



# Anthesis



**Volume 13: 2017-2018**

**Nurturing the Present, Preserving the Future  
(Sustainable Agriculture)**



**Annual Publication of Gargi College Botanical Society**

**Department of Botany**

**Gargi College, Siri Fort Road**

**New Delhi-110049**

The background of the cover is a close-up photograph of several bright yellow flowers, likely sunflowers, with their petals and centers clearly visible. The flowers are arranged in a somewhat circular pattern, filling the entire frame.

# **Anthesis**

**Volume 13: 2017-2018**

**Special Focus: Sustainable Agriculture**

# Anthesis

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## From the Principal's Desk



It is indeed a matter of pride to be at the helm of an institute where students, faculty and staff all are environment conscious. Department of Botany plays a crucial role here by distributing saplings and organizing workshops to promote eco-friendly practice. Healthy environment around you enhances your efficiency which in turn helps one to do things more confidently.

We, at Gargi emphasize on the acquisition of knowledge, useful skills, critical thinking and problem-solving abilities and believe that every student is unique and special. As educators we are committed to nurture and develop every student to her maximum potential in a caring environment. Departmental periodicals are one such endeavor in this direction.

I congratulate the entire editorial team and contributors for the upcoming issue of Anthesis with the theme “Farming for Future: Sustainable Agriculture” and enthusiastically look forward to reading our student’s perspective on theme undertaken.

**Dr. Promila Kumar**

**Principal**

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## From The Teacher in Charge's Desk



Anthesis is the opening of flower buds/ anthers. Our Departmental e-magazine **ANTHESIS** is also blossoming of emerging talents amongst us. The organization of contents, presentation of thoughts and description of Departmental activities showcase the skills of our students. It is a humble effort but with immense future prospects.

I wish to extend my greetings to Anthesis team and admiration for such a vivid and informative piece of literature.

Best Wishes

**Dr Priyanka Pandey**

**Teacher in charge**

**Department of Botany**

**Gargi College**

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## From the Editor's Desk



I am glad to say that Anthesis has completed its long journey of 13 years with the release of this issue. Anthesis provides a platform to the budding botanists to express their views and showcase their creative skills by writing on what interests them in Plant Science.

Volume 1 to Volume 5 were published as hard copies and later from Volume 6 onwards it is being published in electronic form. The electronic form provides several advantages, it is not only easily accessible but also eco-friendly. It is a small step in conserving Mother Nature by reducing paper wastage.

The theme of this volume is **'Nurturing the Present, Preserving the Future'** that focuses on **Sustainable Agriculture**. The goal of Sustainable Agriculture is to meet the present society's demand like food, textiles etc. without compromising with the ability of future generation to meet their demands. This volume provides several ideas in the form of articles by the students in achieving this goal.

Not only this, it also covers all the College and Departmental events.

I would like to acknowledge the constant support provided by our teacher advisors, Dr. Samira Chugh, Dr. Vera Kapai and Dr. Anjana Rustagi. I would also like to thank all the editorial board members for their dedicated work and the students for their articles and contributions to the magazine. Finally, I would like to thank our principal ma'am Dr. Promila Kumar for providing an opportunity to publish this magazine.

**Vishakha Vasishtha**

**Editor, Anthesis Volume 13**

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## **Heartfelt Memories**

By Dr. Geeta Mehta



**Dr. Bharati Bhattacharyya  
(26th December, 1942 - 23rd March, 2018)**

Bharati di, as she was fondly called by her colleagues, was a dedicated teacher much loved by her students.

She taught for 39 years in the Botany department of the College, touching and shaping lives of many generations of students. She had a great passion for plants and was an excellent plant taxonomist. Bharati di authored several books and papers. Her spontaneous smile was her distinguishing mark and stays in everyone's memory. She will be missed as a colleague, teacher, scholar and friend.

# Glimpses of Dr. Bharati Bhattacharyya's life in Gargi College

By Dr. Gita Mathur













**Mr. Deepak Rawat**  
**(7th September, 1979 - 23rd March, 2018)**

Mr. Deepak Rawat joined Gargi College in February 2012, and was working as MTS in the Botany department. His untimely death after a brief illness came as a shocking news. Deepak was a very polite, Well-mannered and a cheerful young man. He was very proficient in computer related works and was always willing to help others. He will be remembered by all those who interacted with him for his courteous nature and a smiling face.

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# COLLEGE EVENTS



## ZISTATVA 2017: THE ANNUAL NSS-CULTURAL MELA 2017



**Preeti Bhati**

**B.Sc. (H) Botany, III year**

Humans cannot live without the essence of their culture, no matter from where they belong. To live with culture is like an inbuilt nature of humans. So, Gargi college's NSS hosted its annual cultural Diwali mela, Zistatva'17, on 11 October, which was a one-day celebration.

Zistatva meaning 'culture' is a way of Gargians to rejuvenate the dying essence of our colorful Indian culture and exquisite traditions. Though, efforts were made at the level of glint and result was at the level of grandeur. This one-day event is celebrated before Diwali every year.

The day opened with an inaugural ceremony in the morning and was followed by theater events, hosted by the stage play society, Upstage; street theater event, organized by street play society, Kshitij; western and various Indian folk dance forms like Bhangra, Bharatanatyam, Kuchipudi, and Rajasthani by various solo and group artists; Indian singing competition by diverse groups of artists.

It provides a chance to all Delhi University students to participate in many activities like performances in theater, paintings, photography, interactive art,

rangoli and sculpturing. It also featured mouth-watering food, various stalls of indigenous jewelry, cosmetics, clothing and stalls of decorative material by diverse people belonging to NGO's and entrepreneurs. Another attraction was foot-tapping dance and music. The day of celebration ended with everyone on their toes dancing to the tunes of EDM music. Performance by Inayat Band made everyone to dance and sing.



### [Some Glimpses from Zistatva 2017](#)

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## REVERIE'18: THE SYMPHONY OF TIME



**Swagatika Mohapatra**

**B.Sc. (H) Botany, II Year**

This year, Gargi College has seen yet another magnificent celebration as its annual cultural festival **Reverie'18** made its way on the **29<sup>th</sup>, 30<sup>th</sup>, and 31<sup>st</sup>** of **January, 2018**. As a farewell to the Golden Jubilee Year, the fest aimed at reflecting all those golden times we have travelled past, hence, the theme- "**The Symphony of time**". The college was decorated with great artworks like "Starry Nights", and the 3-days long event saw many star-studded performances.

The festival came to life with the inauguration ceremony which was graced by the fearless Journalist **Ms. Barkha Dutt** Known for her opinionated views and fierce journalism, she managed to inspire the crowd by her lifelong motto- "Go for what you feel". The Inauguration ceremony also witnessed various eye-catching performances put up by various college societies and events like- Dhanak, Khayal, Malhar, Vaadan and Cursi Veiti. Reverie '18 gave its best in everything, be it- dance, music, talent or food. The grounds were adorned with various rides and stalls providing students with the gobsmacking food, Gargi always delivers. The main attraction of Day 1 was the performances by the **Unplugged Band, the Faridkot band**- both taking the audience to such a trance of a never-ending cheering and grooving



session. The limelight, however, was stolen by the World's fastest Pianist, **Dr.Aman Bathla** who hypnotised the audience with Classical and Bollywood hits, leaving the audience teary-eyed at the end.

Day 2 of the fest witnessed even more action compared to the first day. The day started with events like- Sangam, Randhaari, Extempore, Turncoat, Aabhas and Nivacana. The main stage was also graced with some "out of the world" talent as various students battled for the talent hunt event. One of the major highlights of the day was the acoustic duet by **Mukul** and **Shenjit** which left everyone in awe. The day came to an end with the energized EDM night by **DJ Myris** and **DJ Candice**. The night peaked its madness as everyone welcomed the Sunburn artist, Candice Redding and her lively stage presence.

The last day of Reverie '18 was packed with breath-taking performances as events like Acapella, Rangdaari, and Zenith entertained the Audience. Along with the talent showered in these events, the talented **Arzz Band** yet again mesmerised the crowd. The energy reached its peak as various students and Faculty members walked the ramp of a Fashion show with a very valuable message about body shaming. As the fashion show came to an end, the college welcomed its special guest **RJ Rahul Makin** who got all the girls swooning over him and his enthralling voice won hundreds of hearts. One of the most awaited event of the last day, however, was the star night performance by **Monali Thakur** who set the stage on fire with her hit songs. The three-daylong event then came to an end as the union and Faculty Members gave a token of appreciation to all the guests who attended and made this fest possible.



*Best days of Gargi life....*

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## GOLDEN JUBILEE CELEBRATION



**Ruth Abraham**  
**B.Sc. (H) Botany, III year**

On February 15, 2018, Gargi College celebrated its Golden Jubilee.

The former President of India, Dr. Pranab Mukherjee was the Chief Guest and the Vice Chancellor of Delhi University, Prof. Yogesh K. Tyagi was the Guest of Honor.

Prof. Pradeep Burma, Chairman of Gargi's Governing Body, Dr. Shashi Tyagi, Co-Convener of the Golden Jubilee Committee and Dr. Promila Kumar, Principal of Gargi College were present along with the ex-Principals and Teachers for the celebration.

Dr. Pranab Mukherjee was escorted by Dr. Promila Kumar, other dignitaries and the NCC cadets to the auditorium. In the Auditorium foyer Dr. Mukherjee, Prof. Tyagi and Dr. Kumar lit the lamp to formally begin the event. Dr. Mukherjee brought the curtain down on the Gargi College's 'Wall of Fame' before moving to the auditorium.

As the dignitaries moved towards the auditorium, the Principal said, "Students at Gargi are encouraged towards holistic development with facilities in sports, NCC, NSS and other co-curricular activities. So I can say that Gargi stands for gyaan, anubhav, and rashtraprem ka gaurav iitihas."

The audience gave a standing ovation to the dignitaries as they entered the auditorium. The Guests were felicitated with the Golden Book (50 years of Gargi College) and a *Crassula* plant as a token of appreciation.

Dr. Promila Kumar gave the welcoming speech. She praised the dignitaries for their efforts in bringing changes in their respective fields. She briefly reflected on the college's 50-year journey. She added that Gargi stands for service to humanity.

Prof. Yogesh Tyagi congratulated Gargi College for completing 50 years of academic journey and for choosing Dr. Mukherjee as the Chief Guest. He

said, "As you are celebrating your golden jubilee, set some standards, probably impossible goals because success lies in achieving the goals that seem impossible. Provoke yourself to set extra-ordinary objectives as you have support from everyone. We love you, and whenever you need any support from us, we will always help. And thank you for inviting me here. I have never dared to enter the premises of Gargi College. I would have never done this without my guardian angel (Dr. Pranab Mukherjee). Thank you, sir, because of you; I can dare to do this. All of you are very lucky. I was not part of a college which the former president of the country would visit." He was applauded by the audience for his inspiring speech.

As Dr. Pranab Mukherjee began his speech, he was given a standing ovation. He encouraged Gargi with the words, "Completion of 50 years in the life of an institution may not seem very long, but at the same time, it is an important milestone as it provides an opportunity to stop for a moment, reflect from where we started, to where we are now, and what is our objective in the future. As we know, this college had a modest beginning with 200 students and less than 20 teachers, not having a house of its own. It started from a school building, and now you have reached here. Go ahead, and move forward." He pointed out the need for research, innovation, and development. He expressed his concern on the fact that six lakh Indian students go to foreign universities for higher studies as the current education system does not create the environment to fulfill their educational aspirations. He added that the government is working towards providing quality education in the hope of being able to match with the best universities in the world.

The vote of thanks was given by Dr. Shashi Tyagi on behalf of all the faculty members. The Golden Jubilee celebration ended with refreshments for all. The event left us inspired to reach greater heights in the future.





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## SPORTS DAY: 'SPIN 2018'



**Anshita**

**B.Sc. (H) Botany, II Year**

***GOLD MEDALS are not actually made of gold but I must say they are alloys of one's determination, strong will and energetic sweat.***

The most awaited Annual Sports Day 'SPIN' was well planned and executed by the Sports Union of our Gargi College on 22 February, 2018. The hard work by all enthusiastic participants and volunteers too is highly commendable. The fantastic turn-out from the students and teachers along with the pleasant weather were the perfect boost for all the participants out there at sports ground.

The students were brought into enthusiasm of this grand event with an oath taken by the eminent guests: **Mohit Chillar** (Indian National kabaddi Player) as the Chief Guest, **Sunita Sharda** (Sports Alumna) as guest of honour and **Sandeep Singh Mann** (Indian Para athlete) as special guest. Our Principal Dr. Promila Kumar welcomed the guests and assembly with an introductory speech with a brief report of college's sports activities and students. This was entailed by unfurling the flag, making the commencement of the ceremony followed by lightening of flame. In sequence, March past was held and all the departments along with our Botany department took part in it. Then, there were games and races organised for the students and teaching, non-teaching staff. Even our Lab staff took part in many games-



Mrs. Rajni and Mrs. Shashi won prizes in the race. Winners of Sports Olympiad were declared. From botany department many students like took part in various events and secured positions.

Upma- 1<sup>st</sup> position in Saraki

Apoorva, Pallvi Sharma- 1<sup>st</sup> position in FUTSAL

Ushma, Upma, Pallvi Sharma, Apoorva – 3<sup>rd</sup> position in Tug of War

Anju- 3<sup>rd</sup> position in 50 metre race

Asmita, Anshita, Lavleen - 1<sup>st</sup> position in Rangoli

Lavleen, Priyanka Shekhar- 2<sup>nd</sup> position in Aerobics

Shweta, Rozy – 3<sup>rd</sup> position in Place the ring

This was accompanied by the result announcement of March past competition and the winner was Political science department. The program ended with songs and dances.



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## SCINTILLATIONS (2018)



**Garima Bisht**

**B.Sc. (H) Botany, II Year**

*Nothing in life is to be feared, it is only to be understood. Now is the time to be understood more, so that we may fear less.*

**-Marie Curie**

This is exactly what science does. It is empowering and enthralling. It helps us swim across the vast ocean of truth and knowledge, seeking answers for the unknown wiping away all the fears.

Keeping this in mind the science faculty of Gargi College witnessed one of the most awaited events of the college calendar, the Annual Science Fest – Scintillations 2018. The auspicious event was graced by the presence of esteemed guest speakers. **Ajoy Ghatak** and **Dr. Chirashree Ghosh**. The two day event began with a speech from the Principal of Gargi College, **Dr.Promila Kumar** and proceeded with the presentations by both the eminent speakers followed by a tribute to one of the most eminent physicist and mathematician of his time – **Stephen Hawking** whose death left a hole in the hearts of many. Both the days of the Fest were full of fun events organized by different science departments of the college.

Botany Department also organized events and competitions for the students from all over the university. **TARU**, the Gargi College Botanical Society



(GCBS) held **Paint your own Pot** and **Extempore** competitions for the respective days and both of these were flooded with registrations of students not only from our college but also from colleges across the university. The events received overwhelming responses and were a hit amongst the students. The events tested the creativity and versatility of the students. The lifeless pots came to life and smiled back when the students poured their hearts out during Pot Painting competition covering vivid ideas and thoughts ranging from Lord Buddha to the towering skyscrapers of New York to the stages of evolution and what not!! It was a melange of beautiful ideas carved and weaved into a single canvas of life. Next event was extempore which had brilliant orators from across the colleges competing to win the trophy. The competition covered varied topics of general science like Global warming, deforestation, pollution and many more leaving the participants untrammelled to express themselves the best as possible. It was an epiphany of ideas that left the audience to think back with awe for nature and apprehensions for posterity in relation to sustainable development.

The Science Fest has brought to life the budding scientists of the college celebrating and commemorating the spirit of science as *modus vivendi*. It has paved the way for upcoming science enthusiasts to go on a quest for knowledge and never satiate their thirst for wisdom. Keep questioning everything and never stop imagining as rightly pointed out by the eminent scientist **Albert Einstein – *Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world.***

Hoping to keep this experience and spirit alive, the college would organize many such Scintillations with the ever increasing family of scientists in the years to come.....



**Scintillations Day 1 - Pot Painting Competition**





## Scintillations Day 2 – Extempore

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## North - East Festival



Priyanka



Richa Jain

B.Sc. (H) Botany, II Year

India is one of the countries which is famous for its immense cultural diversity. Different states of India represents their diversity at various significant levels. North Eastern states constitute a unique and vibrant part of it.

North-Eastern India is known for its natural beauty and lush green environment but the most impressive and attractive part is its cultural trends and practices. These states represents a real assemblage of colors of ethnic groups with diverse language and culture all bound together in unison.

North-East event was held for the first time in our college on **23<sup>rd</sup> March 2018** in an attempt to create awareness about **seven sisters of our country**. The purpose of the festival was to reduce the regional gaps and to celebrate frolic of the region.

Here is a glimpse of the series of events performed during the fest-The inauguration of the fest was done by our respected Principle **Dr. Promila kumar**, former Principle **Dr. Shashi Tyagi** and the chief guest **Professor Sanjay Hazarika** by lightning up the ceremonial lamps a symbol of gratification and serenity followed by the guest lecture.



The Guest Speaker was felicitated by LONGPI HAM: Black Gold of The East. Professor Sanjay Hazarika is a human right activist recognized internationally for designing and developing several programmes and initiatives for health and governance. He is also a scholar, author, journalist and film maker. Some of his popular writings are 'Reflection on North east', 'Strangers of the mist', 'writing on The Wall' etc.



**States displaying their respective cultures**

The culture of every state was represented through an extensive display of their respective attire, dances and songs. Among many other events that happened during the day, many dance forms like 'Cheraw' from Mizoram by Michelle and dance group, Arunachali dance by Riter and group, Manipuri

dance by Monica and group etc. were enjoyed a lot by the audience .Melodious duet was performed by Chanreishon and many others. An amazing presentation on prospect of tourism in North-East India was given by Travel Line Holiday. Various stalls were placed having different items like jewellery, shawls, pouches and even North –Eastern food.

India's North-East comprise of eight states of Assam, Manipur ,Meghalaya, Mizoram, Nagaland, Tripura, Arunachal Pradesh and Sikkim have enormous potential and tourism proportions. At the end ethnic attire show was presented by all the states. We must remember that even people from these states are an integral part of India and they own and owe India as much as any other citizen from any other states of our country. Looking forward to an India where there would be a tighter bond between North-Eastern states and the other states of India.

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# **DEPARTMENTAL EVENTS**

## DEPARTMENT OF BOTANY

### FACULTY



**Dr. CHHAYA BISWAS**  
(August 17, 1932 to February 3, 2012)  
Founder of

The Department of Botany,

Gargi College

Superannuated in 1993 as Principal, Gargi College

<b>Current Faculty- Permanent</b>	
Dr. Shashi Tyagi	Dr. Jasmeet Kaur Abat
Dr. Usha Prasad	Dr. Renu Soni
Dr. Gita Mathur	Dr. Vera Y. Kapai
Dr. Kiran Prabha	Dr. Reema Mishra
Dr. Geeta Mehta	Dr. Geeta Prabhakar
Dr. Aparajita Mohanty	Dr. Anjana Rustagi
Dr. Priyanka Pandey	Ms. Ruchitra Gupta
Dr. Leisan Judith	Dr. Garvita Singh



<b>Current Faculty- Temporary</b>
-----------------------------------

Dr. Samira Chugh
------------------

Dr. Shachi Aggarwal
---------------------

Dr. Gladys Muivah
-------------------

Dr. Preeti Aggarwal
---------------------

**Lab staff**

<b>Current Lab Staff</b>
--------------------------

Mrs. M.D Sharma
-----------------

Mrs. Shashi Bala
------------------

Mr. Ashok Kumar Rana
----------------------

Mrs. Rajni
------------

Mr. Arun Kumar
----------------

Mr. Pancham Singh
-------------------

Mr. Vijay Kumar Pandey
------------------------

Mr. Hansraj
-------------

Mr. Amit
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Mr. Gopal
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## Teacher's Day Celebration



**Aruna**

**B.Sc. (H) Botany, III year**

**'A teacher plants the seeds of knowledge, sprinkles them with love and patiently nurtures their growth to fulfill the dream of tomorrow'**

September 5<sup>th</sup> was celebrated with wholehearted zest and zeal by the students of Botany Department in remembrance of Sarvapalli Dr. Radhakrishnan- who was a great Indian Philosopher, Statesman, the first Vice-President and the second President of India.

Students made efforts to ensure that the teachers enjoy each and every moment. Beginning to prepare to surprise the teachers with decorations along with fun-games and activities is an event that leaves a mark in the memory. Teachers have always taught us that smiles are great investments; the more you collect, the better you feel. To give this a perpetual effect, teachers were welcomed with smiley-badges. The day began with a smile on everybody. The teachers were touched to the core of their hearts by the group singing performance given by students of 1<sup>st</sup> and 2<sup>nd</sup> years. Teachers were overwhelmed by the glimpses of photos from the depth of times shown in the video made by the students of Botany. Short video clips made by the college alumni were shown. A dance performance given by the students of 2<sup>nd</sup> year also caught teacher's eyes. Everybody was amazed by the

enthusiasm of students. It was followed by a fun game named **Botany Pictionary** involving the teachers.

Teachers enjoyed these moments, and appreciated the efforts made by students.

All ended with cake-cutting and loads of blessings. It was indeed a day full of memory enchants. One should always be thankful to the teachers who show us the right road to be taken.



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## Gargi College Botanical Society (GCBS) Inauguration Ceremony



**Pratibha**

**B.Sc. (H) Botany, III Year**

Department of Botany organized a lecture on “**Biology Undivided: Molecular Insights**” on 8th September 2017 by **Dr. Sudha Bhattacharya** from School of Environmental Sciences, JNU. Her field of work is Biochemistry, Bacteriophage Genetics, Bacterial DNA Replication, Molecular Biology of Amoebiasis, etc. The inauguration started with lighting of Ceremonial lamp, followed by a melodious Sarasvati Vandana sung by second year students to seek divine blessings of Goddess Sarasvati. Botanical rangoli was made with flamboyant herbal colors and rose petals (mark of attraction). Students welcomed the Chief Guest with a potted plant. This was followed by a welcome speech from Dr. Shashi Tyagi. Then the Chief Guest proceeded with her lecture. She shared her knowledge on Origin of Cell Organelles and Endosymbiotic Theory with the students that enlightened their mind with new possibilities for future perspective. It was an interactive learning session. In the end she wished us for our bright future. This was followed by **Badge Distribution Ceremony of Executive Members of GCBS-TARU**. The Gargi College Botanical Society has always been a part of Department of Botany since 1994, and was named as ‘TARU’

which means 'Tree' in September 2012. Executive Members were presented with their badges by Chief Guest and Teacher-In-Charge. The ceremony concluded with a Vote of Thanks by Secretary of TARU, Miss Vandana Khurana.



Some pictures from the Inauguration Ceremony





**Members of Gargi College Botanical Society (GCBS) 2017-18**

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## WORKSHOP ON GARDENING



**Osheen Taneja**

**B.Sc. (H) Botany, II Year**

The Department of Botany of Gargi College in association with the garden committee organized a skill enhancement workshop on **“Why to grow plants and how to multiply them”** on 26<sup>th</sup> of September 2017. The workshop was coordinated by Dr. Shashi Tyagi with Convenor and Patron being Dr. Renu Soni and Dr. Promila Kumar respectively, witnessed a massive turnout from all courses.

The workshop started with an inauguration ceremony graced by Dr. Promila Kumar, the principal. Followed were the series of lectures by the departmental faculties. The main objective of the interdisciplinary workshop was to expand the importance of plants as indoor purifiers in the increasingly polluted environmental scenarios and to impart the required knowledge on plant propagation to put into commercial use. The workshop also aimed at developing a basic understanding of plant propagation of common indoors plant, growing medium, types of container, watering , weeding and some



cures for the ill symptoms shown by the plants. The session also included the subtle art of bonsai making.


Following the theoretical session a technical session took place in association with the garden committee. The students actually got to practice what they learned in the precedent lectures. At the end of lectures, the students were also gifted with saplings to motivate them to take their learnt skills to next level.




## Department of Botany

in association with  
**Garden Committee**

Organizes  
**Skill Enhancement Workshop**  
on  
**“Why to Grow and How to Multiply Plants”**





*Date: 26<sup>th</sup> September, 2017*  
*Venue: Botany Lab 1*  
*Time: Registration 8:45 am*  
*Inauguration 9:15 am*

**Patron:** Dr. Promila Kumar  
**Coordinator:** Dr. Shashi Tyagi  
**Convenor:** Dr. Renu Soni  
**Organizing Committee:** Dr. Gita Mathur, Dr. Reema Mishra,  
Dr. Geeta Prakash, Dr. Anjana Rustagi, Dr. Samira Chugh





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**Workshop on**  
**Analytical techniques in Bio-Chemistry**



**Shivani Sharma**  
**B.Sc. (H) Botany, III YEAR**

A two day Workshop **on Analytical Techniques in Biochemistry** was conducted on **August 30<sup>th</sup> and 31<sup>st</sup>, 2017** under **STAR COLLEGE SCHEME, DEPARTMENT OF BIOTECHNOLOGY** Organized by **DEPARTMENT OF BOTANY**. Biochemistry is one of the fundamental subjects in life sciences. Different disciplines are now being translated through common language of biochemistry.

The Patron for the workshop was **Dr. Promila Kumar**, the **Coordinator** was **Dr. Shashi Tyagi** and the **Convenor** was **Dr. Kiran Prabha**.

In the recent years we have seen a remarkable increase of interest in biochemical and molecular methods for the elucidation of structural and functional relationship among different physiological processes. The Present day developments in the field of Biochemistry have been made possible by isolation and purification of enzymes, understanding nucleic acid metabolism, by refinement of existing techniques and the development of new ones. . Further, the theoretical background of students needs to be

complemented with practical and hands-on experience for a holistic scientific approach. The aim of this workshop was to produce necessary and simplified methods for students to acquire the knowledge about various techniques using the resources available to them to carry out their research work in upcoming future.

**Dr. Aparajita Mohanty, Dr. Jasmeet Kaur, Dr. Reema Mishra, Dr. Geeta Prakash, Dr. Samira Chugh** were the members of the organizing committee who delivered various lectures on several experiments related to analytical techniques. The methods described by them are also important components of courses in microbiology, genetics, plant physiology, etc.



A **workshop Manual** was provided to the students which includes a compilation of some of the important experiments. A **Certificate for participation** was provided to the students as well. I believe that this workshop can help students in the diverse fields by providing them source of biochemical information directly applicable to plant sciences.

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## **BOTANICAL EXCURSION TO MANALI (2017)**



**Meenal Mittal**

**B.Sc. (H) Botany, II year**

The feelings are completely different when you are travelling with your friends and it reaches to yet another level when it is for the first time in your life. My first ever road trip was with my classmates and faculty of Botany department. For any trip, the packing of bags and the decision of what should be carried and what shouldn't is itself a story to tell. Finally, the day of our botany excursion trip arrived **2 October, 2017**. All the students were assembled in the college waiting for our Volvo to come and begin the fun trip we've been waiting for ages. We departed around 4 pm from the college and travelled in two buses accompanied by our faculty members. And it was the beginning of the trip that we'll remember probably for the rest of our lives. While travelling, we listened to music and danced to the beats of Punjabi, Hindi and English songs. Not only our seniors but our teachers also participated in the dancing, Aparajita Ma'am, Shashi Ma'am and even Reema Ma'am. In no time we reached Murthal where we had our dinner. We enjoyed the meal. Exhausted, we all resumed with our journey. This time soothing songs were played and everyone just laid back on their seats, relaxed and enjoyed the soothing mood. Soon almost every one of us was asleep while some chose to be awake and enjoy the view outside.



Source of images- Pictures clicked by the students during the excursion period.

Next day around 7 am, we were in Himachal yet behind our scheduled time. We stopped at a resting point to freshen ourselves and our teacher, Gita Mathur Ma'am told us about the vegetation surrounding us. We reached our hotel, River **Crescent Resort** around one pm in the afternoon. By 3pm, all of us gathered in the dining hall where we had our brunch. And then we left for our expedition. We all were divided in a group of seven to eight students and travelled via jeep. I, along with my seven other classmates were accompanied by Dr. Jasmeet Kaur Ma'am and our first destination was



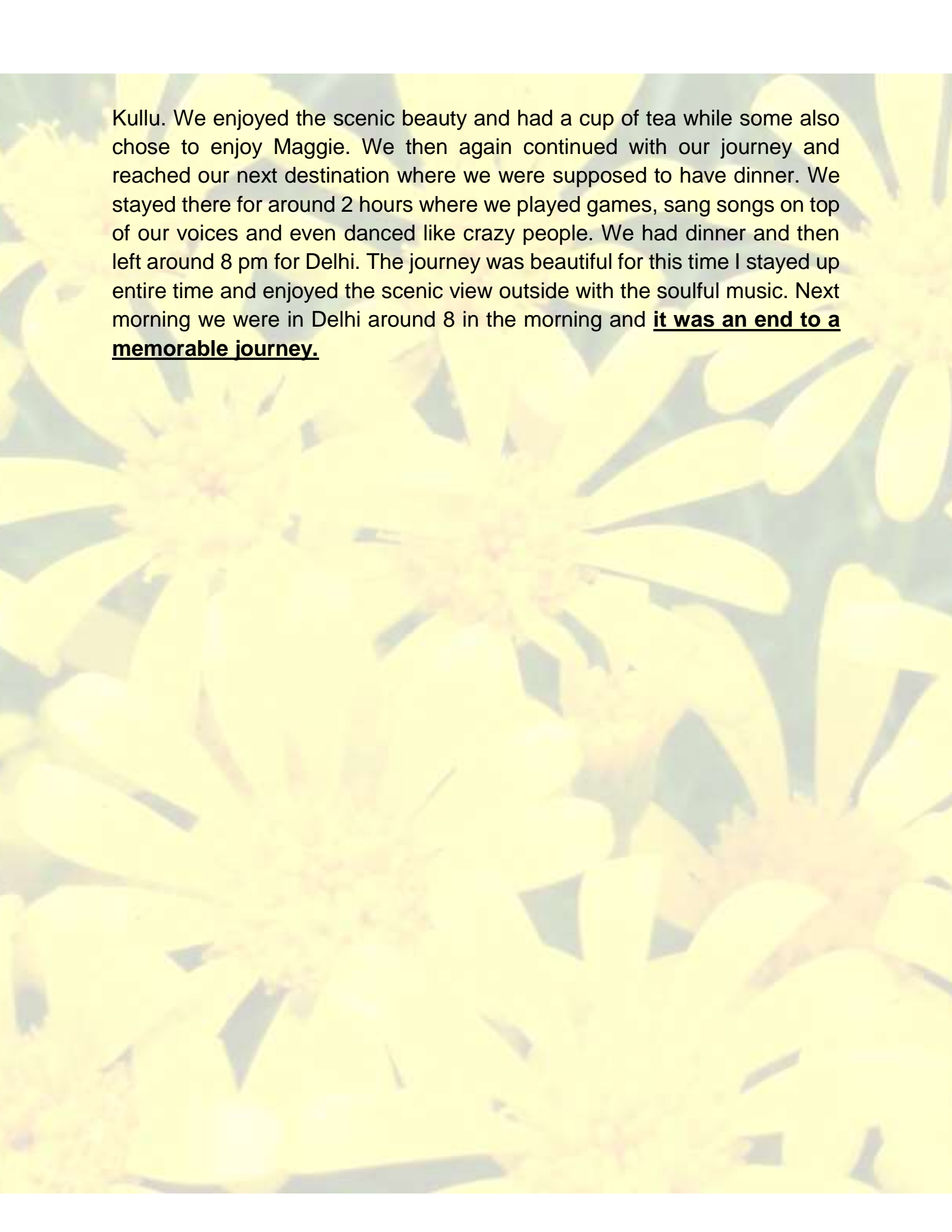
**Vashisht Bath Temple.** Enroute to the bath temple Jasmeet Ma'am educated us about the Pine trees which were widespread and also gave an overview about the bath temple that it is situated on the banks of gurgling Beas River and is a natural Sulphur spring. Pictures were clicked and we had a short stay there. Many native people allowed us to click pictures with the Angoora rabbit. The rabbits were as white as snow and as fluffy as wool and holding them in your own arms was a different level of happiness. From there we headed to **Hadimba temple.** Enroute to it teachers told us that it is an ancient cave dedicated to Hadimba Devi and that the cave is surrounded by the Cedar forest. We reached our destination within no time. Our happiness and excitement knew no bounds. The view was breath-taking. We observed the vegetation of Cedar trees and realized how huge and tall the trees were. After that we clicked some photographs. In Manali, wherever you go there are people who allow you to wear the traditional dresses and get clicked. Both us and our teachers participated this and got ourselves clicked wearing those dresses and jewellery. The fresh air had a soothing effect on us for after months we were far away from the scorching heat and pollution of Delhi. Then we left for the most popular place of Manali, **the Mall Road.** Our teachers left us to ourselves and allowed us to explore the shops of Mall Road for one and half an hour. People bought shawls for their mother's, jackets for their father's and something or the other they found interesting. Even I bought key chains for my family and a few friends and one for myself to keep it as souvenir. We walked through the streets of mall road with hundreds of shops selling woollens, eatables, jewellery, name plates and many more. Around 7.30 pm all of us gathered around the meeting point. We went to our hotels. The breeze blowing had a chilling effect on all of us and as soon as we reached our hotels we rushed into our rooms into the blankets. The dinner was served around 9 pm. After having dinner, we sat in each other's room played games and finally by 11 or so went back to our respective rooms for we all were hell tired and had an early call time for next day. I observed the room I was staying in it was huge and the best part was that we could hear the soothing sound of the river flowing.

By 6.30 in the morning we had our breakfast and left for **Rohtang Pass.** The permit was issued and we crossed the **Solang Valley.** Enroute to the pass we stopped at a point where we freshened up, had something light to eat

and then again resumed with the journey. Through the journey we all were mesmerized by the beauty of nature. We saw the Beas and Chenab River flowing at such a fast rate and with the cleanest form of water. It was a 14 km journey which took around 2 hours to complete. Not only this, we saw many people paragliding. We found hardly any snow at the Pass while the winds were blowing at a faster rate. We soon started the journey back to our hotel and reached around 2 pm in the noon. By 3, the lunch was served and everyone arrived. Entire room was discussing about the beauty of the Pass and some confessed how difficult it was for them to breathe at the higher altitude. After lunch, we had a walk on roads of Manali, we reached to a camping site where we got clicked ourselves, played volleyball, musical chairs and antakshri. Shashi Tyagi ma'am won the game of musical chairs and the game of antakshri ended at a draw. We also observed the orchards of apple at the camping site. We reached the hotel around 7 pm and got ready for the dj night. Some got ready in the party wear dresses while some chose to dress up in pajamas. The dj was bought to an end by the beats of dhol. After it the dinner was served. I along with my classmates sat over a big round table and had loads of fun. That night hardly few of us ate the meal but we made the memories we could cherish for our lives. And then our teachers sent us to our respective rooms but after sometime when we realized that our teachers had slept we sneaked over to our friend's room and had a huge round of games and gossips till 2 am and then we finally went to our rooms and dozed off to sleep.

Next day we woke up at around 6 in the morning and walked through the roads of Manali accompanied by our faculty members where we observed the vegetation of Manali. We collected the sample of *Marchantia*, *Funaria* and observed *Urticadioica* (BichuBooti), *Solanum xanthocarpus*, *Sedum*, *Willow*, *Fern*, *Salix*, *Abies*, *Cedrus* and many more. We returned to hotel rooms and got ready. We had our breakfast and checked out of our hotel. Our next stop was **Kullu Shawl factory**. Enroute we stopped at a fruit shop where almost all of us bought the golden apples and berries. We reached the factory by noon and then Mathur Ma'am demonstrated us the process of making shawls with the help of handcrafts. We had our lunch around the factory itself where we were served with Domino's Pizza and coke. We again started with the journey and then stopped by the river in





Kullu. We enjoyed the scenic beauty and had a cup of tea while some also chose to enjoy Maggie. We then again continued with our journey and reached our next destination where we were supposed to have dinner. We stayed there for around 2 hours where we played games, sang songs on top of our voices and even danced like crazy people. We had dinner and then left around 8 pm for Delhi. The journey was beautiful for this time I stayed up entire time and enjoyed the scenic view outside with the soulful music. Next morning we were in Delhi around 8 in the morning and **it was an end to a memorable journey.**



Some memorable moments from the trip.....

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**'Alien among the Plant Species'**  
**Lecture by Dr. Gyan Prakash Sharma**



**Shivani Sharma**  
**B.Sc. (H) Botany, III YEAR**

On 6<sup>th</sup> April Gargi College Botanical Society conducted another lecture delivered by our esteemed guest **Dr. Gyan Prakash Sharma**.

Dr. Sharma gave an excellent lecture on the topic **“Alien among the Plant Species”**.

Dr. Sharma is an Assistant Professor in Environmental Studies of University of Delhi. He has done his Bachelors and Masters from the University of Allahabad and obtained his Ph.D. Degree from Banaras Hindu University in 2007. Sir has worked as a Post-Doctoral Fellow at Centre for invasion Biology (CIB) , Stellenbosch University , South Africa from 2007-2009.

He has many other achievements including a Post-doctoral Fellowship at the University of Excellence for Invasion Biology, Research Associate by the CSIR, India 2008 and another Post-doctoral Fellowship at Institute of Ecology and Biodiversity, University of Chile. Sir has also been awarded with many prestigious awards.

Sir has enlightened us about the Alien plants, their invasion, need to focus on such plants, especially *Lantana camara*. He also showed some very

interesting stories related to the topic. His lecture was followed by Badge distribution ceremony of Anthesis Editorial Team.

He is a terrific insight and engaging speaker. He inspired the students with his effective communication skills and his engaging style and personality. His ideas and techniques truly enriched us. Lastly I would like to thanks the efforts made by GCBS members for organizing such a wonderful event.



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## FAREWELL 2017



**Vandana Khurana**  
**B.Sc. (H) Botany, II Year**

### **“ADIOS AMIGOS”**

“Our memories of yesterday will last a lifetime. We’ll take the best, forget the rest and someday will find that these are the best of times.” On that day all the people present there was feeling this. The seniors were happy about the time they had spent in the college and have so many memories to cherish with them for their lifetime. But there was a tinge of sadness also because they didn’t realize that time flew by so fast. It was a memorable day for all. To bid farewell to our beloved seniors, all the teachers and students were gathered.

The theme of 2017 farewell was based on the very famous American sitcom, **F.R.I.E.N.D.S.** This show was all about friendship and it portrays a new way of living life and becoming something in life that is not seen in the conventional society. The seminar hall was decorated with colorful balloons, posters on friends’ quotes and college life. The invites for seniors were made in the form of a graduation cap and all the details were written like this:  
**EPISODE- “THE ONE WHERE ALL TURN GRADUATE”**

The show started with a welcome speech by Shweta telling about the bond of friendship. Then girls of first and second years presented an energetic dance performance depicting different college situations like at the time of announcement of test and assignment submission or at the time of party and clicking photos. The performance made everyone relive those moments they had experienced in the college. The Miss Botany competition was done in three rounds with fun activities like mimicry, tongue twisters and many more. Kakul Di was crowned with the title of Miss Botany. The seniors shared their experience which was a bit emotional. After all the happy and sad moments, juniors have prepared two surprise elements for their loving seniors. One was their random photos in the college campus and other was a video made by the students themselves enacting different college situations like entering late in the class, bunking the class, enjoying in the labs and canteen and many more. The reaction of both seniors and teachers was priceless. Everyone loved it. It was followed by the distribution of mementos and titles to the seniors.

The function ended with the cake cutting ceremony and lunch for seniors and clicking lots of pictures to capture those beautiful moments. Saying goodbye is never easy but with a little planning and practice we can bid everyone a fond adieu with style. We wish our seniors all the joy and happiness as they begin with a new chapter in their life. And we hope that they achieve greater heights in all their future endeavors.





*Memories will last forever*

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## COMPETITIONS

Department of Botany organized many competitions such as Paper Quilling, Pot Painting and Extempore.

### WINNERS AT A GLANCE

Paper Quilling Competition held on 27/9/2017 with the theme "Inspired by Nature"

S.No.	Winners	Course	Position
1.	Jyoti & Geetika	(Gargi College)	I
2.	Aruna & Pratibha	B.Sc.(H) Botany (Gargi College)	II
3.	Shweta and Shobhna	B.Sc.(H) Botany (Gargi College)	III





Pot painting competition held on first day of Scintillations - 20/3/18.

S.No.	Winners	Course	Position
1.	Ritika Rai	B.Sc.(H) Life Sciences (Gargi College)	I
2.	Sneha	B.Sc.(H) Life Sciences (Gargi College)	II
3.	Reetika Lomor	B.Sc.(H) Botany (Gargi College)	III



**1**



**2**



**3**

# Pot Painting

Extempore held on second day of Scintillations – 21/3/18

S.No.	Winners	Course	Position
1.	Tavleen	B.Sc.(H) Microbiology (Gargi College)	I
2.	Deepak	B.A. (H) Political Science (ARSD College)	II
3.	Sanskriti	B.A. (H) Political Science (Gargi College)	III



**1**



**2**



**3**

# Extempore

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**Award Winners from B.Sc. (H) Botany (Batch:2014-2017)**

**Best All Rounder-Science Department**



**Drishti**

**Best Student- Botany**



**Aishwarya Singh**

**Academic Achiever's Award**



**Nidhi Gupta**

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## **GCBS ANNUAL REPORT**

**(2017-2018)**



**Shweta Choubey**

**(GCBS President)**

**B.Sc. (H) Botany, III Year**

The Inaugural lecture of Gargi College Botanical Society (GCBS) named 'TARU' was delivered by an eminent environmentalist, Prof. Sudha Bhattacharya, from School of Environmental Sciences, JNU on 8th September, 2017. She provided new possibilities and future prospective to origin of cell organelles and endosymbiont theory by speaking on the topic - "Biology Undivided: Molecular Insights". The talk was very inspiring, stimulating and thought provoking for all, especially for the students. The department conducted fun filled "Paper Quilling Competition" where student's creativity was at its best and they made beautiful pieces on the theme "Inspired by Nature". The Botany Department organized two workshops this academic year. A two day workshop on "Analytical Techniques in Biochemistry" under Star College Scheme, Department of



Biotechnology was organized for the final year students on 30th- 31st August, 2017 as the theoretical background of the students need to be complemented with practical and hands on experience for a holistic scientific approach. The second workshop was for all students and teachers on “Gardening” on 26th September, 2017 to raise awareness about different gardening practices. The participants learnt to grow, propagate and look after both indoor and outdoor plants. A special session on Bonsai making was the major attraction. No course in plant sciences is complete without observing plants in their natural habitat and therefore, a trip to Manali was organized in the mid semester break of 2017. Students learnt about the diverse plant groups, species and their natural habitat. To provide an insight into what we learn into our theory classes into its realization the department organized a one day trip on 6th March, 2017 for the third year students to Yakult Factory, Sonapat (Haryana) producing famous probiotic drink “Yakult”. The students observed fermentation processes, product formulation and packaging systems. The most awaited event Scintillations’18, the Annual Inter College Science festival was held on 20th-21st March, 2018. The two events organized by the department (Pot Painting and Extempore) were a great success with unexpectedly large number of participation.

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## SEMESTER TOPPERS



Name	Current Class	Result of	Position in Class	Photograph
Apoorva Vardhan	B.Sc.(H) Botany I Year	Semester I	I	
Minora Priya	B.Sc.(H) Botany I Year	Semester I	II	
Anamika Saini				
Asmita Saini	B.Sc.(H) Botany II Year	Semester II	I	
Tamanna				



Shalini Sharma	B.Sc.(H) Botany II Year	Semester II	II	
Sameeksha Sharma	B.Sc.(H) Botany II Year	Semester III	I	
Garima Bisht				
Asmita Saini				
Shalini Sharma	B.Sc.(H) Botany II Year	Semester III	II	
Rozy Yadav	B.Sc.(H) Botany III Year	Semester IV	I	

Ruth Abraham				
Pratibha Bishnoi	B.Sc.(H) Botany III Year	Semester IV	II	
Avi Mendiratta				
Ruth Abraham				
Rozy Yadav	B.Sc.(H) Botany III Year	Semester V	I	
Shivani Sharma				
Pratibha Bishnoi	B.Sc.(H) Botany III Year	Semester V	II	



Nidhi	B.Sc.(H) Botany Alumni	Semester VI	I	
Aishwarya Singh	B.Sc.(H) Botany Alumni	Semester VI	II	

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**Executive Committee of TARU**

POST	NAME	YEAR
<b>President</b>	 <b>Shweta Choubey</b>	<b>III</b>
<b>Secretary</b>	 <b>Vandana Khurana</b>	<b>II</b>
<b>Joint Secretary</b>	 <b>Rozy Yadav</b>	<b>III</b>



**Treasurer**



**Amisha Sharma**

**II**

**Executive**



**Vedika**

**III**

**Executive**



**Sandesh Yadav**

**III**

**Executive**



**Mehak Kaur**

**||**

**Executive**



**Garima Bisht**

**||**

**Executive**



**Aditi Kumari**

**||**



**Executive**



**Anamika Saini**

**II**

**Executive**



**Upma Garg**

**II**

**Executive**



**K Gayatri Devi**

**I**

**Executive**



**Kangkana Khakhlari**

|

**Executive**



**Aadrita Das**

|

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**Editorial Board of Anthesis Volume 13**  
**(2017-2018)**

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Co-Editor	 Shivani Sharma	III
Editorial Board Member	 Ruth Abraham	III

<p>Editorial Board Member</p>	 <p>Aruna Vashisth</p>	<p>III</p>
<p>Editorial Board Member</p>	 <p>Pratibha Bishnoi</p>	<p>III</p>
<p>Editorial Board Photographer</p>	 <p>Preeti Bhati</p>	<p>III</p>
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Member



Nishika Ravi

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**Articles on Sustainable Agriculture**

## Vertical and Urban Farming



**Vishakha Vasishtha**  
**B.Sc. (H) Botany, III Year**

It has been estimated that by the year 2050, total population of the world would increase by 3 billion people and majority will live in urban areas. At this stage the biggest challenge would be to feed the growing population that would require a very large amount of farmland. Scientists are very much concerned for the availability of farmland.

At this point of time, what can be better than the fact that now it has become possible to grow crops vertically in stacks. This is what we call as **VERTICAL FARMING**.

Gilbert Ellis Bailey coined this term in his book – Vertical Farming (1915).

It is a proposed system of growing produce in vertically stacked layers commonly integrated with some structures such as shipping container, skyscraper, repurposed warehouse and that involves indoor farming techniques along with controlled environment agriculture technology (CEA). Enclosed structures similar to Greenhouses are used in Vertical Farming. The stacking is vertical, either directly above each other or staggered for better light exposure. Instead of soil or in addition to soil other growing methods such as Hydroponics and Aeroponics are used. Some mediums such as Coconut husks or peat can also be used. Natural light augmented with artificial light that is often LED is used. The artificial lights can be driven by solar power / wind turbines (Renewable resources). To improve light efficiency, rotating beds are often used.



The primary goal is to maximize the productivity in a limited space.



Lettuce grown in vertical farming system

Vertical farming at home using Hydroponics

Source- [https://en.wikipedia.org/wiki/Vertical\\_farming](https://en.wikipedia.org/wiki/Vertical_farming) Source- <https://www.thebetterindia.com/79003/ajay-naik-go-a-hydroponic-farm-software-engineer/>

## **Advantages of Vertical Farming:**

- **FUTURE ROLE:** Vertical farming is an amazing technique to meet the needs of growing population.
- **REDUCED USE OF WATER:** It generally requires 70-95% less water than required for land cultivation.
- **INDEPENDENT OF WEATHER EVENTS:** Extreme weather condition is one of the major causes for destruction of crops grown in traditional outdoor farming. As controlled environmental conditions are provided in vertical farming, the crops will not face the extreme conditions. Though tornadoes and earthquakes still cannot be avoided.
- **MAXIMIZE CROP PRODUCTION:** It has been seen that productivity of some crops multiplies by a factor of 4 to 6. For Strawberries the factor becomes 30. Allows crop to be grown in places where land is not fertile (Desert regions).
- **CONSERVATION OF RESOURCES:** The need for farmland will reduce; therefore it will conserve many of the natural resources that are under danger due to pollution and deforestation.

- **HUMAN HEALTH:** In traditional farming laborers are exposed to certain risks such as infections, toxic chemicals, dangerous wildlife, injuries etc. Since in Vertical farming environment is more or less regulated, these risks are not present.
- **REDUCED SPOILAGE:** Transportation is reduced as the crops will be sold in the same infrastructure in which they will be grown so it would definitely reduce spoilage.

### **Problems with Vertical Farming:**

- High cost investment.
- High energy requirements for controlling the environment such as light, temperature, humidity etc.
- Most designs cannot efficiently deliver light.
- Pollination process is done manually that would be expensive and labor intensive.

Vertical farming has been introduced in India and is growing rapidly. Many experts, scientists, entrepreneurs in Bengaluru have started to think the ways in which we can take this process forward. (Source: The Hindu Newspaper).

Despite of few problems, vertical farming can definitely help the urban world to become self-sufficient in food and will ensure the availability of fresh fruits and vegetables on one's doorstep. Vertical farming needs to be encouraged.

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- 
- The background of the page is a close-up photograph of several bright yellow flowers, likely sunflowers, with their petals and centers clearly visible. The flowers are arranged in a somewhat circular pattern, filling the entire frame.
- <https://www.thebalance.com/what-you-should-know-about-vertical-farming-4144786>
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## Biostatistics in the Improvement of Agriculture



**Shivani Sharma**

**B.Sc. (H) Botany, III Year**

**Biostatistics** is the branch of statistics responsible for the proper interpretation of scientific data generated in the biology, public health and other health sciences. Biostatistics is a broad discipline encompassing the application of statistical theory to real world problems , the practice of designing and conducting biomedical experiments and clinical trials , the study of related computational algorithms and display of data , and the development of mathematical statistical theory.

Agriculture plays an important role in the economy of developing countries, and provides the main source of food, income and employment to their rural population. Improvements in agriculture and land use are fundamental to achieving food security, poverty alleviation and overall sustainable development.

### Importance of Agriculture

- Is the hub of agrarian economy
- Is a Key Economic Driver. It is central to Individual livelihood
- Poverty alleviation



- Nations “Economic “growth, e.g. agriculture contributes 20.9% of GDP of Pakistan.
- Is the Key to Healthy Biosphere as it provides Nutrition which is a key determinant of human health
- Provider of energy-fuel-wood and medicinal plants

Agricultural research has played a key role in the development of statistical methods. The presence of wide heterogeneity in the experimental material that is often used in agricultural research, led to the application of statistical tools and consequently many refinements and newer developments in statistical followed. The famous Statistician , **Sir R.A. Fisher** and his colleagues at Rothamsted Experiment Station in UK and elsewhere, while attempting statistical solutions to agricultural problems, led to the development of design of experiments and analysis of variance techniques which are fundamental to the subjects of statistics.

Agricultural Statistics has three core subjects’ areas, namely, sample surveys, design of experiments and biometric techniques. Sample surveys in agriculture is primarily concerned with estimation procedures for area under different crops, crops yield and crop production. Besides the estimation of land use statistics, statistics related to input use in crops such as the varieties, seeds, fertilizers, irrigation, insecticides/pesticides, machines/implements/tools, the supply and demand of various inputs are often collected through sample surveys. The cost of cultivating /production needs to be compiled through detailed survey inquiries so as to understand the farm level efficiency. The information about markets, prices, imports/exports is also becoming important now that India has attained food sufficiency leading to surpluses in certain pockets and the fair competitive trade discipline being enforced under **World Trade Organization regime**.

Statistics, in fact, provides scientific tools for representative data collection, appropriate analysis and summarization of data and inferential procedures for drawing conclusions in the face of uncertainty. It is indeed true that statistical tools have wide applicability to almost any branch of science dealing with the study of uncertain phenomenon involving aggregates. However, in agricultural research, statistics finds some of the very interesting applications which often led to the development of newer statistical techniques or at least a refinement of existing ones. Consequently, the

branch of statistics dealing with the agricultural research sector is termed as **Agricultural Statistics.**



Images showing Indian agriculture

Images Source- <https://indiafacts.org/ancient-indian-tradition-agriculture-food-sharing/>

### **Purpose and Objectives of Agricultural Statistics**

- a) To provide comprehensive knowledge of the basic information of agriculture, rural areas and the farmers
- b) To provide the scientific basis for the study of the development of economic and social development, planning and decision making.
- c) To provide statistical information services to the planners, scholars and public.

### **What should be measured in an Agricultural Statistics System?**

To determine which statistics should be collected, it is important to look at its objectives of the user community which is being supported and to consider which type of decisions that may need to be made at various levels in the system. It is clear that the reasons we need agriculture is because we need to eat, be clothed and to be able to earn money. Thus we end up measuring the stocks under the following headings:

Crops, Horticulture and Floriculture, Livestock, poultry, Aquaculture, Purchased inputs and investments, paid labor, Equipment and capital stock.



Experimental design is the most important step in agricultural research, and an appropriate design can help reduce experimental errors. The **ANOVA** approach invented by **Fisher (1925)** has remained the dominant approach in the natural sciences, including agronomy and crop research.

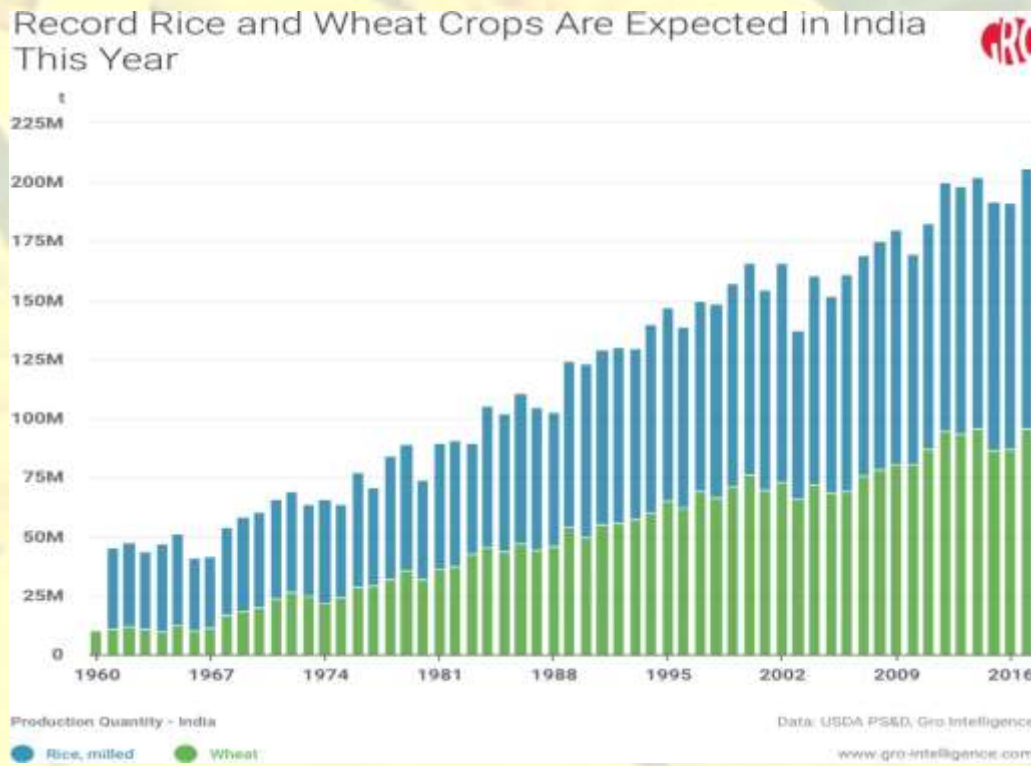


Image Source: <https://www.gro-intelligence.com/>

## EMERGING ISSUES

### Approach towards Agriculture Statistics: Sector Wide Approach (SWAP) or Adhoc Approach

: For the developing countries, the agricultural Statistics are an essential and basic part of their statistical system. The Adhoc approach focused on only one domain of statistics did not prove to be the most successful approach for the development of sustainable statistical systems. Therefore SWAP should be adopted.

### Globalization trend in Agricultural Statistics

: Globalization is recognized as an important challenge for economic and social statistics. Also in agriculture, the globalization trend is visible in

countries specializing in certain crop production and increasing trade flows of agricultural products between regions and countries.

### **Coordination with International Agencies**

: Compared to other statistics Biostatistics are relatively far from the direct reach of statisticians. As a result the communication and coordination on the international level of agricultural statistics is rather restricted, which needs to be improved.

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## Olericulture



**Manasvi Bhaskar**  
**B.Sc. (H) Botany, III Year**

Vegetables play a very important role in our lives. They are the ultimate source of carbohydrates, proteins, vitamins and minerals. The science of cultivation of vegetables for human and animal consumption is known as **Olericulture**.

Olericulture is originated from Latin word 'oleris' meaning pot herb and English word 'culture' meaning raising of plants. It is the branch of horticulture which deals with the culture of herbaceous plants. It is the production of plants for the use of their edible parts. It includes production, storage, processing, transportation and marketing of vegetables. The steps involved in olericulture are **1)** selection of cultivar, **2)** seedbed preparation, **3)** crops establishment by seeds and transplants. The basic requirements of all the plants are water, nutrients, light, temperature and oxygen and when these conditions are fulfilled vegetables can be grown for food.

**Scope in India:** India is the second largest producer of vegetables in the world (surpassed only by China), accounting for about 10 per cent of the world's production.

**Biotechnology in Olericulture:** Biotechnology has played a major role to increase vegetable production to meet the demands of growing population. Some of the techniques used are as follows:

**1) Traditional breeding:** Pollen and ovule from desired male and female parents are crossed to get desirable characteristics. Example- honeycrisp apple

**2) Mutagenesis:** Mutations are induced in crops by mutagenic chemicals or radioactivity to create variety within crops and to get desired traits. Example- ruby red grapefruits.

**3) Polyploidy:** polyploidy is induced in crops to change the chromosome number to influence its fertility and size. Example- seedless watermelons are created by crossing 4 set chromosome watermelon with a 2 set chromosome watermelon.

**4) Protoplast fusion:** joining of cells to transfer traits of species. Ex-male sterility was transferred from radish to red cabbages by protoplast fusion.

**5) Transgenic:** introduction of foreign gene using plasmid vectors.

Example: Rainbow papaya that gives it resistance to the papaya ringspot virus.

#### **Methods of vegetable cultivation:**

Nowadays there are many methods for vegetable cultivation. Some of them are as follows:

**1) Mulching:** This practice involves covering of cultivated plants with some covering materials like leaves, straw, sawdust, peat moss, compost, gravel etc. or synthetic, like polyethylene and PVC to conserve soil moisture, maintain higher soil temperature and to control weeds.

**2) Polyhouse/greenhouse:** It is the practice of growing vegetables in an inflated structure using transparent covers to create greenhouse effect. This



enclosed space allows partial control on microclimate of crop and high carbon dioxide concentration improves plant productivity.

**3) Low Tunnels:** Low tunnels cover rows of plants in the field and provide protection against low temperatures and frost, winds and insect pests.

**4) Hydroponics:** It is the science of growing vegetables in water having dissolved nutrients. It is also referred as soilless cultivation in which plants can be grown in an inorganic substance like sand, gravel, perlite, Rockwool or in an organic material like coconut fiber, pine bark or sphagnum peat moss and periodically watered with a nutrient solution.

**5) Aeroponics:** It is the science of cultivating vegetables in air or mist environment and not in soil. In this plants are suspended in closed environment and the roots and stems of plants are atomized with nutrient rich solution.



AEROPONICS



MULCHING



GREENHOUSE



LOW TUNNEL

Source:

[-https://harvesttotable.com/2011/07/mulch\\_hot\\_weather\\_vegetable\\_ga/mulch-chinese-cabbage/](https://harvesttotable.com/2011/07/mulch_hot_weather_vegetable_ga/mulch-chinese-cabbage/)

<https://i.pinimg.com/736x/3e/5e/44/3e5e44b5f05955f68f6296d5e3b16a65--social-science-hydroponics.jpg>

The background of the slide is a close-up, slightly blurred image of several bright yellow flowers, likely sunflowers or a similar species, with dark brown centers. The flowers are arranged in a pattern that fills the entire frame.

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## TILLING THE COSMOS



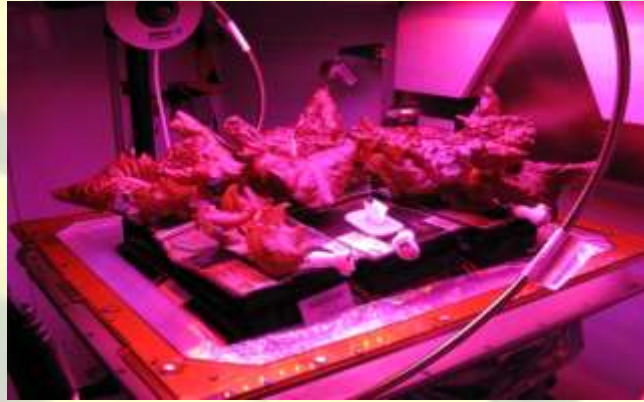
**Jutismita Pathak**

**B.Sc. (H) Botany, III year**

**Space Farming** is nothing but growing of plants in space. After intense research, plants can now be grown on Mars, Moon and in a space station or space colony. This technology is a very tricky process. It involves light, gravity and nutrients as limiting factors.

People like us, i.e. one living on earth can eat anything and everything as we desire but those travelling in space cannot. Scientists every day, are trying to find different means to grow food that will be feasible for astronauts to eat. Plants play an important role in providing food to astronauts. Along with this, they also help in removing carbon dioxide from air present inside the spacecraft and create oxygen in turn.

Generally almost all the International Space Station expeditions are of short durations, so astronauts do not face much health related problems and can survive by physical and chemical means of life support. But for long duration endeavors to Moon or Mars, scientists say that a biological life support system would surely prove beneficial. But growing a plant such as a fruit or vegetable in space is not easy.



Space Farming

Source- [https://www.google.co.in/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&ved=0ahUKEwj-8g\\_n0tXYAhUXSY8KHd7KAFMQjRwIBw&url=https%3A%2F%2Fwww.nasa.gov%2Ffeature%2Fspace-farming-yields-a-crop-of-benefits-for-earth&psig=AOvVaw2TbPVQc\\_tXGYh3uY9KnYNm&ust=1515957193005045](https://www.google.co.in/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&ved=0ahUKEwj-8g_n0tXYAhUXSY8KHd7KAFMQjRwIBw&url=https%3A%2F%2Fwww.nasa.gov%2Ffeature%2Fspace-farming-yields-a-crop-of-benefits-for-earth&psig=AOvVaw2TbPVQc_tXGYh3uY9KnYNm&ust=1515957193005045)

## How to grow plants in space?

The first and the toughest challenge is to grow plants without gravity. Two astronauts namely Steve Swanson and Rick Mastracchio had set up a project named “veggie” in the International Space Station. Veggie is a container which guides plant growth using plant pillows which are bags filled with fertilizer and nutrients. In space, roots grow in every direction unlike downward as here in earth, and water and other plant essentials float. As such, the nutrients in plant pillows are equipped with wicking material to which seeds are glued so that roots grow downward and stem upward. LED lights are used as the light source which provides the required energy for growth.





[https://www.google.co.in/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwjbzb-b1NXyAhXEvo8KHU7ZA9YQjRwIBw&url=https%3A%2F%2Fwww.artstation.com%2Fartwork%2F5BvbW&psig=AOvVaw3-55KGZ\\_52IzU\\_YqqrSebD&ust=1515957558723287](https://www.google.co.in/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwjbzb-b1NXyAhXEvo8KHU7ZA9YQjRwIBw&url=https%3A%2F%2Fwww.artstation.com%2Fartwork%2F5BvbW&psig=AOvVaw3-55KGZ_52IzU_YqqrSebD&ust=1515957558723287)

[https://www.google.co.in/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwjH1dLI1NXYAhUEu48KHXTHBtUQjRwIBw&url=https%3A%2F%2Fwww.nasa.gov%2Fmission\\_pages%2Fstation%2Fresearch%2F10-074.html&psig=AOvVaw0nq8EcyvdVRLJDdHJZE553&ust=1515957725906519](https://www.google.co.in/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwjH1dLI1NXYAhUEu48KHXTHBtUQjRwIBw&url=https%3A%2F%2Fwww.nasa.gov%2Fmission_pages%2Fstation%2Fresearch%2F10-074.html&psig=AOvVaw0nq8EcyvdVRLJDdHJZE553&ust=1515957725906519)

**Plants grown in space:** *Arabidopsis*, Rice, Flax, Onions, Radish, Lettuce, Potato, Cinnamon, basil, etc.

### **Benefits of Space Farming**

Farming in space more than anything else has health-wise benefits. This technique if proved entirely successful can be employed during the long-term journey to Mars.

- **Food:** Astronauts can eat fresh produce with the help of this technology.
- **Stress relief:** It is very important for astronauts to stay calm in which growing plants during their spare time can prove helpful.
- **Air quality:** Plants can be useful to remove carbon dioxide and add oxygen to the air and also absorb pollutants and improve air quality.
- **Time record:** As the plants bloom and wilt, they may be helpful to record the passage of time as they change over time in space where in nothing else is changing.

Space Farming is not at all a piece of cake because of course, there is no gravity up there. It is growing with increased research but to avoid all mishaps and achieve best results, more and more work and experiments are needed so that this proves as a revolution.

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## Agriculture Friendly Organisms



**Michelle**

**B.Sc. (H) Botany, III Year**

Agriculture has been a part of the human world ever since it was first discovered by the prehistoric humans. Since then it has been an essential practice that ensures survival as well as proper health of human beings. Every country small or big is directly or indirectly dependent on agriculture to provide food to its population.

As you may have heard before, India is an agricultural country which means that its economy is greatly dependent on agriculture. Agriculture is practiced far and wide in the country. In such cases, sustainable agriculture becomes very important. In simple terms, sustainable agriculture is the practice of agriculture in order to provide food and fiber whilst using techniques that are safe for the environment, public health as well as animal welfare. There are several microorganisms, insects, plants, animals, etc., that are beneficial in sustainable agriculture and they may be referred to as agriculture friendly.

Most of the agriculture friendly organisms are microorganisms. Bacteria and Fungi are the commonly found beneficial microorganisms in agriculture. However, some viruses too are helpful in plant growth and resistibility to drought. Soil bacteria are widely used in crop production and they are referred to as Plant Growth Promoting Rhizobacteria (PGPR).

These soil bacteria help widely in nitrogen fixation and are very important in the nitrogen cycle. They are divided into symbiotic and free living bacteria. The symbiotic bacteria are those that form an association with the roots of

plants stimulating the formation of root nodules. Nitrogen is converted to ammonia in these nodules and utilized by the plant.

Examples of **symbiotic nitrogen fixing bacteria** are: *Rhizobium*, *Bradyrhizobium*, *Azorhizobium*, *Allorhizobium*, *Sinorhizobium* and *Mesorhizobium*. The **free living nitrogen fixing bacteria** belong to species: *Azospirillum*, *Enterobacter*, *Klebsiella* and *Pseudomonas*. Apart from nitrogen fixation they also provide protection from phytopathogens and certain plant diseases.

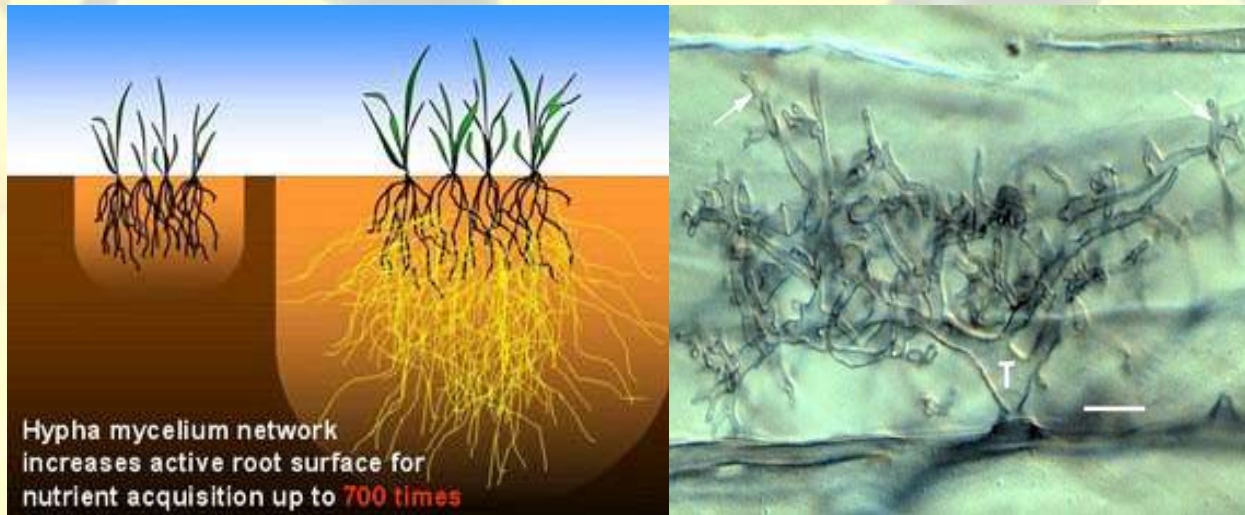


Image-Root nodules due to symbiotic association

Source: [https://biology-forums.com/gallery/33\\_24\\_07\\_11\\_11\\_14\\_13.jpeg](https://biology-forums.com/gallery/33_24_07_11_11_14_13.jpeg)

An association between fungi and roots of higher plants called the ***Mycorrhiza*** is in plant growth. The mycorrhizae are again divided into two types: **Endomycorrhiza** and **Ectomycorrhiza**. Endomycorrhizal fungi penetrate within the cell walls and form arbuscules within the cells. Arbuscules are small tree like structures that are organs of nutrient exchange. The ectomycorrhizal fungi form a more exogenous association with the plant. These fungi form associations with the roots of higher plants and help in the uptake of nutrients from deeper especially Phosphorous which is low in motility. The fungi on the other hand derive nutrition from the host plant. Apart from this they are also now being used to control pests.





Increased root surface area for absorption.

Arbuscules formed by Endomycorrhiza.

Images source: <http://biology.kenyon.edu/fennessy/SrexMarx/arbgood.jpg>  
<http://www.mantisplantprotection.com/wp-content/uploads/2017/04/mycorrhizae-benefits-1024x585.jpg>

Virus are almost always immediately considered as pathogens, however, some experiments showed that viruses are not always harmful. One experiment showed that the virus infected plants had higher tolerance to drought. Also viruses were seen playing a role in heat tolerance for some plants growing in geothermal areas. **Baculovirus** are natural pathogens of several insects (mostly lepidopteran). They are used in biocontrol as species specific **bio pesticides**.

Not all **insects** are harmful and damaging for crops in agriculture. In fact the percentage of harm causing insects is lesser compared to those that are not harmful. Many insects are also beneficial to plants in several ways. They maybe predators or parasites of several pest insects (Example: Spiders and some beetles, flies and lacewings are predators of insects. Wasps are parasitic insects which lay their eggs inside insects). Certain insects like bees, honey bees, butterflies and moths help in pollination of plants. Thus, insects are mostly helpful in biocontrol and pollination.

Another very common beneficial insect in agriculture is the **earthworm** belonging to the phylum **Annelida** .They can be of two types the burrowing and non-burrowing type. The non-burrowing earthworms are red in color and also known as red worms. Earthworms are efficient decomposers and therefore help in production of humus. They also help improve soil structure

and are great fertilizers. As a result they are often known as a farmer's best friend. The excretory product of the worms called casting are usually nutrient rich (nitrogen, phosphorous and potassium). The red worms are more efficient than the burrowing worms. These worms are also used in composting known as **vermicomposting** which is the natural degradation of agricultural waste by the earthworms. This in turn provides humus for fertilizer.

Farm animals may also be considered as agriculture friendly. Rearing of cattle and simultaneously cultivating crops is an effective method of sustainable agriculture. Animals such as cows, horses, bulls, donkeys, sheep, and goat prove very useful in agriculture.

Pesticides and fertilizers and other chemical products are very widely used in agriculture which proved to be hazardous for the environment and also for the consumer. A method of sustainable agriculture is now becoming widespread and is called **organic farming**. This type of farming utilizes the natural processes of the ecosystem and avoids the use of synthetic substances such as fertilizers, pesticides, herbicides, etc., for crop and livestock production. Hence, organic farming utilizes a lot of these agriculture friendly organisms.

**Sustainable agriculture** is an important step towards preserving what remains of our environment for future use. Hence, its practice must be much more greatly encouraged in the years to come.



## Images of some agricultural friendly organisms



This beneficial insect is the aphid parasite *Aphidius ervi*, attacking an aphid.



Mealybug Destroyer, *Cryptolaemus montrouzieri* attacking prey



*Eisenia fetida*

Images Source: [http://cdn.arbico-organics.com/images/uploads/6\\_730\\_large.jpg](http://cdn.arbico-organics.com/images/uploads/6_730_large.jpg)

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## Pomology



**Nishika Ravi**

**B.Sc. (H) Botany, I Year**

We have been doing agricultural practices since very long. We have a lot of agricultural activities like arboriculture, floriculture, olericulture etc. It is a branch of botany devoted to the study and cultivation of fruits i.e., “**POMOLOGY**”.

### **Introduction: What is Pomology?**

Pomology is a branch of horticulture which deals with various aspects of fruits starting from rising of saplings, growing them properly and providing various intercultural operations. The term pomology is a combination of two Latin words *pome*-fruits and *logos*-culture. *Poma* in Greek means fruits later subsequently transfer in to, “Pome” in Latin means fruits and logos stand for study. Pomology is the science of growing fruits, which divide fruits into groups based on plant morphology and anatomy. It is so important to the production of fruit that the United States Department of Agriculture (USDA) established a division of pomology in 1886.

### **INDIAN POMOLOGY**

In India, commercial horticulture has a recent origin (100 years old). Orchards in olden days were planted just for hobby by the kings. Akbar planted more than 1 lakh plants of fruit trees at Dharbanga (in Bihar) named as Lakhbagh as referred in a book called **Ain -e -Akbari**. Mughals established Mughal gardens. In Himachal Pradesh Major Bannon and Captain Lee were the first to plant the apple orchard in Kullu valley. Sir Alexander Couatts owned an apple orchard at Mashobra. S. N. Stokes use to grow apples in Kotgarh.

### **The American Pomological Society**

The American pomological society is the oldest fruit organization in North America founded by Marshall P. Wilder in 1848 to foster the science and practice of fruit production and variety development.

### **How to get Maximum Yield**

- Pomology is instrumental to the cultivating of fruit, developing new or improved varieties, developing disease-resistant fruit, and discovering new pruning or grafting techniques.
- Pomology enhances fruit quality.

For example, peaches have been bred that can tolerate colder temperatures, and produce larger and juicy fruits with higher yields.

### **POMOLOGY BENEFITS**

#### **The Benefits of Banana Farming**

Banana farms are abundant in Uganda. A large percentage of bananas consumed locally are grown in small-scale. [Grassroots Reconciliation Group](#) (GRG) has helped facilitate groups to establish banana farms through strategic training sessions.

In this sessions, they learnt effective techniques for planting and growing bananas, pineapple and citrus. They discussed the best control methods for pest and diseases prevention and control.

They identified other benefits to growing bananas:



1. Banana does not require as much attention as other crops.
2. They have potential to improve domestic situations.
3. They can help with issues of constipation.

## **Conclusion**

Through pomology growing bananas is seen as a huge benefit to communities. Bananas hold culture importance as well as financial and health benefits.

## **POMOLOGY INSTITUTE**

- National Agricultural Research Foundation (N.AG.RE)
- Indian Agricultural Research Institute (IARI)
- Research Institute of Pomology and Floriculture
- Institute of Pomology (IOP) , Chinese Academy of Agricultural Sciences (CAAS)

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## URBAN FLORICULTURE



**Shobhna Yadav**  
**B.Sc. (H) Botany, III year**

*'Flowers are the music of the earth' -Marty Rubin*

Just the thought of flowers- their beauty and fragrance, refreshes us. They detoxify our minds. Flowers have been part of human life from ancient past to present day. Floriculture is a discipline of horticulture which deals with the cultivation and management of ornamental, especially flowering plants. The use of flowers in urban areas is known as urban floriculture-a discipline of horticulture. It is the study of production of ornamental plants through cut flowers, seeds, bedding plants, grafting and marketing of flowers and flower produces.



Some flowers used in floriculture. Source: Self

Flowers are used to express our feelings to one another, to welcome people, to decorate our houses, as raw material in cosmetics, perfume industries, pharmaceutical sector etc. Some flowers used in Urban floriculture are *Ageratum*, Annual vinca (*Catharanthus*), Black-eyed Susan (*Rudbeckia*), Daylily (*Hemerocallis*), New Guinea impatiens (*Impatiens*) Japanese iris (*Iris*), Marigold (*Tagetes*),

*Chrysanthemum*, *Calendula*, *Hollyhock (Alcea)*, *Petunia*, *Pansy (Viola)*, etc. Floriculture, a very old farming activity, is a productive self-employment of farmers. It is now emerging as a profitable agri-business in India and around



the world. Today, this industry has turned out to be dynamic and fast growing. During 1950s, the global flower trade was below US \$3 billion. Recently, the world production of floriculture was valued at US \$40 billion.

The demand for flowers in the urban areas reaches peak levels during festivals, religious ceremonies, valentine day, marriages, etc. The farmers earn more money in season and less during off-season. Value added products help farmers to sustain themselves when demand is low. The value of raw product is increased through processing. The customers pay more for value added products as they have longer life than raw flowers.

Some value added products are floral jewelry, petal embedded handmade paper, dried flower arrangements like wreaths and wall swatches, painted gourds, sachets, *potpourris*; products made up of press dried flowers like greeting cards, wall hangings, sceneries, table tops, book marks etc. Value addition also includes processed flower products like jam, jelly, beverages, rose water, gulkand, floral dyes, floral tea etc. Other products are oil, perfumes, cosmetics etc. Some flowers have nutraceutical properties and pharmaceutical properties.

### **Harmful effects:**

Floriculture has some serious side effects on the floriculturists. The chemicals used to protect the flowers and floral crops from insects and pests can cause cancer, birth defects, reproductive and nervous system damage. Floriculture in greenhouse uses almost 127 different chemicals in an enclosed



Some value added products. Source: Internet

space-increasing risk of exposure through the skin and by inhalation.

A study of fern and flowers in Costa Rica found that over 50% of respondents had at least one symptom of pesticide poisoning, such as headache, dizziness, nausea, diarrhea, skin eruptions or fainting.

In Ecuador, nearly 60% of workers surveyed showed poisoning symptoms, including headaches, dizziness, hand-trembling and blurred vision.

Workers also suffer from reproductive problem as female floral workers in Columbia were found to have an increased rate of miscarriages and

delivered babies with birth defects. They showed reduced ability to become pregnant. The male workers who were exposed to these chemicals for about 10 years showed 40 per cent less sperm concentration.

Floriculture also has adverse effect on environment. It has lead to depletion of water table in the savanna surrounding Bogota. Pesticides are directly discharged into water bodies and washed into streams and rivers leading to water pollution.

Floriculture is an emerging field in India with immense scope. The field expands with value added products. However, with it come some harmful effects. These negative effects must not be ignored. Today, in the urban areas, life cannot move on without floriculture. Flowers have a freshening and healing effect on mankind. A walk in the flower gardens lifts our spirit. They help us to stop and realize that there is more in life than our busy world. Truly flowers are a big part of our life. They make our world bright and beautiful.

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## SKY PLANTERS



**Pallavi Sharma**



**Shweta Singh**

**B.Sc. (H) Botany, II Year and B.Sc. (H) Botany, III Year**

The easiest and most sustainable way to filter or purify the air is to go with sky planters. Use sky planters and take your outdoor plants inside your house and grow them hanging down wherever you want to grow.

It was first designed by Patrick Marris while he was a student at Central Saint Martin's College of Art and Design, in London, the sky planters was originally produced by New Zealand's company BOSKKE, out of porcelain but now they are available in recycled plastic. As you can see for stunning ceramic sky planters suspends ferns, ivy, orchid, herbs and vegetables. A porous reservoir refillable with water through hole at the top, delivers the right amount of water through diffusion process.

It is a great way to save space, reserve water, decorate the ceiling and purify the air with plant's life.

In today's world of development, we are going away from our plants; we are losing our interest in nature. With the rapid development in urbanisation, resulting in the construction of large buildings everywhere, but the construction of buildings all over the land, sometime leads to lack of space for the plants to grow. People are interested in development and busy only in the construction of industries, buildings, and bridges, etc. but no one is worried about nature, the use of the land where these plants used to grow. Man has become so selfish. Development in today's life is must but we can't go alone in our journey. We have to develop along with showing care towards

surroundings, as the nature feeds us, we also have some responsibility towards it

But nothing is lost, it is possible to have garden and do gardening in less space even inside your rooms. It is true, we can grow plants in air (hanging downward), we can do air gardening, which involves growing of plants hanging downward. It is a great method or technique to utilize and save the spare space. An upside down garden can be grown inside rooms, halls, balconies, washrooms, kitchen, living area, etc. It is an easy way of gardening where no soil land is required. Thus hanging plant pots purify the air inside our houses.

### **Some of the plants that can be grown in sky pots are:**

Tomatoes aren't the only plant you can grow as sky plants some other plants are:

1. Cucumber
2. Squash
3. Mint
4. Strawberry
5. Grapes
6. Zucchini
7. Egg plant
8. And beans can also grow well as sky planters
9. Some flowers can be grown as an ornamental plants inside the room

### **MATERIALS FOR SKY PLANTERS**

#### \* For bucket like or pots like sky planters

1. A large bucket, such as a 5- gallon bucket (100% recycled plastic)
2. Strong carabiner ( hook ) must hold 50 pounds if you are using heavy bucket, length of strong chain (3 feet long, hold at least 50 pounds )
3. Fertile soil
4. Plant

#### \* For Bottle like sky planters:

1. Cleaned 2 litre of soda bottles
2. Utility knife or scissors
3. Hole punch
4. Plotting soil
5. Hook or place to hang your plant
6. Plant which you want to grow.



## **INSTRUCTIONS**

### **\* For Bucket pots**

1. Take a bucket and create a hole in the bottom of your bucket .Turn the bucket, and make small holes around the open end of the bucket.
  1. Now tie three holes with heavy, strong string or wire and then tie at one place now hang it with the help of hook to ceiling.
  2. Take 4cm diameter of circle of sponge and cut half inch hole in between sponge and fix your plant between this.

### **\* For bottle like hanging planters:**

1. Firstly cut off the bottom ( $\frac{3}{4}$ ) part of the bottle with the help of scissors.
2. Now, you can cover the edges (sides cut with knife) with duct tape.
3. Make three holes in a duct and bottle edges (which are cut)
4. Pass out the 3 strings from these holes and tie them at a point and make it hang with the help of hook.
5. Gently slip the plant through the top of bottle so the plants hang and out from the cap and root remains inside.
6. Fill the bottle with potting soil up to the space leaving 1 inches or 2.5 cm of space below the cut end.
7. Now hang it anywhere you want to, water it and flourish your house.

### **Conditions required:**

1. Temperature: should be 60F but temperature of about 50F in winter will result in flowering.
2. Humidity: place them in kitchen or bathroom.
3. Fertilizer: urea, green manure etc.

### **How to water the sky planters:**

A porous ceramic reservoir sits at the top of the sky planters and connects with soil. It is filled through a small hole at the top of planters and water is gradually released drop wise into the soil by diffusion method. And this makes the water to come in direct contact of roots of the plant, reducing the evaporation and conserving the water. This ensures you to not fill the reservoir again and again, saving time and indicates that there is good connection between soil and reservoir for the water to flow sufficiently.

### **ADVANTAGES OF SKY PLANTERS:**

1. No need to fill the reservoir all the time, saves time, ensures conserving water because of less evaporation method. Very beneficial for plant and the planter( farmer)
2. No threat of destroying of plants by birds, insects, and animals.
3. Protection from the hot sunny days during summer and extreme level of rainfall.
4. Plants enhance the beauty of house.
5. Purification of air (polluted air).
6. Occupy less space
7. Include the elimination of garden tasks such as tilling.
8. Watering is very much easier and plants grow vigorously. No chances of rotting and attack of any pests, insects or microbes. Reduce soil borne problems.

#### **DISADVANTAGES OF SKY PLANTERS:**

1. No proper sunlight or natural sunlight to the plants effects the proper growth.
2. No proper spreading of roots.
3. Water evaporation system sometimes went wrong due to misbalance of the provided climate conditions.
4. Dry leaves and ripen fruits fall down makes the ground dirty and slippery.
5. During watering, filling of reservoir and over flow of water makes place slippery.

**Gardening in a small space needn't restrict your ideas or planting opportunities, accept the challenges and discover new possibilities.**

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## **BOTTLE GARDEN (MINI ECOSYSTEM)**



**Swagatika Mohapatra**

**B.Sc. (H) Botany, II Year**

With the increasing population and industrialization, conserving the biodiversity has turned into a necessity. And, so is the necessity to bring forward new methods for building sustainable ecosystem to combat the evil aspects of climatic changes. That's where bottle gardens come into existence. For people like us who live in a world with tiny living space and busy lifestyle, bottle gardens are the best substitute to satisfy our inner gardener soul.

A bottle garden is a container like a terrarium in which life size plants are grown. They usually consist of a plastic or glass bottle with a narrow neck and a small opening, with plants growing inside them that can have no or little connection with the outside environment, and can be contained indefinitely inside the bottle if properly illuminated.

### **HISTORY:**

Historically, they were used to transport plants from their native countries to other countries where ordinarily they would not be able to survive in the new conditions. As time progressed they became more widely available to the public and this allowed house plants to be protectively grown under glass or plastic even though they were surrounded by unfavorable conditions.

The first terrarium was developed by botanist Nathaniel Bag Shaw Ward in 1842.

## **HOW BOTTLE GARDENS WORK:**

Bottle gardens work in such a way that their sealed space creates an entirely self-sufficient ecosystem in which plants can survive by using photosynthesis to recycle nutrients.

The only external input needed to keep the plant going is light, since this provides it with the energy it needs to create its own food and continue to grow. Light is absorbed by proteins containing chlorophyll (a green pigment) of leaves.

Some of that light energy is stored in the form of adenosine triphosphate (ATP). The rest is used to remove electrons from the water being absorbed from the soil through the plant's roots. These electrons then become 'free' - and are used in chemical reactions that convert carbon dioxide into carbohydrates, releasing oxygen.

But the eco-system also uses cellular respiration to break down decaying material shed by the plant. In this part of the process, bacteria inside the soil of the bottle garden absorb the plant's waste oxygen and release carbon dioxide that is often reused by the growing plant. Mostly the reaction takes place at night.

Because the bottle garden is a closed environment that means its water cycle is also a self-contained process. The water in the bottle gets taken up by plants' roots, is released into the air during transpiration, and condenses down into the potting mixture, where the cycle begins again. Photosynthesis creates oxygen and puts more moisture in the air. The moisture built up inside the bottle is released back on the plant. And, the dropped leaves rot at the bottom of the bottle, creating the CO<sub>2</sub> also needed for photosynthesis and nutrients which it absorbs through its roots.

## **HOW TO MAKE YOUR OWN BOTTLE GARDEN:**

They are very easy to set up and then look after going forward, you can grow many different plants that would ordinarily be quite difficult in the home.





## **STEPS:**

1. The bottle or a terrarium to be used should be thoroughly washed as a dirty exterior or interior can cut off the light needed for survival. Recycling soda bottles or other glass wastes by using them as bottle garden can be a good form of waste management.
2. Filling up the bottle garden is done in such a way that there are two layers within the base of the container. The first layer should be a very porous material such as gravels, pebbles or sand, you can also add a thin layer of activated charcoal at this point if you want. The second layer is the growing medium such as soil compost. It needs to be quite a thick layer.
3. Although bottle gardens allow you to grow most kinds of plants, it is often advised to avoid flowering plants. Your chosen plants need to be reasonably slow growing so not to take over the others, they will all need similar light and water requirements.
4. This is the hardest part. You will need to revert to long handled spoons, long chop sticks or something similar, to enable you to dig out a small trench and then to help you lower the plants into the newly created hole.
5. The final thing to do in terms of the preparation is to water by slightly rotating or letting the water run down the slides.
6. With the requirements, watering and fertilizing is done to gain better results.

## **CONCLUSION:**

Bottle garden is extensively used as a form of decoration, or as a substitute garden in areas with little space. Being easy to create and maintain, bottle gardens are also used in schools as an economic way to study miniature eco-systems. They can also be used as a control mechanism. Bottle gardens have also been used for vegetable production in dryland areas, allowing water to be conserved.

This process is one reason why NASA was interested in taking plants into space. 'Plants operate as very good scrubbers, taking out pollutants in the air, so that a space station can effectively become self-sustaining'. 'This is a great example of just how pioneering plants are and how they will persist if given the opportunity.'

The background of the page is a close-up photograph of several bright yellow flowers, likely daisies, with their centers in focus and petals radiating outwards. The lighting is soft, creating a warm and natural atmosphere.

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## Horticulture Therapy



**Osheen Taneja**

**B.Sc. (H) Botany, II year**

**“And I firmly believe that nature brings solace in all troubles.”- Anne Frank, The Diary of a Young Girl**

Have you ever wondered why a recovering patient is gifted with flowers or why is a lover more likely to gift his companion flowers amongst other things? Flowers are not just visually appealing; they have amazingly powerful effects on our body and mind. Flowers calm the human nervous system, rejuvenates us and instils positivity. It did not take humans long to understand and exploit these effects and evolve a science now known as Horticulture Therapy. Horticulture Therapy (also known as Social and Therapeutic Horticulture) simply put is gardening based activities under the guidance of trained psychiatrists, psychologists or occupational therapists in order to achieve inner peace, calmness, to get over a traumatic past or for a speedy recovery after a medical surgery.

Since time immemorial, plants and nature in general is used to attain inner peace and a positive outlook towards life. Earliest known record of

application of Horticulture therapy is from ancient Egypt where physicians prescribed walks around gardens for patients with mental and physical illness. Grounds of monastery hospitals were planted with numerous plants to induce a sense of relaxation and to cheer up the recovering patients. In recent times, Dr. Benjamin Rush (now considered “father of American psychiatry”) documented the positive effects of gardening on his patients with mental illness. The results were so impressive that following WW II, gardening was used as a form of occupational therapy for the returned veterans.

The therapy helps participants learn new skills or regain those that are lost, improves memory, cognitive abilities, task initiation, language skills, and socialization. In physical rehabilitation, it can help strengthen muscles and improve coordination, balance, and endurance. People also learn to work independently, exhibits problem solving capabilities, and learns to obey under command. This all is achieved under the guidance of Horticultural therapists who are professionals with specific education, training, and credentials in the use of horticultural for therapy and rehabilitation.



A patient enjoying Horticulture Therapy

Image Source: <http://www.cpalberta.com/wp-content/uploads/2015/11/CPAA-Colleen-loaded-up-June-4th.jpg>



Therapy reduced attention fatigue and promoted a higher level of attention. It also improved alertness and concentration and lowered chronic stress, which can reduce the ability to learn and remember. Issues with memory and thinking aren't uncommon among people in recovery, but the good news is that this is often reversible, and horticultural therapy can help.

**Promotes emotional growth:** According to Virginia Tech horticulture professor Diane Relf, horticultural therapy improves self-esteem and confidence, and it helps to improve self-control through the redirection of aggressive feelings. Horticultural therapy also promotes curiosity, rekindles interest in the future and satisfies the human creative drive.

**Reduces stress:** It's commonly understood that engaging in gardening activities and interacting with nature reduces stress and lowers levels of the stress hormone cortisol. But research shows that horticultural therapy can also help the body learn to respond better to stress, reducing its negative effects like increased heart rate and blood pressure.

The benefits of horticultural therapy do not end here. Horticultural therapy helps people in recovery engage in healthy conversation about their experiences and learn important life lessons from them. And for many who participate in horticultural therapy, gardening becomes more than a leisure activity that brings great joy and peace.

Horticultural therapy can be a helpful and enjoyable addition to one's treatment plan, and it can lead to a lifelong love for growing beautiful plants with icing on cake being it environment friendly.

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## Zero Waste Farming



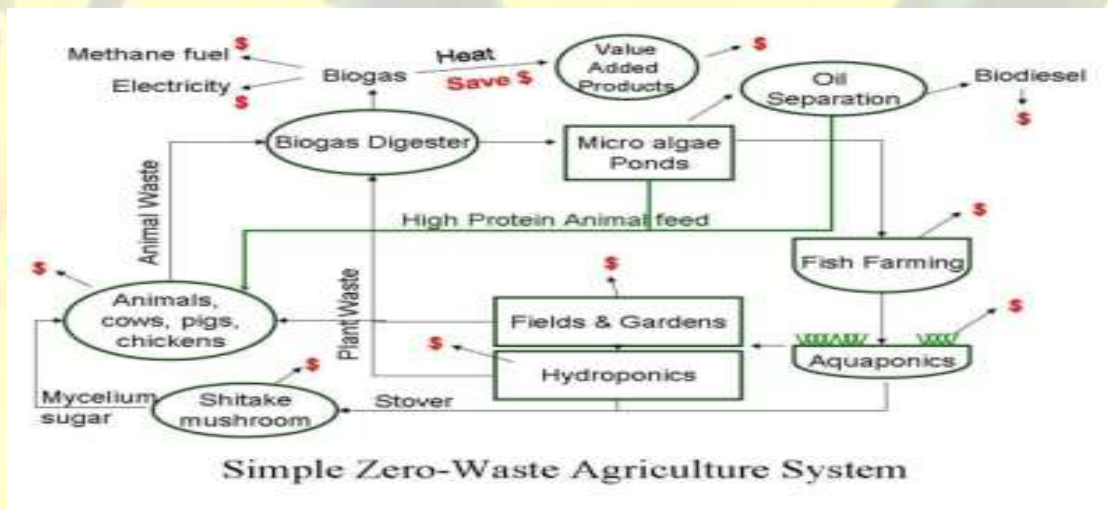
**Upma Garg**

**B.Sc. (H) Botany, II Year**

Everything is being modernised and globalised from pant zip to the clothes we wear. In this era of fashion; fashion may be related to clothes, beautiful houses or anything else, one more thing is in fashion: ZERO WASTE PRACTICES, e.g.: zero waste homes where the waste generated from houses is brought down to zero which seems to be very difficult but not to be forgotten is possible.

Similarly, a concept is zero waste farming i.e., agricultural practices in such a way that the wastes generated are minimised near to zero via smart work. It is actually an integrated management/co-operation between different fields like cattle rearing, farming etc. such that waste of one product becomes the raw material for or useful for another.





Source: [https://en.wikipedia.org/wiki/Zero\\_waste\\_agriculture](https://en.wikipedia.org/wiki/Zero_waste_agriculture)

Zero waste farming comes under the category of sustainable agriculture increasing the use of plants, algae, fungi, bacteria and animals to produce biodiverse energy, nutrition and food in a compiled process of profit making and waste of each process becomes input for another.

## History

The integration of shallow micro algal oxidation ponds was demonstrated by Golueke and Oswald in 1960s. Global implementation is credited largely to Prof. George Lai Chan for ZERI.

## Farm wastes

- These may include the
- Pesticides
- Fuel oil
- Contaminants from field
- Livestock excreta
- Silage effluent

## Present Status

Today, ZWA is practised in India, China, Columbia, South Africa, Fiji and Mauritius. The government of Brazil has taken up a major social technology for the upliftment of marginalised and subsistent farmers through coordination with TECPAR.

The zero waste management system in farming can be of various types like ecological farming in China, integrated food and waste management systems in Columbia and India with integrated biogas farming.

## **Some Examples**

- One may be the production of biogas from cow dung i.e. chemically methane gas that can be used further as a fuel.
- The plant litter like fallen leaves etc. can be used to make compost along with the animal waste.
- Green manure can be prepared from plant litter and plant leaves like that of neem.
- Today, such machines have been discovered that will take up the biodegradable waste either at homes or at farms like fruit peels and convert it into manure that can then be used at a smaller scale at homes.

## **Uses**

1. Have economic, social and ecological benefits.
2. Optimizes food production in an ecological way.
3. Water consumption is highly reduced through recycling and decrease in evaporation.
4. Greenhouse gases emission is less, so, climate change relief is there because of traditional agriculture and fossil fuel usage.
5. Chemical usage is highly reduced as green manure can be produced.
6. Energy is produced as in the case of biogas i.e., bio methane and extraction of biodiesel from micro-algae and these are by-products of food production.
7. Balanced ecosystem overall.

## **Case Study**

ZWA is an aggregation of various sectors like cattle rearing, agriculture etc. because ecosystem processes are all inter-dependent and a huge mesh of connections is there between organisms.

Alappuzha, located in Kerala, the state which has highest literacy and lowest infant mortality is a paradox caused by environment related diseases. In fact, it was recently recognised by UNEP as one of the five model cities across the globe for managing solid waste. Decentralised management system was introduced and people were made aware of their responsibility of managing the environment.



## Major Targets

- No waste should go to dumps or incinerators.
- To fight over-consumption and greed of people for more and ends up creating a lots of waste.
- Awareness among people and learning community responsibility.
- Government should not be allowing manufacture of non-recyclable products.
- Realising that ZWA is a new way up the lane.

## Conclusion

Solid waste is a visible form of our inefficiency. Human community is the only one that generates waste. We should think of ZWA as a way of life, as a way of agriculture and should be more and more and adopted by us with various traditional practices fused with modern technology.

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## FOOD SECURITY



Anshita

B.Sc. (H) Botany, II Year

***"Full planet, empty plates....."*** If we look at multi-dimensional complexities in India seen at all economic, political and social level, then Food Security occupies the prime place. No wonder to call this phenomenal humanity aspect as '**a science with a human face and hunger**'. This concept rather explains the application of household food security. Food Security is the concept originated only in mid 1970s in the observations and discussion evolved by surveys and reports of international food problems at the time of global food crisis. In mid 1990s, food security was published as a significant concern and spanning a spectrum from the individual level to the global one. A prime intra-country gap exists in current examination of food insecurity, which emphasize on national level or individual level as depicted either in average results derived as ratios of national aggregates or a national survey estimate.



It is a flexible but operational notion which is reflected by many definitions which needs to be studied in public techniques and policy making. Food Security of a populous county is more than just economics and trade.

Food security is a complex sustainable development issue linked to the health through malnutrition and also to sustainable economic development, environment and trade.

Food security was defined in 1974 World Food Summit as: **“the availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices”**. But in 1983, it got expanded by Food and Agriculture Organization (FAO) for ensuring security access by all people to available and affordable supplies, by implying that attention should be balanced between demand and supply side of the food security equation.

A simple definition would be as: the accessibility of enough food to all people at all times for an active and healthy life at most economic-friendly prices.

Food security is built on five pillars:

1. Food Availability: -Having sufficient quantity of food available on consistent and fulfilling basis.
2. Food accessibility: - Having all the sufficient resources to obtain appropriate food for basic nutritious diet, so that it can be available to every individual belonging to each class.
3. Food Acceptability: - The type and kind of food that is available in market to reach to the people. There is difference in acceptability of food in every country with diversity.
4. Food Adequacy:-Food variety is a good indicator of nutritional adequacy of the diet. There is a moderate balance in all the components of a basic nutritious diet.
5. Food Action: - To create utility and housing of food for creating health. There is a need to highlight the importance of food policy and to promote policies that support healthy diets, reduce hunger and improve food accessibility.

## **FOCUS LAID ON BY FOOD SECURITY –**

► The foremost focus is primarily on food supply problems -for ensuring the availability and to some extent, the price stability of basic foodstuffs at international and national level. This might have led to the World Food Conference of 1974 and a new set of institutional arrangement covering information, resources for promoting food securing and forms for dialogue on policy issues.

► This aspect of food security is accepted in the process of international consultation leading to World Food Summit in 1996. The issues on famine, hunger and food crisis were also being examined.

## **THREATS TO FOOD SECURITY**

Indian agriculture has faced new challenges in terms of sustaining factor productivity and increasing profitability.

Major threats are:-

1. Food Safety
2. Energy Disruption
3. Economics Misbalance
4. Terrorism
5. Chemical Pollution
6. Climatic Conditions
7. The Natural Disasters
8. Bio piracy

This time all we need is –adaptation strategies, policy responses to worldwide changes that should include possibility of handling water allocation, land management, food trading and safety .To improve the existing conditions of farmers and rural population .These policy responses will play a planetary role. If these policy responses are not build or are hampered after existence ,the country-owned and country-driven food security strategies will also be changed and may lead to decrease in global,



regional and country level economic growth. Though the government has run large food security and antipoverty programs but still occurs critical gaps such as economic level differentiation, sex based food distribution etc. Ultimately new challenges are emerging due to inefficiency of policies and responses. They can be slowing agricultural growth, land degradation, climate changing and depleting biodiversity.

## **GOVERNMENT OF INDIA PROGRAMMES AND INITIATIVES**

The problem is that there is lot of food stored in Food Corporation of India warehouses but they are not distributed fast enough. This means a lot of food is wasted when it reaches the plate of a common man. There is a need to shift from existing expensive, inefficient and corruption ridden institutional arrangements to those that will ensure cheap delivery of quantity grains in a transparent manner.

Government has taken significant steps to combat and fight with such challenges and few of them are National Food Security Mission, Rashtriya Krishi Vikas Yojana, the Integrated Schemes on Oilseeds, Pulses, Palm oil and Maize (ISOPOM), Pradhan Mantri Fasal Bima Yojana along with effective methods of massive irrigation and increasing soil fertility and water management.

The National Food Security Act, 2013 is an act of the parliament of India which aims to provide subsidized food grains to approximately two thirds of India's 1.2 billion space. It converts into legal entitlements for existing food security programs of the govt. of India.

Thus it can be combated in two major ways:

1. Enhancement of the government policies for the poor and proper implementation. For this public development sectors are also opened with joint responsibility of central and state government for storage, transportation and bulk allocation of food grains. There are network of Fair Price Shops with state government. The Revamped Public Distribution System was launched in 1992 to improve the reach of food

grains in far flung, hilly, remote and other inaccessible areas where a substantial section of poor live. It becomes the responsibility of the state government to identify the families Below Poverty Line and provide them with basic necessities like ration cards.

2. Enhancement of Agricultural technologies for more production of food grains and other remedies to make profitable outcome from every inaccessible even after the net wastage. The analysis have shown that the added production of 4.23 lakh tonnes of paddy, 5.90 lakh tonnes of wheat was achieved due to improved agricultural technologies. Data further reveals that research and technology led growth has helped decline in real cost of production in the range of 1.0 – 2.3 % per annum in case of cereals, gram, cotton, rapeseed and mustard. This has helped in keeping the prices low for consumers. Indian agriculture has stood test for time, despite facing constraints on resources to the competing goals and programmes. The economic benefits realized in the past are comparable to the country and other benefits in terms of reduction in rural poverty and leading to environment stability. And off course above all are certain governmental responsibilities to combat with the food crises in India such that it becomes place for healthy and prosperous community.

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## **BIOPIRACY**



**Vandana Khurana**  
**B.Sc. (H) Botany, II Year**

**Biopiracy (is) biological theft, illegal collection of indigenous plants by corporations who patent them for their own use.**

**-Vandana Shiva**

Vandana Shiva is an Indian Scholar, Environmental activist and anti-globalization author. In her book, "**Biopiracy- the Plunder of Nature and Knowledge**" she has clearly and passionately stated objection to the ways in which western business are being allowed to use natural resources and traditional forms of knowledge for their own profit. According to her, "genetic engineering and the cloning of organisms are the ultimate expressions of the commercialization of nature and life itself is being colonized."

**What is Biopiracy?**

Biopiracy is a situation where the indigenous knowledge of nature, originating with indigenous people, is used by others for profit, without permission from them or without any compensation or recognition to the indigenous people. Developed countries are exploiting developing countries genetic resources and indigenous communities traditional knowledge in the name of patents on the inventions derived from those genetic resources.

### **Threats posed by Biopiracy:**

- That knowledge and genetic resources belonging to a region, community or country is stolen or claimed as one's.
- That the use of this knowledge or genetic resources in the area of its origin or traditional usage may be hampered.
- That the patent holder will unfairly profit from the patents.
- That the patent claimed and awarded illegally and unethically.
- And it is bound to disturb an established system somewhere in the own world.

### **Biopiracy cases**

#### **1. Turmeric (*Curcuma longa*)**

The rhizomes of turmeric are used as a spice for flavoring Indian cooking. It also has properties that make it an effective ingredient in medicines, cosmetics and dyes. It has been used traditionally for centuries to heal wounds and rashes.

In 1995, two expatriate Indians at the University of Mississippi Medical Centre ; Suman k. Das and Hari Har P. Cohly were granted a US patent no. 5,401,504 on use of turmeric in wound healing.

The Council of Scientific and Industrial Research (CSIR) India, New Delhi, filed a re-examination case with the USPTO challenging the patent on the grounds of existing of the prior art[ any information that has been made available to the public in any form before a given date that might be relevant to a patent's claim of originality]

CSIR argued that turmeric has been used from thousands of years for healing wounds and rashes and therefore its medicinal use was not a novel invention. Their claim was supported by documentary evidences of



traditional knowledge including ancient Sanskrit text and a paper published in 1953 in the journal of the Indian Medical Association.

Despite an appeal by the patent holders, the USPTO upheld the CSIR objections and cancelled the patent. The turmeric case was a landmark judgment case as it was for the first time that a patent based on the traditional knowledge of a developing country was successfully challenged. The US Patent office revoked this patent in 1997, after knowing that there was no novelty and that the findings by innovators have been known in India for centuries.

## 2. Neem (*Azadirachta indica*)

The neem extracts can be used against hundreds of pests and fungal diseases that attack food crops. The oil extracted from its seeds can be used to cure cold and flu. They are mixed in soap and provide relief from malaria, skin diseases and even meningitis.

The European Patent Office granted a patent to the US Corporation W.R. Grace Company and US department of Agriculture for a method of controlling fungi on plants by the use of hydrophobic extracted neem oil.

In 1995, a group of international NGOs and representatives of Indian farmers filed legal opposition against the patent. They even submitted the evidences regarding it, proving that neem extracts had been known and used in India for centuries for protecting the crops. Therefore it was unpatentable.

Then in 1999, according to the evidences it was clear that all the features were disclosed to the public prior and the patent didn't involve any inventive step. The patent granted on neem was revoked by the EPO in may2000.

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## **SOIL STUDY**



**Preeti Bhati**

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Basic natural resource for the mankind is soil, it is called as life zone of earth's biosphere. Humans depend upon plants for food, and plants grow in soil. It is mixture of various substances like solid, liquid and gases. It has both living and non-living matter. As organisms die, nutrients re-enter the soil to be used by plants and this nutrient cycle continues for keeping soil useful for mankind.

Soil is the final result of many living and non-living processes such as weathering of rocks, climatic conditions and decomposing activities of animals like earthworms etc. Formation of soil takes about years as it is the result of long term process of complex interactions leading to the production of a mineral matrix with organic matter.



**Pedology** is the study of soil and **Pedogenesis** is the process of soil development. During its formation, the soil profile slowly deepens and develops characteristics different layers, called horizons. There are five categories of components in soil complex.

**[i] MINERAL MATTER**- it is the largest component of soil. it is a matrix of mineral particles derived by varying degrees of weathering or breakdown of the parent material rock.

**[ii] SOIL ORGANIC MATTER**- it is also known as humus, and the organic matter component of the soil. It is derived from the plant and animal residues addition at various stages of decomposition. The process by which organic compounds are broken down and transformed into mineral compounds is also referred to as mineralization.

**[iii] SOIL WATER**- or the soil solution. Soil holds and contains considerable amount of water. Much of this retained water is used by plants and other organisms. Soil water is held by absorptive and capillary forces both between and at the surface of soil particles.

**[iv] SOIL ATMOSPHERE**- it occupies the pore spaces between soil particles, which at any time not water filled, the composition differs from the aboveground atmosphere because here oxygen content is lower and carbon dioxide content is higher.

**[V] BIOLOGICAL SYSTEM**- each soil has distinctive biological system with unique and abundant flora and fauna of bacteria, fungi, algae, molluscs, arthropods, nematodes, rotifers and protozoa. Biological system of soil plays very important part in determining many soil characteristics.

Formation of soil generally involves two stages. (1) Weathering process. (2) Pedogenesis or Soil development.

**Weathering** is the breakdown of bigger rock material into fine small particles. Rocks go through various physical, chemical and biological processes which lead to the complete disruption. In physical breakdown, rocks are exposed to action of water, temperature, gravity etc. which cause weathering of rocks by process of wetting-drying, heating-cooling, freezing, glaciation, solution and sand blast etc. The chemical processes of weathering include hydration, hydrolysis, oxidation-reduction, carbonation, and chelation etc. In biological processes, organisms like fungi, lichens, bacteria, blue-green algae, and

bryophytes etc. are able to extract nutrients from bare rocks, and make sure for water to retain on rock surface for longer periods, which eventually leads to the process of chemical weathering.

**Pedogenesis**, also known as soil development is the complex process after weathering. During chemical and physical weathering process, the rocks are broken down into smaller particles, and then this weathered soil further undergoes number of changes. It is mostly a biological phenomenon. Organic acids, enzymes and carbon dioxide is produced by living organisms such as lichens, bacteria, algae, fungi, micro-arthropods, molluscs etc. and addition of organic matter after their death, which bring about geochemical, biochemical, biophysical processes. This soil, when fully developed can be seen in different layers or horizons because during Pedogenesis, there is addition of various organic compounds, dead organic matter and living organisms etc. to the mineral matter.

Factors affecting in soil formation are mainly five: - [I] parent material or the bedrock, [ii] local climate, [iii] plants and animals [IV] topography and time taken in soil development, [v] elevation.

- The parent material mainly influences the leaching rate, aeration and texture of the developing soil and chemical composition of the material influences the chemical characteristics of soil.
- Climatic factors such as rainfall, humidity, temperature, and wind strongly influence soil formation. Due to same rainfall, temperature and humidity conditions different parent material may form the same soil and likewise, same parent material may develop into different types of soil in different climatic condition.
- Organisms plays very important part in soil formation. Addition of dead organism and then decomposition takes place by the action of microbes and soil-dwelling organism like earth-worm etc.

Soil profile is known as the sequence of the horizons. A soil horizon is the layer horizontal to the surface and possesses unique properties then the adjoining soil layer. Soil profile consists of five main horizons.

**[I] THE 'O' HORIZON-** this is the uppermost organic layer of the soil, consisting of freshly fallen dead organic matter dead animals, leaves, flowers, fruits etc. in the origin, just beneath the upper surface,



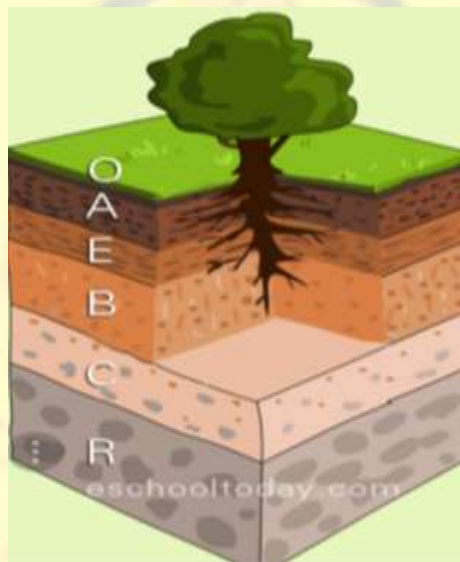
decomposition has begun and microorganisms like bacteria, fungi etc. are found mainly.

**[II] THE 'A' HORIZON-** this is mineral horizon, present just adjacent to organic region. This horizon is rich in organic matter and shows eluviation mineral salts, clay, iron, or aluminum etc. It is divided into two sub-layers. A1 Region, is dark and rich in organic matter, known as humus. A2 region, is of light in color, with large size particles. This is also known as eluvial or zone of leaching.

**[iii] THE 'B' HORIZON-** this horizon is rich in minerals due to enrichment with in washed clay, organic matter, iron, aluminum, etc. Residual enrichment occurs due to silicate clays. It is dark colored due to presence of silica and known as illuviation zone due leaching material from 'A' horizon.

**[iv] THE 'C' HORIZON-** this is known as mineral horizon, present below the 'B' horizon. It consists large masses of rocks, usually incompletely weathered.

**[v] THE 'R' HORIZON-** this is unweathered rock zone, where water is collected.



Soil Profile

Source: <http://www.eschooltoday.com/soils/soil-profile-and-soil-horizons.html>

As there is growing need for food, we must rely on the practice of sustainable use and the practices which increases soil fertility and then eventually leads to healthy and higher food production. As we all know, most of the human needs are fulfilled by the plants and the plants grow in soil, so we must make sure that our soil is healthy, to guard our vegetables, crops etc.

Mixed cropping is well-known way to improve soil fertility. By growing different crops in same field, leads to prevent soil erosion and control the spread of soil-borne plant diseases.

If we want to live a healthy and productive life on earth, then we have to put efforts towards the sustainable use of soil.

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## CROP ROTATION FOR SUSTAINING SOIL FERTILITY



**Tanvi Saxena**  
**B.Sc. (H) Botany, I Year**

What is Crop Rotation?

Crop rotation is defined as a process of growing different crops in succession on the same area through a period of definite time depending upon the defined plan. It helps the soil to regain its fertility and helps it in sustaining.



Source: <http://www.underwoodgardens.com/wp-content/uploads/2017/11/Handful-of-Soil-495x400.jpg>

## What is the significance of Crop Rotation?

It helps in creating diversity on the same land. It helps to build soil organic matter and provide the soil its essential and non-essential nutrients. It decreases the chances of weed during crop season, pest and disease problems on the land. It lets the field to regain its fertility thereby increasing the cropping capacity.

## How it aids in sustaining soil fertility?

In the process of crop rotation, most of the crops cause depletion of soil nutrients during their period of development. Some of the nutrients leave as they get incorporated in the products harvested and the remaining return as crop residues. The nutrients that are left as residues may not be available to the following yield. They improve soil fertility by stimulating the microbes to grow thus improving soil aggregation. This improves soil external environment, increases its water retention capacity etc. leading to growth and plant nutrient foraging. In order to plan a successful crop rotation to meet nutrient requirements several things should be made considered and kept in mind. For Example: The Legume crops, they capture atmospheric nitrogen and make it available to plants which can be utilized by them and therefore be utilized strategically to meet the demands of nitrogen-demanding crops.

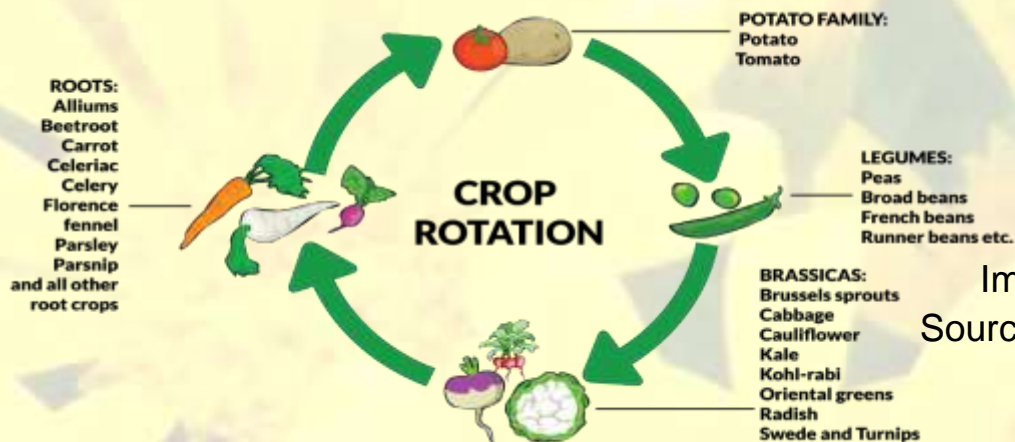


Image  
Source:

Source: <https://www.fruithillfarm.com/wordpress/wp-content/uploads/crop-rotation-.png>



## Choice of Crops:

Crop choice depends on the requirement of Farmer with the rotation.

It could be to increase availability of nitrogen , decrease soil erosion, increasing the biomass of area and many more.

When crop rotation is concerned crops can be of different types. For example: giving appropriate attention to the plants which are essential for minimizing the chances of pests. Many farmers are reported to be successful in managing crop rotations.

### 1. Row crops

Crops which are beneficial for market like vegetables which are grown in compact rows.

### 2. Legumes

Interrelationship proves to be of great advantage with the crops that are nitrogen deficient. For example: alfalfa and clover they are reported to collect nitrogen which is available in soil in nodules of the root structure

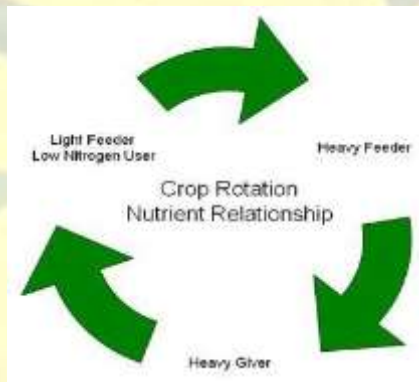
### 3. Grasses and cereals

They are considered as essential cover crops because of their great benefits they provide to soil quality and structure.

## Planning of Rotation

There are various factors which should be kept in mind while planning crop rotation. An effective rotation involves weighing of fixed and fluctuating circumstances in production which includes the following aspects like market, farm area, labor availability, surrounding climate, type of soil, crop growing practices, etc. Moreover, a crop rotation must consider the conditions in which crops will be fully grown and the soil for the succeeding crop and how the crop must be succeeded with other crop. For example, a

nitrogen-fixing crop, like a legume, should always precede a nitrogen depleting one; similarly, a low residue crop (i.e. a crop with low biomass) should be offset with a high biomass crop, like a mixture of grasses.



Source: <https://cdn.herb.co/wp-content/uploads/2016/05/effects-fusarium-marijuana-plants-nutrient-cycle.jpg?x88442>

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## Genetic Engineering of Ornamental flowers



**Aruna**

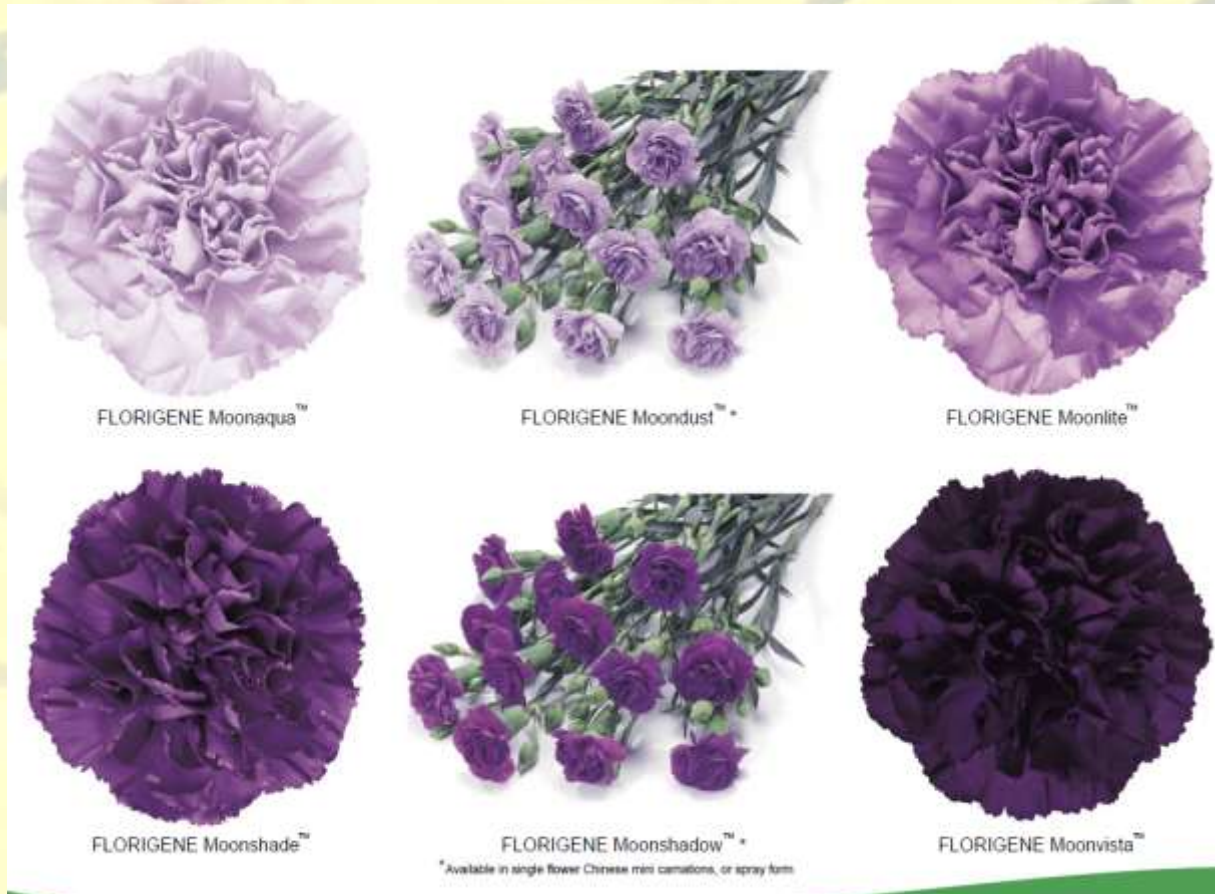
**B.Sc. (H) Botany, III Year**

Flowers are such creations of nature that if we could see the miracle of a single flower, our whole life would change. Some of the miracles are brought up by human's scientific approach and creativity. Ornamental flowers are grown not only for aesthetic appeal but for fragrance attracting wildlife and cleaning the air as well. Cut flowers, turf grasses, indoor plants, ornamental grasses are all encompassed by ornamentals.

Genetic engineering is a boon in the field of ornamentals. It has been widely used in the upbringing of ornamentals on a large scale. With manipulated genes, these plants develop several new characteristics coming up with tanks of benefits. Genetic modification has been used for the development of varieties of numerous important food species. Several efforts have been made in the field of ornamental plants for varietal development, especially for flowering ornamentals. There are other ways to raise such plants through hybridization or mutagenesis which can be very difficult, lengthy or improbable if varieties are completely sterile, like orchids. But Genetic engineering answers all constraints and objections and form a new way for variety improvement.

Genetic engineering has been a successful way in modifying several traits like flower color, fragrance, flower shape, plant architecture, flowering time, postharvest life and resistance for biotic and abiotic stresses. Ornamental plant traits are classified according to their value to the market chain. With the use of genetic manipulation, traits have been developed with more value to the grower than to the consumer. Such traits are incorporated with disease resistance and shelf life while other traits have more value to the consumer such as novel colors, dwarfed plants, improved fragrance, flower shape and sizes etc.

Till date, several ornaments have been produced which include Carnation, **the moon series carnations** containing various flower colors, have been commercially available in Japan, Australia, USA, European Union since the late 1990s while Colombia approved them in early 2000s.



### Moon Series Carnations

Source: <http://mesosyn.com/st1.html>



**Chrysanthemum**, which is the most important ornamental plant in the world is developed with insect resistance, flower color modification, abiotic stress resistance, pollination control and altered plant architectures achieved through various transformation techniques. Still, molecular breeding for Blue Chrysanthemum is on-going.



Blue Chrysanthemum

Source: <http://www.golfian.com/55-amazing-chrysanthemum-flower-collection/>

**Blue Roses** and **lone petunia** are also most popular creations of genetic engineering.



Blue Rose

Source: <http://www.fabiovisentin.com/photography/photo/27/blue-roses-04606-1.jpg>



Lone Petunia

Source:[http://4.bp.blogspot.com/-z3ImkICQS7w/T6hsIV2ZEil/AAAAAAAAARgg/egtd\\_QSzG4k/s1600/201205petunias004.jpg](http://4.bp.blogspot.com/-z3ImkICQS7w/T6hsIV2ZEil/AAAAAAAAARgg/egtd_QSzG4k/s1600/201205petunias004.jpg)

Biotechnology renew every day and gives new scopes for varietal improvement every day. As more genetically modified cut flower varieties are released, public awareness will increase. Some traits may also be compatible to produce secondary metabolites and pharmaceuticals. Coming era will be full such of such creations that will play a significant role in supporting life and livelihood for sure. But it needs several efforts like organizing workshops and seminars. There is also a need to stop the crimes regarding genetic engineering so that lots of benefits could be brought up for human welfare.

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## KRISHI UNNATI MELA



**Shreya Srivastava**

**B.Sc. (H) Botany, I year**

Krishi Unnati Mela is a three day fair cum exhibition event. This event provides a platform for the farmers where they are informed about the farming technologies. The farmers get an opportunity to interact with researchers and scientists who are working for the improvement in agriculture. The event is organized by IARI (Indian Agricultural Research Institute) and is open for all. It was launched by Prime Minister, *Narendra Modi* on March 19, 2016.

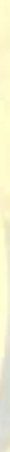


A view of the Krishi Unnati Mela, 2016

IARI is a leading institute that works to promote and improve agriculture related technologies, research and education. It is also known as PUSA institute. It is financed by the Indian Council of Agricultural Research (ICAR). It is located in New Delhi. IARI has been organizing Krishi Vigyan Mela since 1972 to improvise technologies related to agriculture. ICAR institutes, SAUs,

Voluntary organizations and other Government and Semi-Government organizations from all over the country participate in the Mela. The Mela provides a platform for addressing the national issues of agriculture.

In 2017, the event was held in the campus of IARI in New Delhi from March 15-17. It was organized jointly by ICAR and Ministry of Agriculture and Farmer's welfare. It was inaugurated by Shri Radha Mohan Singh (Minister of Agriculture and Farmer's Welfare).



A stall at Krishi Unnati Mela 2017

The fair witnessed a huge gathering of the farmers, scientists, and researchers. The fair provided information on technologies. There was also the sale of high yielding varieties of crops, farm equipment and machineries, livestock animals, bio fertilizers and agrochemicals.

The major highlight of the fair was the sale of a bull worth 7 crore. A woman empowerment workshop was held to make the farm women aware of the latest agricultural technologies and their rights. There was live demonstration of production technologies of crops.

Another highlight was the digitization in agriculture. If implemented it would be a major revolution in agriculture and would enhance yield. Free testing of soil and water samples were done and irrigation technology for water saving was studied.



Stalls at Krishi Unnati Mela 2017

An important discussion was the integrated farming which includes agriculture, horticulture, floriculture as well as dairy keeping that will lead to zero waste in fields.

Pandeet Deen Dayal Krishi Vigyan Protsahan Puraskar was given away during the inaugural session. The total sum of this award was Rs. 50 lakhs (in which there is a provision of one award of Rs. 25.00 lakh at national level



and 11 awards of Rs. 2.25 lakh at regional level). This year the award was given to Ramakrishna Ashram, South 24, and Parganas of West Bengal.

This year, the Krishi Unnati Mela, 2018 will be organized during 9-11 March, 2018.

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## RECIPES OF HOMEMADE FERTILIZERS



**Shivani Dalai**

**B.Sc. (H) Botany, II Year**

With the growing demand of nutritious food for the overpopulated world, almost all the burden to satisfy the hunger shifted to agriculture. A large amount of food grains, legumes, fruits and vegetables are produced and still, the enlarging population is left short of what all is required leading to the brutal application of chemical fertilizers. This in turns leads to production of thousands of hectare of unfertile soil which is no longer agriculturally viable. Given this scenario, the discovery of Bio-fertilizers is here to save the day. Today, a large number of chemical fertilizers are used in order to increase the yield of the crops. And for those who are always up for cultivation at home, homemade fertilizers are making their position to the top most ranks in the list of essentials.

These homemade fertilizers have come along a long way and are being loved by many people because of the easy availability and usage. Most of the homemade recipes involve using the products at a hand's distance making it convenient and affordable for the user. The most important aspect of using a homemade fertilizer is the surety of its non-toxicity. Though, a number of chemicals are used as fertilizers by farmers across the globe, the recipes for homemade fertilizers hardly involve any harsh chemicals. Infact, it generally is a mixture of natural and organic items which all of us usually discard off as waste products. Hence, these fertilizers are good not only for your lovely, healthy plants but also for the environment. In this article, the word organic is concerned with everything decomposable.



A plant generally requires Nitrogen (N), Potassium (K) and Phosphorus (P) for a strong aerial growth and healthy root development. While continuing to make fertilizers at home, one must keep in mind to include these nutritional requirements for the plants. Along with these, there are additional micro elements to enhance the health and productivity of the garden like Calcium (Ca), Magnesium (Mg), and Sulfur (S). During photosynthesis, plants use sunlight to break water and carbon dioxide down into hydrogen (H), oxygen (O), and carbon (C); the three non-mineral nutrients which they turn into food. Boron (B), Copper (Cu), Iron (Fe), Chloride (Cl), Manganese (Mn), Molybdenum (Mo), and Zinc (Zn) are the necessary micro-nutrients which a plant must obtain from the surrounding soil.

Here, let's discuss some of the recipes of easy to make homemade fertilizers.

### **1. Diane's Homemade Organic Rose fertilizer**

Ingredients:

- 2 tablespoons Mermaid's fish fertilizer (powdered fish)
- 1 teaspoon Maxicrop kelp extract (powdered seaweed)
- 1 tablespoon Epsom salts
- 2 tablespoons apple cider vinegar
- 2 tablespoons molasses
- 3 cups water

Tested to be best for roses, mix all the above ingredients in 3/4th quantity of a measuring cup. Stir well to avoid lumps and pour it into the watering can. This mixture is known to be good for foliar feed and the root zone.

### **2. The Epsom salt (Sendha namak) fertilizer**

Ingredients:

- 1 tablespoon of Epsom salt ( for garden plants)
- 2 tablespoons of Epsom salt ( for potted plants )
- 1 gallon of water

Mix the above ingredients and spray this solution over the plants once in two weeks. Fertilize your onions, broccoli, and cabbages with Epsom salts to get

healthier, sweeter-tasting vegetables. Use Epsom salts on tomatoes, peppers, and roses to grow stronger plants with more blossoms.

### **3. The Banana Peel Fertilizer**

Ingredient:

- 1-2 banana peels

Banana peels are high in potassium. Simply throw one or two peels in the hole before planting the seeds or saplings or bury peels under mulch so they can compost naturally. Get bigger and more blooms.

### **4. The Fish emulsion Fertilizer**

Ingredients:

- Frozen fish parts like fish bones, guts and heads, leftover tunas and sardines.
- Water

Add 1 part fish to 2 parts water in an airtight container, and place it a sunny spot in the least visited area (because of the foul smell coming from it). Stir every two days as the soup cooks; in about two weeks, apply to your garden soil at 3 gal./100 sq. ft. Leafy greens, beets, Brussel sprouts, and broccoli love it.

### **5. Human urine**

Ingredients:

- Urine
- Water

However disgusting it may sound, but urine is one of the best fertilizers for the plants as it is being rich in Nitrogen, phosphate and potassium. Dilute the urine with water in a ratio of 1:10. Soak the plants with it. It works really well for leafy greens, cucumber, cabbage and roses.

### **6. Vinegar Fertilizer**

Ingredients:

- 1. White Vinegar
- 2. Water



Mix one tablespoon of white vinegar with one gallon of water. Spray it over the plants every three months.

### **7. Fireplace Ash fertilizer**

Fireplace ash fertilizer is an excellent source of potassium and calcium carbonate. Use it as a replacement for lime.

The soil amendment uses fireplace ash applied to the soil by massaging or working it in or laying fertilizer on the soil bed. This fertilizer should not be use on acid loving plants when the soil is alkaline in nature.

### **8. Fish tank water fertilizer**

Used fish tank water contains excessive nitrogen which is favorable for plants. However, be careful of removing all new born fish from the water. Also, the contents should not come from a salt water tank. Add dirty and untreated fish water to the plants directly.

Let's use up as much biodegradable wastes as we can and stage up towards organic waste farming using some of these homemade fertilizers.

Happy gardening!

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## **SELF-WATERING DEVICES**



**Lavleen Sachdev**

**B.Sc. (H) Botany, II Year**

Self-Watering? Sounds techno-digital, doesn't it? The heading makes one feels like plants can water themselves; means there is good news for all those who are the owners of a large collection of plants at their homes or farms? Well! You felt it right! With era of innovation, technology has given birth to smart and sophisticated devices which take care of your garden in your absence, updating you about its status in wherever you are.

Here is an account of such advanced user friendly Irrigation systems that can play a key role in this by ensuring that no over or under irrigation takes place.

- 1. Self-watering reservoir for pots:** A reservoir pot made up of poly-propylene with a capacity of 1 quart (0.94L-small ~10-14"); to 4 quarts (big ~16-20") consisting of a sieve -type lid with an attached tube with which the water is filled into the reservoir. The reservoir is fixed at the bottom of plant pot. Water is filled into the reservoir through the tube and topped up with the soil (on to the lid). Water from the reservoir reaches into the soil through the aerating action. These have also now made their homes in India



## 2. Wi-Fi Plant watering systems (Effective, but *less prevalent in India than in the West*)

**Garden Water Valve:** This valve can be used in combination with Drip Irrigation system; hose sprinkler or to a spigot; wherein it regulates these devices (so as when to water and when not) depending on the weather forecast recorded in the **sensor** (connected to it.) The farmer/gardener can keep a track of both of their individual functioning over the Wi-Fi.

**Garden Sensors:** Compact, user friendly systems with a Solar panel (for continuous working) and a sensing bottom nib these garden sensors monitor the nutrients composition of the agro-land; temperature; water content; humidity of the soil. Marvelous feature of this sensor is that it can be connected over Wi-Fi and deliver the time-to-time updates of the agro-land in a jiffy. Moreover, it provides suggestions of growing crops that are best to be grown per the conditions of the land. The sensor stem sends out a series of very mild electrical pulses to the soil every 10 minutes, and measures changes to those pulses over time. Different patterns in pulse response are then separated into a soil nutrient reading and a volumetric soil moisture reading.

**Green IQ:** Smart Sprinkler Controller, Wi-Fi, 6 Zones, 2nd Generation, Compatible with Alexa, Water Sense Certified Irrigation Controller. The later three systems work automatically to monitor and thereby regulate the watering as required. At the same time, they keep on updating the gardener about the field conditions. These can be used in combination with Drip Irrigation systems and sprinklers (hose, rotary) in place of timers which need to be manually monitored.

India been one of the largest agro-economical state with the responsibility of supplying good quality food to its 1.35 billion population plus India being the second largest FARM PRODUCER .In this regard, India must have an effective system of Irrigation and advanced techniques for the same, so that it can fulfil this liability.

### Drip Irrigation system (with timer)

The **timer** can be attached to the spigot/tap to which an underground (hose) is connected. This further is connected to a **shower** with big and small holes (to regulate the pressure and direction of the flowing water as

per the requirement. The hose can also be fixed underground. **Working:** frequency of water discharge, speed, time of 1 water discharge round should be set up in the timer so that no plants get over/under watered.

India had also adopted such a Smart system called **NANO GANESH** (A Pune based company) in collaboration with Ossian Agro Automation which to quite an extent, has helped the farmers of major crop producing states like Punjab, Haryana, and Maharashtra.

### **CONCLUSION:**

These and many other such systems are developing in India. The only need of the hour is the development and more importantly proper implementation of programs which support such user -friendly smart systems. This will not only make the job of the farmer hassle free but also keep a check on whether the crops are getting adequate water even without being physically present in the farm. With increase in Economic development, government in near future can develop such useful and advanced devices and make them a crucial component.





**Picture Sources:**

**Picture 01: Garden Water Valve**  
**(Image source)**

**Picture 02: Green IQ (Image source)**

**Picture 03: Garden Water Sensors (Source)**

**Picture 04: Self-watering reservoir pots (Image source)**

**Picture 05: Drip Irrigation system (Image source)**

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## Permaculture



**Vandana Khurana**  
**B.Sc. (H) Botany, II Year**

### **“Earth Care; People Care; Fair Share”**

If you happen to pick up a newspaper these days you probably found the growing sense of despair regarding climate change and environmental degradation. But there has been astounding efforts from several communities to try solving these problems and among these communities and modern techniques and philosophies lies the promising idea of permaculture which not only helps in tackling the difficult environmental challenges ahead but also for thriving in a transformed world.

Permaculture a term coined by David Holmgren and Bill Mollison, in 1978 was originally referred to as “permanent agriculture”, but was later it was coined in a more inclusive term that is “**permanent culture**”.

With those two words permanent and culture lies behind the philosophy of permaculture in the sense that it gives people a set of tools to rethink and redesign their communities so that they can live seamlessly with the natural world and by working with rather than against nature in order to grow food. In doing so the concepts and practices of permaculture built communities that are adaptable to changing climate. Jermor Nigers sums up these ideas in his book “permaculture promise” where he writes, “**Permaculture is**



**about rebuilding much needed relationships with people, land and the systems that support us”.**

At the core of permaculture teaching lies 3 ethics – **earth care, people care, and fair share**. While earth care and people share are simplest forms while the fair share is a bit less, self-explanatory. The concept of fair share is essentially the synthesis of earth and people care acknowledges that there is one earth that we all need to live on So **surplus**, whether its food, money or time should be shared with those who otherwise are languishing and are in need of it. These three ethics ultimately intertwined to create an effective base on which permaculture practitioners can built and transform their local systems.

There are several permaculture projects that are going on like the city repair project and many more which provides means to create better sustainable society. There are 12 **principles** which are listed by David Holmgren which includes:

- Observe and interact
- Catch and store energy
- Obtain a yield
- Apply self-regulation and accept feedback
- Use valuable resources
- Produce no waste
- Design from patterns to details
- Integrate rather than segregate
- Use small and slow solution
- Use and value diversity
- Use edges and value the marginal
- Creatively use and respond to change

Permaculture emphasizes traditional and new practices in which all the input is produced by the farm itself, resulting in food self- sufficiency. It originated as a design science for small-scale farmers to create quantity produce, ease their work and also to address environmental degradation.

Although permaculture is growing rapidly in India, the average villager’s reluctance to try different foods and habits slows down the movement. For

example, only a few varieties of vegetables are consumed in areas even when a huge diversity is feasible.

Permaculture is important because it brings to the table tangible, ethical based solutions for systemic change. It involves **beyond sustainability and into resilience**. Looking towards not only surviving in this quickly changing natural world studying at the local, personal level the concepts of permaculture leans off to industrialization and eccentric world view and replace that materialistic perspective with a new outlook that emphasis ethical interaction with nature and a community oriented lifestyle.

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## Kitchen Garden



Tamanna

B.Sc. (H) Botany, II Year



Great old fashioned Potager

Source-

[https://www.pinterest.com/search/pins/?q=old%20fashioned%20potager&rs=typed&term\\_meta\[\]=old%7Ctyped&term\\_meta\[\]=fashioned%7Ctyped&term\\_meta\[\]=potager%7Ctyped](https://www.pinterest.com/search/pins/?q=old%20fashioned%20potager&rs=typed&term_meta[]=old%7Ctyped&term_meta[]=fashioned%7Ctyped&term_meta[]=potager%7Ctyped)

The traditional kitchen garden, also known as a Potager (in French) is a space separate from the rest of the residential garden- the ornamental plants and lawn areas. Most vegetable gardens are still miniature versions of old family farm plots, but the kitchen garden is different not only in its history, but also in its design.

A kitchen garden is where herbs and vegetables are grown around the house for household use. Since early times a small plot near to the house has been used for growing a variety of vegetables according to the season. Local varieties such as radish, broad leaf mustard, beans, pumpkins etc. are all grown in the kitchen garden.

Plants are chosen as much for their functionality as for their color and form. Many are trained to grow upward. A well-designed potager can provide food as well as cut flowers and herbs for the home with very little maintenance. Potagers can disguise their function of providing for a home in a wide array of forms-from the carefree style of the cottage garden to the formality of a knot garden.

How to make a kitchen garden?

Because there's often no tradition of kitchen gardens, many people can't grow the vegetables they need for a good diet. Or they spend lots of money on vegetables, or their health suffers from lack of vegetables. It may be that you haven't been able to make a kitchen garden. There are several reasons why it may be difficult to make kitchen garden, or if you have made one, it is not successful. For example-

- Pests, diseases or livestock have destroyed the crop.
- No good seed or seedlings.
- Lack of space, water, fertility.
- No spare time
- Lack of right skills.

Things to pay attention to-

1. Site selection- If you already have a kitchen garden you may not need to choose a new site, it's enough to improve the old site. If you are making a new garden, there are many factors to consider. For ex:-
  - How to protect from livestock?
  - How can you bring water to the site and distribute it?
  - How to manage the fertility of soil?
  - How can the area be accessed easily from the house?

When these issues are considered, the best site can be chosen and the work of making the garden will be easier.

2. Protection - The kitchen garden area needs protection from the very start. It should not be possible for livestock to enter the area. A permanent fence should be made. Thorny plants can be cut and used to make a fence.



- The crops will also need protection from damage by many types of pests and disease. There are many ways to do this. Mixed cropping, rotations, liquid manure etc. are all ways of Protecting crop.

3. Water Management- It is important to provide enough moisture for the kitchen garden. There are many ways of conserving and increasing the moisture available. For ex-

- Mulching: prevents the wind and sun drying the bare soil.
- Green manures: also cover the soil, and so help in conserving water.
- Windbreak: wind will dry out the soil, so stopping the wind helps to conserve soil moisture.
- Provide shade: in the hot season trees can provide shade to the kitchen garden. As well as giving shade, these trees can also provide other benefits, such as firewood, fodder or mulch material.
- Mist collection: mist collects on the leaves of trees around and within the kitchen garden, and drips onto the soil to provide extra moisture.
- Irrigation: collecting and using waste water from the kitchen can be enough to water the garden.

4. Fertility- Without fertility in the soil the crops won't grow. Fertility can be as limited as water. Our kitchen garden needs to be self-reliant for fertility. Sources of fertility are given below:-

- Sweepings pits
- Liquid manure
- Mulching
- Green manure
- Legumes

5. Seeds and Seedlings- It is very important to save and protect any good seed- this is the farmer's responsibility. From good seed it is important to be able to raise good, healthy seedlings for transplanting into the kitchen garden.



Growing of vegetable seeds

Source- <https://nurserylive.com/>

6. Garden Design- More production in a small place

- ❖ Edge planting- It means growing of support crops, companion plants, in the edges around the garden and its beds.
- ❖ It helps to make maintenance work easy in the kitchen garden.
- ❖ These plants support the garden by providing mulch, protection from weeds, windbreaks, and repelling pests.
- ❖ Edge plants take nutrients from deep in the soil and cycle them to the surface, where they are used as much, and then returned to the soil

#### Benefits of the Kitchen Garden

- To grow healthy, fresh vegetables yourself.
- To save the cost of buying vegetables and herbs.
- Waste resources such as sweepings, kitchen, scraps and dirty water can be recycled onto the garden.
- Wasteland around the house can be made productive.





Small kitchen garden

Source- <http://gardensdecor.com/?s=kitchen+garden>

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## Drug Plants Cultivation



**Karishma Sahu**

**B.Sc. (H) Botany, II Year**

In today's world, medicinal plants are extensively used for pharmaceutical purposes. These have been discovered traditionally and used in traditional medicinal practices since the dawn of civilization. The drug plants synthesize hundreds of chemical compounds as defense against insects, fungi, diseases etc. These chemicals which are produced by the plant are exploited by humans in form of drugs and are used in making medicines. With the onset of globalization in the early 21<sup>st</sup> century in India, the drug plant sector was seen as one of the profitable sectors owing to the vast variety of drug plants available in India. These plants produce secondary plant metabolites like alkaloids, terpenoids, flavonoids etc., which are extracted and used in the pharmaceutical companies and in traditional medicinal practice that is - Ayurveda. As the global demand increased, the export from India also rised from rupees 450 crores to rupees 1500 within a decade. As a result, the shift from meeting the demand from the wild shifted to cultivation of these plant. This happened because collecting drugs from wild plants was endangering the species. The cultivation of these plants has created new jobs for many people in the agriculture sector. Most of the drug plants are



found in forest covers due to globalization, the forests are now being exploited. To obtain these raw materials of the drug plants, we needed to cultivate them.




<https://plnami.blob.core.windows.net/media/2014/10/poppy102114-800x500.jpg>

Due to cultivation of drug plant, the resource availability of the drugs have become easy as people do not longer have to dwell in the forest to identify and collect them. When the plant is cultivated under proper care, the product return is more and the quality is better. Cultivating drug plants provides us a scope to improve the variety and obtain the maximum benefits from them. To promote the cultivation of the drug plants in India “National Medicinal Plant Board” which is under the Ministry of AYUSH is working to promote cultivation of the same under centrally sponsored scheme of “National Mission on Medicinal Plants (NMMP)” since 2008-09 and now is continuing under “National AYUSH Mission (NAM)”. Their main objective is to promote the cultivation of the drug plant.

With the cultivation of these plants comes the matter where people illegally abuse the drugs as they usually have carcinogenic substances which when consumed release certain hormones in our body leading to a feeling of euphoria. To keep a check on such issues ,a close monitoring of the area where the plant is being cultivated is required along with necessary steps taken by the government so as when the law is broken, one gets punished for the abuse act.

Plants whether drug or normal when cultivated have given massive return to the mankind and a drug plant in themselves are the medicine reservoir and itself are the physician. So cultivating them will lead to a healthier society only if it is not being misused.

The background of the slide is a close-up photograph of several bright yellow flowers, likely daisies, with numerous petals radiating from a central brownish-yellow core. The flowers are slightly out of focus, creating a soft, textured background.

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## Traditional Agroforestry



**Supriya Sen**

**B.Sc. (H) Botany, II Year**

Before discussing about traditional Agroforestry, let's first talk about Agroforestry.

### **What is Agroforestry?**

Agroforestry refers to as a land management system which also includes growing of trees and shrubs around. As the name suggests both agriculture and forestry technologies are combined together to diversify and sustain land use systems.

### **HOW AGROFORESTRY IS BETTER THAN CONVENTIONAL AGRICULTURAL SYSTEMS?**

- Control soil-erosion and runoff
- Maintain organic matter of soil
- Enhanced nutrient cycling and hence effective use of nutrients.
- Reduce toxicity of soil
- Reduce infections and disease through pests
- Increase availability of soil water to land use systems
- Increase nitrogen fixation
- Provide more diverse farm economy.

## What is Traditional Agroforestry?

Traditionally Agroforestry is a system to manage natural resources through integration of trees on farms. The *Alnus nepalensis* and *Amomum subulatum* combination in the humid sub-temperate regions of Nepal and Bhutan and Sikkim State of India is an excellent example of a commercial but traditional agroforestry system.

Agroforestry systems bring changes in

- Edaphic
- Microclimatic
- Flora & fauna
- Components of the ecosystem

**According to Schroth et al. agroforestry also contributes to biodiversity conservation on a landscape scale.**

## TYPES OF TRADITIONAL AGROFORESTRY

There are several types of traditional agroforestry practices. Some of the practices are

### 1. SHIFTING CULTIVATION (JHUM) -

This agroforestry system has originated in the Neolithic period in the years between 13000 to 3000BC and is still practiced in the Northern Eastern Hill region and some other hilly regions and humid parts of Indian subcontinent. Shifting cultivation refers to the rampant encroachment of farms to forested areas by cutting down trees and shrubs and burning them. This system is also known as “jhumming”.



<http://www.northeasttoday.in/assets/resources/2015/10/jhum.jpg>

## ADVANTAGE



The advantage of the shifting cultivation is that it provides very easy and fast method of preparation of the land for agriculture.

## **DISADVANTAGE**

Many trees are cut and forests are cleared which may lead to heavy soil erosion

## **2. THE TAUNGYA SYSTEM –**

The taungya (taung = hill, ya = cultivation) is a Burmese word coined in Burma in 1850. This system was introduced to India by Brandis in 1890 and the first taungya plantations were raised in 1896 in North Bengal. In 1890, it was introduced to Coorg in Karnataka. This is a modified form of shifting cultivation in which the labor is permitted to raise agri-crops in an area but only side by side with the forest species planted by it. The practice consists of land preparation, tree planting, growing agricultural crops for 1-3 years, until shade becomes too dense, and then moving on to repeat the cycle in a different area. A large variety of crops and trees, depending on the soil and climatic conditions, are grown in India. In fact this system was introduced to raise forest plantations, but finally became recognized agroforestry system.



Source: <https://image.slidesharecdn.com/agroforestrysystemsandarchitecture-150926103141-lva1-app6891/95/agroforestry-systems-and-architecture-37-638.jpg?cb=1443263635>

### **Advantages of Taungya:**

- Unemployment problems solved.
- Artificial regeneration of forests is obtained.
- Establishment of low cost method of forests plantation

### **Disadvantage of the Taungya:**

- Loss of soil fertility

- Danger of epidemics
- Exploitation of human labor

### 3. *PROSOPIS CINERARIA* (KHEJRI) BASED SYSTEM –

*Prosopis cineraria*, has played a significant role in the rural economy of the arid north-west region of the Indian subcontinent. This tree is an important constituent of the vegetation system and is a source of animal feed, fuel and timber. Its pods are used as a vegetable. It improves the fertility of the soil beneath it, is well adapted to arid conditions and stands up well to the vagaries of climate and browsing by animals. The rural communities encourage the growth of *khejri* in their agricultural fields, pastures and village community lands, as. It improves grain yield and forage biomass production. The limitations of *khejri* are its slow growth.



Figure- *Prosopis cineraria* (khejri) trees in the agricultural fields in western Rajasthan, India (Photo: Central Arid Zone Research Institute, Jodhpur, and Rajasthan)

### 4. HOMESTEAD AGROFORESTRY SYSTEM –

Homestead also known as home gardens have originated in pre-historic times. It is a system that provides multiple products to the household and meeting their requirements through a wide variety of fruits, vegetables, spices and different tree products. This system is traditional to

Eastern and southern part of Indian subcontinent. The Homestead agroforestry system is very important in the economy of Bangladesh. The many woody species grown in the homesteads are a significant source of fuelwood; they also provide fodder, building materials and other forms of wood. In the context of the prevailing shortage of fuelwood and excessive



deforestation in Bangladesh, this homestead agroforestry system needs to be strengthened.

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## VANISHING TRADITIONAL FOOD CROPS



**Apoorva Verma and Ruth Abraham**  
**B.Sc. (H) Botany, II and III Years**

In this 21<sup>st</sup> century we can savor any food that we desire to. Today distance is no barrier in getting what we want. With the advancement in science and quality of transportation, food can be stored for very long time. We can enjoy any food at any place at the cost of good amount of money.



Traditional and exotic colored capsicum  
Source-  
[http://absfreepic.com/absolutely\\_free\\_photos/small\\_photos/bell-peppers-3504x2336\\_32938.jpg](http://absfreepic.com/absolutely_free_photos/small_photos/bell-peppers-3504x2336_32938.jpg)

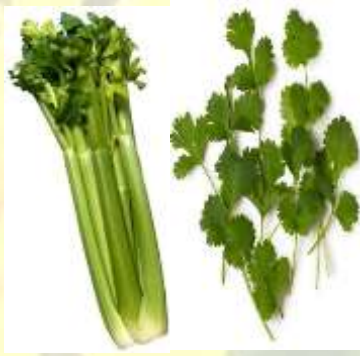
costs 15 rupees while broccoli costs 60 rupees per kg. The exotic food are in high demand in sophisticated shopping malls, metro cities, luxurious hotels, international tourist 's places, etc. who can afford to buy these expensive food.

These foods are expensive because they are resource demanding and high input cost. The regular capsicum costs 20 rupees while the exotic colored capsicum costs 80 rupees, which is 4 times that of regular capsicum. The regular cauliflower



Cauliflowers being replaced by exotic ground water depleting Broccoli  
Source:  
[https://cdn.pixabay.com/photo/2018/03/05/13/19/cauliflower-3200734\\_960\\_720.jpg](https://cdn.pixabay.com/photo/2018/03/05/13/19/cauliflower-3200734_960_720.jpg)





Celery replacing traditional cilantro

Source:

<http://5.imimg.com/data5/TI/IJ/MY-28190452/1-500x500.jpg>  
<https://2.imimg.com/data2/NG/HY/MY-1934612/17-500x500.jpg>

Now the farmers are tempted to cultivate remunerative exotic crops in place of traditional crops. As a result, the crop patterns in India are changing without consideration for local agro-climatic conditions and simultaneously putting a burden on environment, incurring huge long-term losses. Broccoli depletes more ground water than cauliflower. Similarly celery and parsley are replacing coriander (cilantro) while millets are being replaced by oats in several places.

Some examples showing the effect of replacing traditional crops with exotic cash crops on environment, health and food security have been discussed below.

Here's a detailed look at a few upsets that the cash crops have brought about in different regions impacting environment, health and food security.



Traditional Finger millet

Source:

[https://upload.wikimedia.org/wikipedia/commons/6/6c/Finger\\_millet\\_3\\_11-21-02.jpg](https://upload.wikimedia.org/wikipedia/commons/6/6c/Finger_millet_3_11-21-02.jpg)

After 1970s, the farmers in Mandya, Karnataka shifted from traditional finger millet (ragi) to more profitable but water-intensive paddy and sugarcane crops. The low rainfall put the crops in Karnataka at risk. The problem was aggravated due to the changed crop pattern. This forced the Government to stop water supplies to Tamil Nadu resulting in water conflict between the two states.

Traditionally, in Maharashtra, millets and oilseeds which require less water were grown. Now by the influence of politicians a wide network of sugar mills have been set up. Sugarcane covers only 4 percent of the total farmed land in the state. However, it consumes 71.5 percent of irrigated water. On the other hand, pulses take only 3.4 percent irrigation though they occupy 16.8 percent of cropped area in the state. The cost of sugarcane cultivation is Rs 1, 65,962 per hectare. This cause led to the growing farm distress and farmer suicides in the state.

Menthol cultivation in Bundelkhand (UP) is another crop that contrasts with the agro-climatic zone. A study in 2008 done by Parmarth Samaj Sevi Sansthan showed mentha got the highest per acre income of Rs 35,000. However, it is not profitable as the input cost of production was Rs 17,514 per acre. Most of the farmers complained about high cost, low income or low productivity.

A major cause for the vanishing of traditional crops and the expansion of high yielding but irrigation – heavy cash crops in the Indian fields is the large scale development of dams and canals along with increased access to ground water. The exotic plants require heavy dose of agrochemicals and assured irrigation.

However, now Indian farmers are realizing the importance of traditional crops and are reoccupying their land with them. The Dongria Kondh community in India's Odisha state is endeavoring to revive their heritage millets. Millets ensure nutritional security during climate distress.



Women of Kadarguma on a mission to collect long lost variety of millets

Source-

<https://d1u4oo4rb13yy8.cloudfront.net/article/61555-oncrjesomi-1498463761.jpg>

Olive oil, sunflower oil, soybean oil etc. which are sold only in a 'pure' (highly refined, transparent and almost colorless) form are, in nutrition and health respects, inferior to traditional oils like mustard oil and coconut oil

etc. They penetrated into the Indian markets through heavy advertisements. These changes reduced the income of indigenous farmers for their mustard and sesame crops.

The impact of the exotic crop on the natural resources has been manifested as the production scale expanded. Declination of soil fertility, receding groundwater chemical pollution and changing food habits adversely affecting human health are its direct evidence. These evidences show that short-term financial gains can't be a justification for long-term impacts on the environment and the farmer. Now the farmers are reverting back to use of traditional plants.



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## **FOREST CITY, CHINA**



**Pratibha Bishnoi**

**B.Sc. (H) Botany, III Year**

When China decides to do something, the country can be incredibly agile and quick in implementation. One example is the construction of a "Forest City" that pushes the boundaries of sustainable urban planning and development, a concept the EPA should certainly take a look at.

The Chinese government has broken ground on this Forest City with the ambitious plan to have it fully completed by 2020, an urban development that will be covered in plants and solar panels. The city will sit along the Lijiang River in the mountainous region of Guangxi in southern China. The design is the brain child of Stefano Boeri Architect, an Italian architectural agency known for environmentally focused urban designs. A key premise for this Forest City will be to fight air pollution that has engulfed many of China's metropolitan areas and remains a critical health threat to the Chinese people.

The city will include typical buildings such as schools, offices, hotels, hospitals, and homes of course. Albeit, these will all be covered in thousands of trees and plants of various species. Below are some key statistics about the city, including its ability to scrub the air of CO<sub>2</sub> and pollutants and release oxygen. As the city ages and trees become older they will only absorb more CO<sub>2</sub> and become more effective. A single adult tree can absorb 48 pounds of CO<sub>2</sub> and about 260 pounds of oxygen per year. This is because trees, opposite to humans, take in CO<sub>2</sub> and release oxygen during photosynthesis.



- 10,000 tons of CO2 absorption per year
- 57 tons of pollutant absorption per year
- 900 tons of oxygen produced per year
- 30,000 inhabitants
- 40,000 trees within the city

1 million plants and over 100 species within the city. This ambitious plan will be an example to the global community on how to build sustainable cities that help cut down on pollution while at the same time generate biodiversity and fresh oxygen.

This concept may not work exactly as built here for every city but there are certainly ideas and best practices that can be implemented around the world. This is especially true in highly populated polluted areas that are badly in need of more green space. A city of a new generation, capable of becoming a model of sustainable growth in a large country seeing, each year, 14 million farmers migrating to the cities.



[https://www.google.co.in/search?dcr=0&biw=1366&bih=664&tbn=isch&sa=1&ei=i4\\_PWpvrJNKHgQa-3Log&q=forest+city+china&og=forest+city+chin&gs\\_l=psy-ab.1.0.0l2j0i24k1l6.79478.81378.0.84198.5.5.0.0.0.584.1090.5.2.2.0....0...1c.1.64.psy-ab..3.2.1088...0i10i24k1.0.uwDyU-6bapI#imgrc=crjoPW4en\\_5qZM:](https://www.google.co.in/search?dcr=0&biw=1366&bih=664&tbn=isch&sa=1&ei=i4_PWpvrJNKHgQa-3Log&q=forest+city+china&og=forest+city+chin&gs_l=psy-ab.1.0.0l2j0i24k1l6.79478.81378.0.84198.5.5.0.0.0.584.1090.5.2.2.0....0...1c.1.64.psy-ab..3.2.1088...0i10i24k1.0.uwDyU-6bapI#imgrc=crjoPW4en_5qZM:)

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**Forest City Shijiazhuang** is:

## **1. The prototype of a city composed by Vertical Forests.**

Forest City Shijiazhuang (FCS) is the prototype of a new generation of small, compact and green cities, composed by dozens of tall and middle size buildings – the so called “Vertical Forests”– all surrounded by the leaves of trees (ranging from 3-9 meters in height), shrubs and flowering plants. Every VF grafts the equivalent of thousands of 20.000 square meters (2 ha) of a real forest.

## **2. An urban ecosystem.**

Forest City Shijiazhuang is an urban ecosystem which hosts 100,000 inhabitants and occupies a land of 225 hectares. Forest City Shijiazhuang is composed by 5 districts and one central Park (carpel). Every district (petal) is hosting ca. 20,000 inhabitants. Every petal is a mix-use social environment, with residential housings, offices, retails, malls, public spaces and gardens. The central Park (carpel) is the place for the main Public Facilities of FCS: The Hospital, the School, and the Cultural Activities.

## **3. An anti-sprawl device.**

Every Forest City will concentrate in a vertical dimension – and within a perimeter of 1.5 for 1.5 square kilometers (225 hectares) – the urban volumes that normally are hosted in a 25 hectares of land. For this reason, Forest City Shijiazhuang is the prototype of a new model of urbanization in China, which doesn't consume agricultural and natural lands, limits the costs of public transportations and reduces the energy consumption.

## **4. A sustainable city, with low energy consumption.**

The vegetative filter on the buildings balconies creates a reduction – in the difference between the outside and inside temperature – of about 3 degrees. In summertime it reduces the heating of the facades by up to 30 degrees.

## **5. An absorber of CO<sub>2</sub> and the dust of urban pollution.**

FCS cleans the air the vegetation within FCS is designed in such a way as to form a continuous green filter between inside and outside of inhabited areas, able to absorb the fine particles produced by urban traffic, to produce oxygen, to absorb CO<sub>2</sub>, and to shield the balconies and interiors from very high pollution of Chinese cities. Approximatively, every SQM of a Vertical Forest facade is absorbing 0.4 kg of CO<sub>2</sub> a year. Only considering the plants housed in the vertical facades of the green buildings (and not the ones



present inside the parks and gardens), FCS will absorb approximately 1,750 kg of CO<sub>2</sub> a year. FCS will contribute to improve the environmental quality of the air in the whole city.

## **6. A multiplier the biodiversity of the living species.**

FCS will be the home of hundreds of different species of plant life, including trees, shrubs and perennials. FCS will host many species of birds and domestic animals.

## **7. An ever-changing urban landmark.**

Thanks to the variety of plant species housed along the balconies – and in the presence of deciduous trees –, FCS will change its skin and the color composition of its leaving facades, according to changing seasons and weather conditions.

## **8. The basic element of a new model of urbanization in China.**

FCS is a model of urbanization and the basic element for a large number of settlement combinations. Different FC could be assembled in a cluster or along a line, creating a major conurbation, but always in respect for the maintenance of the standard fixed in FCS: for 225 hectares of a city in a 25,000 hectares of a green (agricultural, natural, sport) permeable land.



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## The Famous Botanist: Janaki Ammal



**Tanvi Saxena**

**B.Sc. (H) Botany, I Year**

### **Meet India's first woman PhD in Botany-She is the reason YOUR SUGAR TASTES SWEETER!**

A woman who comes from the era where the education of women was considered a great splendour, **Janaki Ammal Edavaleth Kakkat** name is the one written with golden letters in history of India. She became the first Indian woman to receive D.Sc. (honorary doctorate) from the Michigan University. The famous botanist was born in the year 1897 in state of Tellichery, Kerala. She completed her elementary education in Tellichery and then moved to Madras where she obtained the undergraduate degree from Queen Mary's College and achieved botany honours degree from the Presidency College in the year 1921.

She was the co-author of few of the renowned books like '*The Chromosome Atlas of Cultivated Plants*' and was also known for her contribution with the Sugar Breeding Station located in Coimbatore. Her contribution are also remarkable in creating sugarcane hybrids that yielded much sweeter sugar. Also the very famous flower *Magnolia kobus Janaki Ammal* was named in her honour and contribution to the field of Indian Science. She conducted research in cytogenetics and phytogeography. Her most notable work involves those on eggplant and sugarcane.

Janaki Ammal was an iconic woman who represented our country across the ocean at a time when patriarchy was dominating. She was a woman

with ambition and always curious about the flora in her surroundings. A woman like her will always be remembered for her passion, courage and contributions in enhancement of the Indian Science and brought it into spotlight even overseas.



**Janaki Ammal**

**(4 November 1897-7 February 1984)**

Source: <https://scroll.in/article/730186/remembering-dr-janaki-ammal-pioneering-botanist-cytogeneticist-and-passionate-gandhian>

### **Contributions**

The famous botanist returned to India and worked as Professor of Botany at the Maharaja's College of Science, Trivandrum, in the year 1932

She completed her research in polyploidy which helped to understand the nature of sugarcane ploidy. She acted as an important instrument in creating a firm scientific basis for crossing and hybrids, and helped in choosing plant varieties for cross-breeding. She worked at the institute till 1939.

She then travelled to England in 1940 to work as Assistant Cytologist at the John Innes Horticultural Institution in London. There she worked on chromosome studies on a wide range of garden plants, and her studies on chromosome numbers and ploidy led to new results in the study of the evolution of species and varieties.

### **Major Works**



- Some of her pioneer works include the contribution in cytogenetics in India and the development of sweeter hybrid varieties of sugarcane has been incredible. Being a member of the Sugarcane Breeding Institute, she was instrumental in not only in the analyses of the geographical area of sugarcane across pan India, but also in selecting good quality for cross-breeding.

### **Awards & Achievements**

- She was made the Fellow of the Indian Academy of Sciences in 1935 and was elected a Fellow of the Indian National Science Academy in 1957 by Professor C.V.Raman.
- She was also awarded an honorary LL.D. from the University of Michigan in the year 1956.
- In the year 1977, she was honoured by the Government of India with one of the prestigious awards that is Padma Shri.

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## Avocado – A fruit



Rupal Singh

B.Sc. (H) Botany, II Year

Let's talk about avocado, actually what it is?

Avocado is also known as Alligator pear. It is very useful for health. It contains fat which can provide us energy.



Source – <https://www.organicfacts.net/health-benefits/fruit/health-benefits-of-avocado.html>

According to the recent searches it was found that avocado was present in Peru but it is originated in South Central Mexico. Its scientific name is *Persea americana*. It belongs to the lauraceae family. This family includes many aromatic plants and shrubs. There are some common names of Avocado like avocetier, aguacate, avokaa etc.

**Now talk about its morphology, how its look like -**



- It is a dense polymorphic, broad leaved and aromatic evergreen tree. It is a fast growing plant and attains a height of 20 meters. Usually trees are 8 – 10 meters tall. It has an irregularly low branched trunk.
- It has so many cultivars but some are columnar in shape and others are prostrate.
- Vegetative growth is cyclical with pronounced growth form.
- Avocado tree shades many leaves in early springs.
- Inflorescence grow frequently during warmer region. This tree produces one long inflorescence per year in cooler areas.
- This tree also produces axillary branches.
- Their roots are shallow and has poor water uptake and hydraulic conductance.
- Sometimes injury of branches causes secretion of dulcitol, a white powdery sugar.
- Avocado leaves are alternate, glossy, and elliptic to obovate – oblong and 10 to 30 cm long, 4 to 10 cm wide.
- Flowers are conspicuous in nature and appear in terminal panicle of 200 to 300 small yellow green blooms.
- The pear shaped fruit is 7 to 20 cm long, weighs between 100 to 1000 grams has a large central seed, 5 to 6.4 cm long.
- Calyx is not persistent in fruit.
- The flowers are perfect can be protogynous.



Avocado plant

Source – <https://www.fast-growing-trees.com/images/D/AVO-HAS.jpg>



Avocado flower



Avocado variety - Hass

Sources - <https://www.agric.wa.gov.au/sites/gateway/files/Avocado%20flower%20female.jpg>

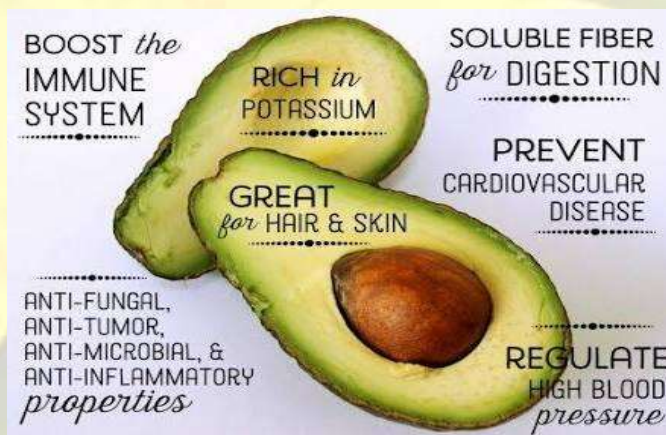
[http://www.lauriemeadows.info/food\\_garden/fruit/avocado\\_cv\\_hass\\_fruit\\_set\\_january\\_01\\_2017.jpg](http://www.lauriemeadows.info/food_garden/fruit/avocado_cv_hass_fruit_set_january_01_2017.jpg)

### Cultivation of avocado –

This is a subtropical species and it needs a climate without frost and with little wind because high wind reduce the humidity, dehydrate the flowers and affect pollination. An avocado can easily grow from seed but most of the commercial growers tend to use vegetative propagation method. The fruit is picked when it reaches maturity. Fruit has a special quality that they do not ripen until they are removed from the tree.

This fruit has so many cultivars like HASS, FUERTE, and GWEN etc.

### Uses:-



Source - Pinterest.com



Avocado has been cultivated for their edible fruits, the flesh is highly nutritious and has a composition different from that of other fruits. It has a high calorific value, it contains vitamin A, B and E. It is also good source of niacin, riboflavin, iron, thiamine, potassium. It is eaten in salads and desserts and used as a sandwich filling and an ingredient in dips and spreads, ice creams and milkshakes.



### Avocado uses

Source – <https://www.organicfacts.net/health-benefits/fruit/health-benefits-of-avocado.html>

**It is a world health beneficial food.**

Avocado oil penetrates human skin more than other oils such as almonds, corn and olive oil and also used in cosmetics and toiletries. The seeds yield a milky juice which has been used as an ink for making linen and clothing. It is grown as an ornamental tree.

It can also cause allergy to some people. Most of the symptoms include urticaria, abdominal pain and vomiting etc. American society for the prevention of cruelty to animals proved that it can be toxic to horses. Avocado leaves, bark skin, are poisonous to many animals, cats, dogs, cattle, goats, rabbit, rats and can be severely harmed and even killed when they consume them.

## Some searches about avocado

- ❖ Avocado's variety Colombian Hass arrived in US for the first time in November 2017.
- ❖ In Lakeland the farmers are growing a South African variety of Avocado called Maluma Hass , reckons the fruit is “bigger and creamier” than the typical Hass grown in Australia.
- ❖ Britain gets seedless avocados to prevent knife injuries

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## Ode to the best days...!



**Aishwarya Singh**

**Batch of 2014-17**

It was not long ago that my juniors from Gargi College approached me to write something for the annual publication of Botany Department- Anthesis. Writing for my beloved Anthesis has always been something that I look forward to doing and I was more than happy to pen down my thoughts and experiences regarding my journey in and after Gargi. The thing I like about writing is that it has a start and a finish- not something you find in scientific research! Research is like an infinite expanding space that expands at the same rate as the number of confounding questions that arise our minds as we uncover more about the research problem we set at the start. It was my time at Gargi College that I developed this aptitude for research and the infinite possibilities of consequences of these researches!


Although my association with Anthesis is not new, as I have been a member of the editorial board for two years, writing as an alumna is certainly a new experience. The word 'alumna' brings me to the realization of how fast time actually passes by! It feels like yesterday that I was in my graduation, enjoying the carefree, fun-filled yet highly knowledge-gaining life at Gargi College. It was undoubtedly the best part of my academic journey so far and I feel proud to be a part of the Gargi College family. I remember that I used

to bunk classes, idle out at canteen, watch movies, have lunch in the classroom during lectures, laugh around- aloud, travel in DTC buses and metros, negotiate with Auto driver, share samosa & drink, stand in photocopier queue, loads of fun in fest and what not...and why not? Those were the days, my own days, my own time...to live the student life at fullest.

I was always a dynamic student and believed religiously in enjoying my life without compromising with studies. The department of botany had been my second home during my graduation. I feel blessed to have been a student under the best teachers, whose knowledge and teachings made me fall in love with plants and nature as a whole. I have always admired the wonderful educationalists around me and have looked up to them. All the teachers in the department had been so supportive throughout my graduation and even after I passed out. I can never thank Dr. Aparajita Mohanty and Dr. Jasmeet Kaur Abat enough for believing in my potential and giving me opportunity of having the first research project of my life (I cannot imagine having a better start!). I have spent more time in the research lab than in classroom during the final year, making dilutions and loading gels... thus; the lab is one of the things that I miss most about Gargi. Although we did not get a chance to have Dr. Geeta Mathur (the most passionate botanist I have ever come across) teach us for long, her passion has always amazed me. Her able guidance during my journey as Anthesis editor has helped me learn a lot about technical scientific writing and my abilities. I remember Dr. Kiran Prabha's power point presentations and sincerely appreciate the enormous efforts she used to put in for making such detailed presentations. Had it not been the efforts of the teachers of botany department, I would have never developed such fondness for plant sciences. It was because of them that I was able to understand my interest in Environmental Studies, which finally led me to pursue my M.Sc. in Environmental Science.

Gargi College also blessed me with best of friends for a lifetime and I shall always cherish the memories of the times spent with them. I miss the Nescafe and the playground field, our favourite hangout zone where we had unlimited fun, our whisperings at the library, those pretty scolding from professors after bunking classes!! I learned a lot about life in Gargi, the most important lesson being faith in my own-self. I have learned to keep my mind open and follow my interests, which has helped me choose the right path so





far. Memories keep bringing back glimpses of my life at Gargi College and these shall be with me wherever I go.

Once a Gargian, always a Gargian!

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## AN ENDLESS BOUNTY!



**Preeti Bhati**

**B.Sc. (H) Botany, III Year**

I was just born out of my mother's womb,  
When I first met **Nature**.

Endless nature itself is of no nature – I'd thought!

But I proved fallacious instantly, as maunder- like wind came up, to lift me  
in her soft petal like arms to soothe my soul to the infinity – like my Granny!

Next morning, I found sunrays beaming through my windows,  
Just to cherish my newly born face.

Myriads of birds singing everlasting enchanting songs in my welcome,  
fluttering wings to play with me – like my Father!

Months later, when I became limb-crawling baby,  
I found soil under my feet.

Smiling, as it was her relishing act of obligations to nurture and raise me  
high in the endless sky – like my own Mother!



And that is how, I touched the 'to be forever' sky – like a new Friend!

Years later, I grew up to be an adult,  
Searching for someone to complete my soul.

And then realized, trees around me were always there in every season of  
my life – like my Soulmate!

Now I'm utterly nurtured,  
Serene to the infinity, sheltered to the deepest core of my soul.  
With the endless bounty of nature!



**“An Endless Bounty!” – Picture by Preeti Bhati.**

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**GARGI'S FASCINATING FLORA**



**By Shalini Sharma**  
**B.Sc. (H) Botany, II Year**





**By Pratibha Bishnoi**  
**B.Sc. (H) Botany, III Year**





**By Jyoti**

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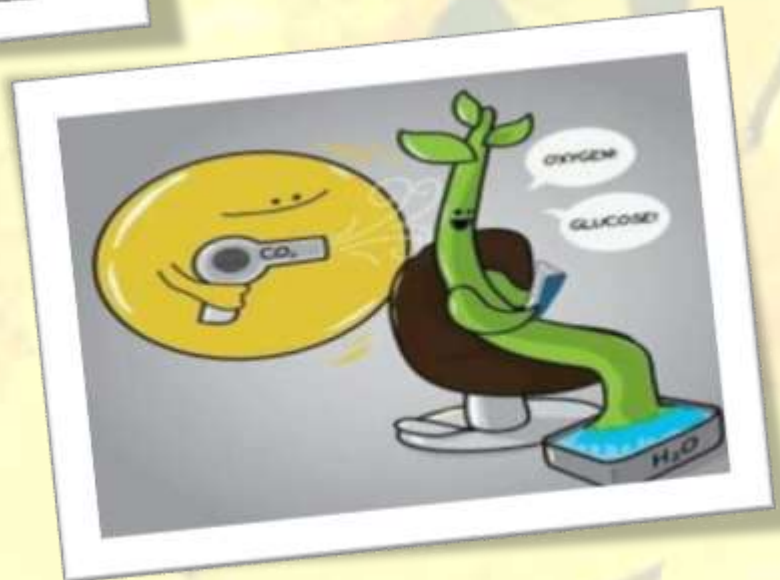
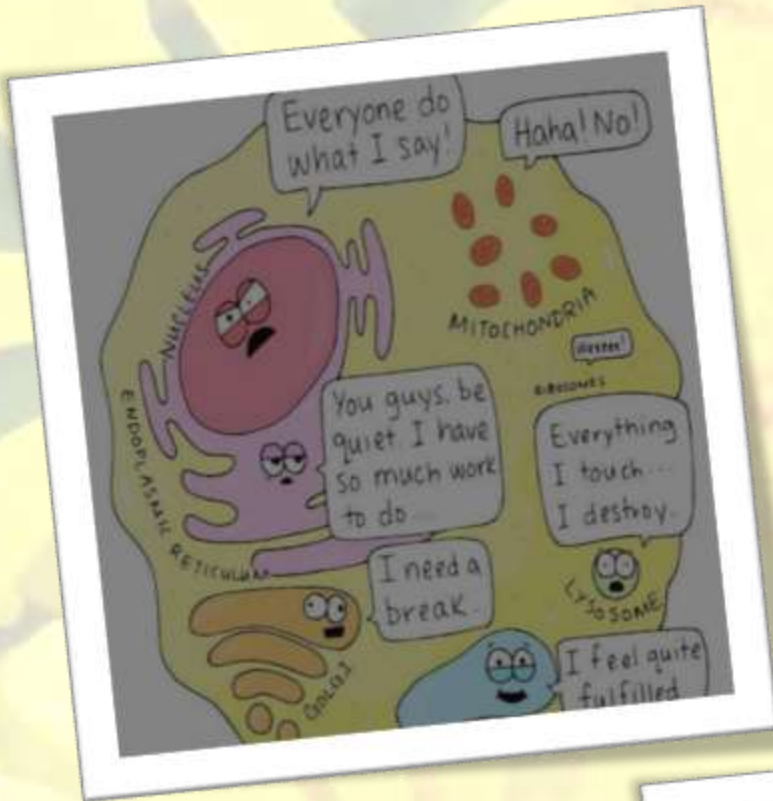
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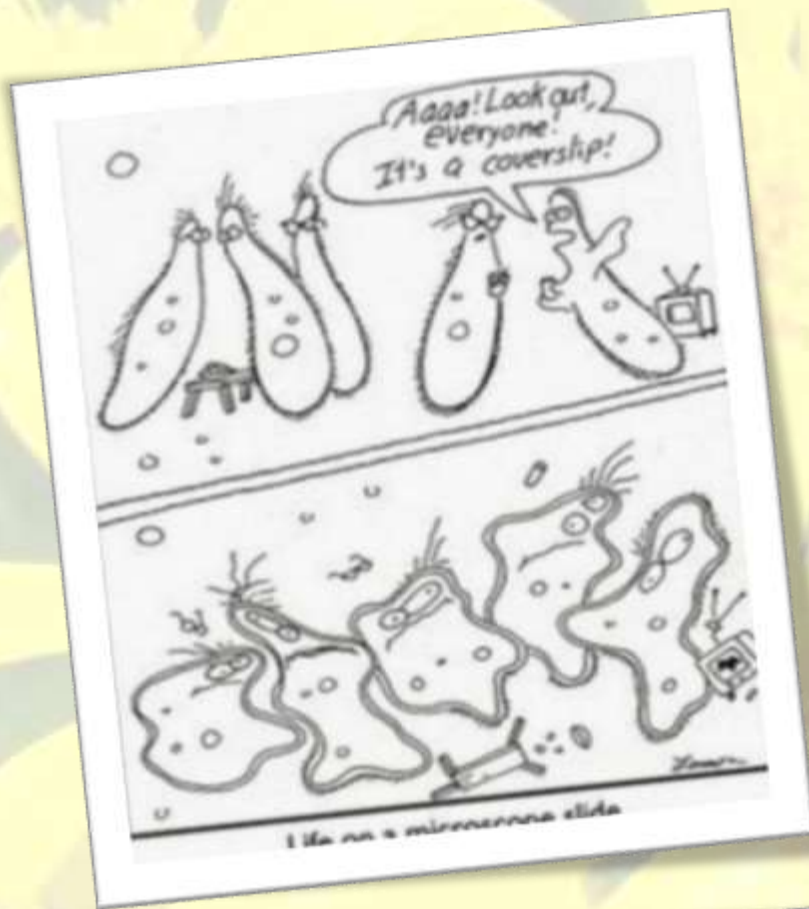


# Botanical Fun Pages

By Tanvi Saxena

B.Sc.(H) Botany, I Year





Why do potatoes make good  
detectives?  
Because they keep their eyes  
peeled.



## laugh out loud....

if a plant is sad do other plants  
photosynthize with it?  
"i chlorofeel you man"

NO, YOU MAY NOT BE EXCUSED. YOU'RE  
NOT LEAVING THIS DINNER TABLE UNTIL  
YOU'RE FINISHED PHOTOSYNTHESIZING!



## Anaphase



A chromosome shaking with dread,  
To her dear sister chromatid said,  
"Though it's beaking my heart,  
We'll be soon torn apart,  
By a strong microtubule thread!"

What did one hungry plant say to the other plant?  
I could use a light snack.

"What did the carrot say to  
the wheat?  
Lettuce rest, I'm feeling  
beet."

You have most likely never seen me .  
I am a strange-looking, cone-bearing desert  
plant that grows in southwestern Africa.  
My leaves look like straps of leather,  
are wide and trail on endlessly for many  
yards. My root and stem are special  
water storage organs.

**Who am I?**

I am a living fossil tree and my name  
means "**golden apricot**" in Japanese.  
I am easy to spot, even far away, because  
my leaves look like small umbrellas and my  
branches stick straight out from the trunk.  
In the autumn, my leaves turn bright yellow  
and all fall to the ground on the same day.

**Who am I?**

(*Welwitschia*, *Ginkgo*)

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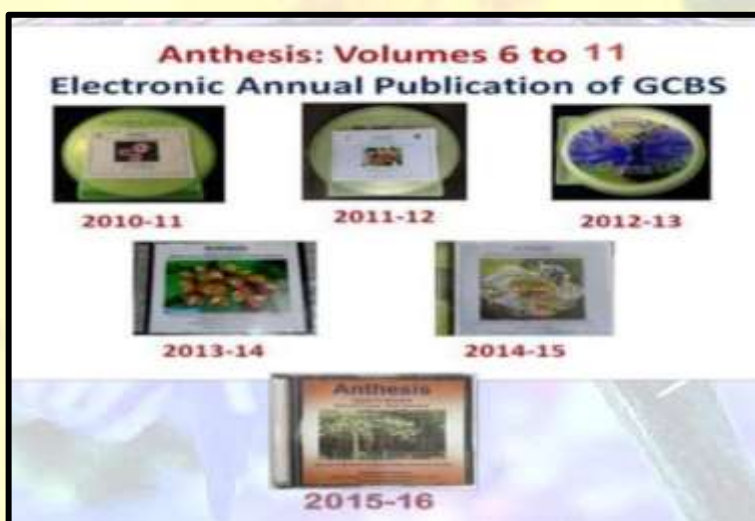


## **ANTHESIS: THE JOURNEY SO FAR**



### **Volumes 1-5**

Anthesis was first published in 2005 as a photocopied and spirally bound version; soon we got sponsorship to produce a printed version. Now Anthesis has a new avatar; we are producing e-Anthesis since Volume 6. The electronic version is proof of our concern for the environment as well as our technological advancement.



**2016-2017**

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