1

Arijit Chowdhuri
B. Sc. (Agriculture) 3rd year_2

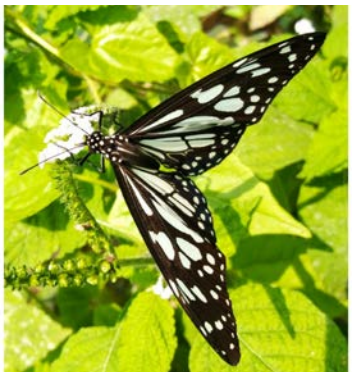
Arijit Chowdhuri
B. Sc. (Agriculture) 3rd year

Barnali Pramanik
B. Sc. (Agriculture), 3rd year

BIPASHA DUTTA
B. Sc. (Agriculture), 2nd Year

Debasmita Mondal
B. Sc. (Agriculture), 3rd Year

Masuma Khatun
B. Sc (Agriculture), 3rd Year



Masuma Khatun
B. Sc (Agriculture), 3rd Year

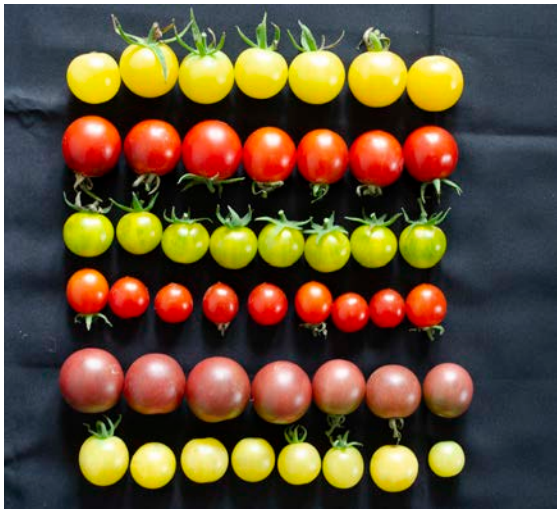
Masuma Khatun
B.F.Sc 1st Year 1st Semester

Injamamul Haque
B. Sc. (Agriculture), 3rd year

Md Abdus Samad Zia
B. Sc. (Agriculture), 3rd Year

Mrinmoy Das
B. Sc. (Agriculture), 3rd year

Priya Maji
B.Sc. (Agriculture)_3rd Year



Prof Samir Kumar Samanta
Visiting Professor, SAAS TNU

Prof Samir Kumar Samanta
Visiting Professor, SAAS, TNU

Prof. Samir Kumar Samanta
Visiting Professor, SAAS, TNU

Puja Dutta
B. Sc. (Agriculture), 3rd year

Puja Dutta
B. Sc. (Agriculture), 3rd year

Sakshi Jha
B. Sc. (Agriculture), 3rd year

Rimpa Bera
B. Sc. (Agriculture), 3rd year

Sakshar Mondal
B. Sc (Agriculture), 3rd year

Sayak Ghosh
B. Sc. (Agriculture), 3rd year

Saurabh Pal
B. Sc. (Agriculture), 3rd year

Sayak Ghosh
B. Sc. (Agriculture), 3rd year

Sayak Ghosh
B. Sc. (Agriculture), 3rd year

Sayan Hazra
B. Sc. (Agriculture)_2nd year

Sayan Hazra
B. Sc. (Agriculture)_2nd year

Sayan Hazra
B. Sc. (Agriculture)_2nd year

Rimpa Bera
B. Sc. (Agriculture), 3rd year

Sayak Ghosh
B. Sc. (Agriculture), 3rd year

Sayan Rath
B. Sc. (Agriculture), 2nd year

Sayan Rath
B. Sc. (Agriculture), 2nd year

Shreya Ghosh
B. Sc. (Agriculture),

Souryadipta Ghosh
B. Sc. (Agriculture), 3rd year

Srijanee Pal
B. Sc. (Agriculture), 3rd year

Sritama Choudhury
B.Sc. (Agriculture), 3rd year

Subhendu Chowdhury
B. Sc. (Agriculture), 3rd year

Sumit Biswas
B. Sc. (Agriculture), 2nd year

Swagata Ghosh
B. Sc. (Agriculture), 3rd year

Swarnendu Bhowmick
B. Sc. (Agriculture), 1st Year

Swarnendu Bhowmick
B. Sc. (Agriculture), 1st Year

Tiyasa Mukherjee
B. Sc. (Agriculture)_3rd year

Dr. Shankha Koley
Assistant Professor, SAAS

Dr. Shankha Koley
Assistant Professor, SAAS

Arnab Banja
B. Sc. (Agriculture), 3rd year

Dr. Shankha Koley
Assistant Professor, SAAS

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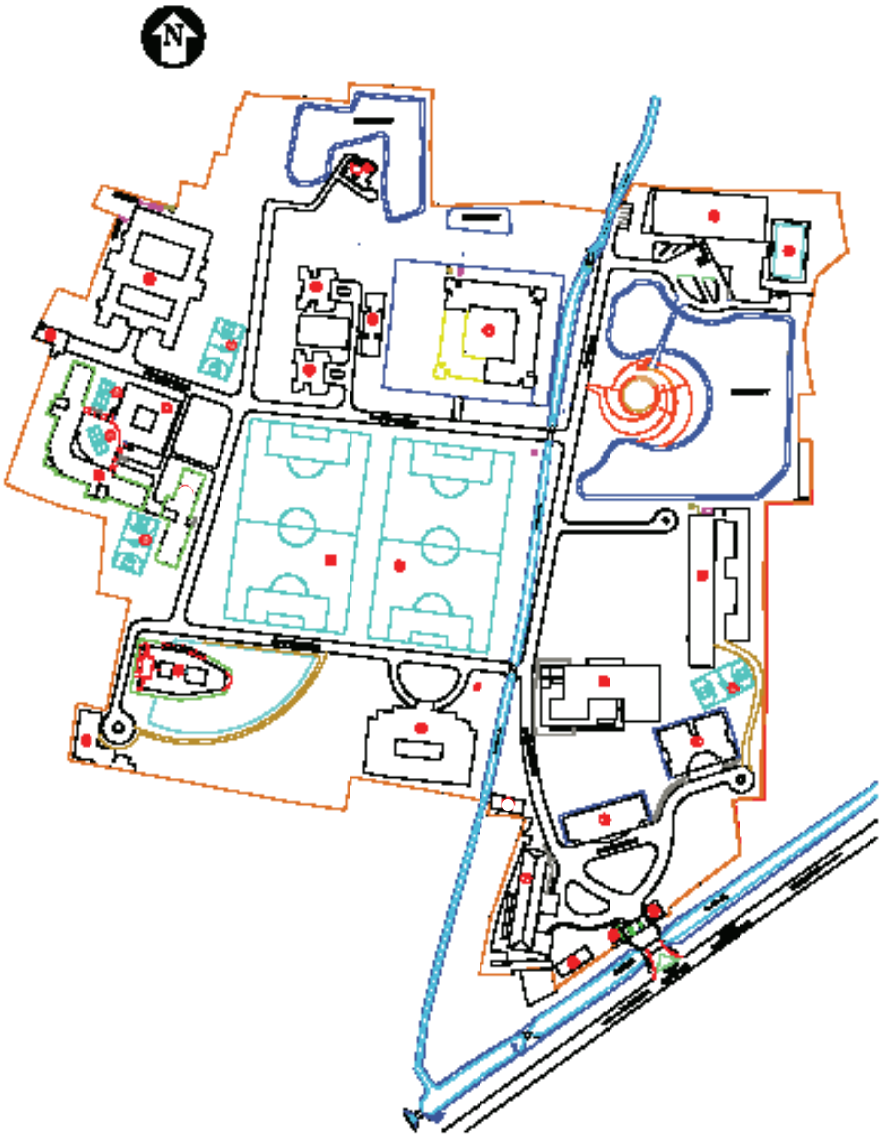


LEGEND- BUILDING

A. UTILITY & SERVICES

1. Main Gate/ Securityroom
1a. ATM
6. Panel Room
16. Central Store
19. Electrical Room

B. ADMINISTRATIVE

2. Administrative Block

C. INSTITUTIONAL

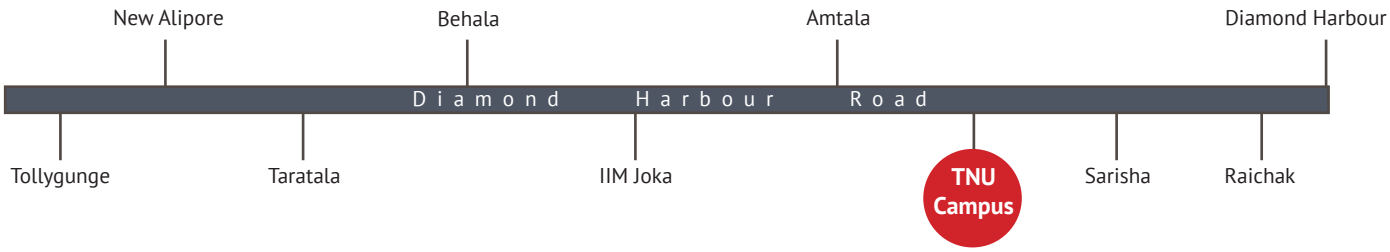
3. Scholastic Building-I
4. Scholastic Building-III
5. Scholastic Building-II
7. Workshop
8. Ship Building
9. BNS Scholastic Building

D. RESIDENTIAL

10. Boys Hostel-II
11. Girls Hostel-III
12. Boys Hostel-IV
13. Boys Hostel-VI
15. Staff Quarter
17. Canteen Block
22. Director's Residence
23. Basketball Court
24. Badminton Court
25. Football Ground

E. RECREATIONAL

20. Multipurpose Hall
21. Swimming Pool



AmbujaNeotia

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