In the 175th meeting of HODs and Deans on 04-07-2018, it was decided to start Organic farming inside the campus. The main advantages were, it would reduce the dumping cost of biodegradable waste of the campus, which was presently dumped in the municipal area with Rs. 10,000 per month. Union Tribal Affairs Minister Jual Oram on November 10, Saturday launched the organic farming project of the National Institute of Technology – Rourkela (NIT-R) in an area of 2 acres. The idea was to improvise the techniques practiced by nearby farmers and also improvise them with involvement of interdisciplinary research in science and engineering. We have also started our efforts to combine the organic farming with our activities in Tribal centre and Unnat Bharat Abhiyan. I believe that this would not only increase our outreach activities but also have a positive impact on strengthening the institute’s contribution to the society.

Organic farming Project NIT Rourkela

Investigator Core Team:

Prof. Animesh Biswas
Director NIT Rourkela

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Organic farming Project NIT Rourkela

Investigator Core Team:

Prof. Debayan Sarkar

National Institute of Technology Rourkela has already initiated an intramural organic farming project with a seed money of Rs. 5 lakhs and is presently running successfully.

The motto is “Waste to Wealth & 3 Rs- Reduce, Recycle and Reuse”. The project has already delivered pure organic vegetables to campus community and the total area under cultivation is 2 acres. The team is presently working to develop funds for expanding the organic farming concept in the region and increase the outreach activities. The next outlook is to develop organic (vermi) compost from the waste generated from the 10000 population residing in the campus and use it in the organic farming. At the same time, to sell these highly fertile compost to nearby farmers and generate institute IRG. Training sessions of the nearby farmers are being executed so that the message of organic farming would spread in the nearby areas. At the same time a team of interdisciplinary scientists is trying to understand the science involved in the old techniques being used in the farming and improvise it. Thus it will not only deliver value from zero investment but also develop a cleaner and healthy ecosystem.
Organic farming is a fast growing sector of the food industry. In India it has become a matter of extreme importance these days. Production of organic foods involve usage of ingredients that are manufactured organically. However, it is getting harder and harder to find organic ingredients and also proper norms for organic food production is still at stake. Our duty as food process engineers extends in manufacturing organic foods at low cost with proper usage of organically produced ingredients. Moreover, the appropriate standards created can help the farmers, food manufactures as well as the consumers to understand organic foods, their production, and their health benefits in a better way. Our farmers are used to conventional practices of farming and their awareness regarding organic farming is still less. However, at the same time, organic farming, in general, is recognized to produce lower yields compared to conventional agriculture which stands as major disadvantage of Organic Farming. As a food processor creating awareness among people, lowering the production cost and improving the yield has turned out to be our primary duty concern. We look forward for resolving these challenges by conducting research which can improve the status of organic food production in India.

Realizing the relevance of organic farming in contemporary world NIT Rourkela has taken an initiation in establishing an organic farm in its campus. The main objective of this initiation is not just to provide organic vegetables to its campus communities but to promote inter-disciplinary research in organic farming and transferring the research output to the field for sustaining tribal/rural agriculture with low cost. Establishment of this farm is an attempt to popularise organic farming among farming communities. It will try to remove thinking in the minds of most of the farmers that organic farming is costly in nature. It will attempts to persuade farmers to go for multi-cropping and inter cropping instead of traditional monoculture and indigenous seed banks created by farmers. To train farmers how to prepare organic fertiliser using cow dung, cow urine, jaggery (a type of brown sugar made in India) and lentil powder, as well as organic pesticides using the leaves of neem (Azadirachta indica), karanja (Pongamia pinnata), garlic, jaggery, cow dung and cow urine in different compositions. Taking the humanitarian approach into account our technical institute has adopted a social engineering mechanism in serving the people living in its periphery. It will not stop its journey there rather will try in identifying new market opportunities for the sale of their products.
What we want to do?

OUR MOTO: 3 R’s- REDUCE, RECYCLE & REUSE

- In the 175th meeting of HODs and Deans on 04-07-2018, it was decided to start Organic farming inside the campus.
- The main advantages are as follows:
  - It will reduce the dumping cost of biodegradable waste of the campus, presently, it is dumped in the municipal area with Rs. 10,000 per month.
  - It will make the campus cleaner.
  - The campus residents will be able to get pure organic vegetables and fruits.
  - The waste is being used for efficient production thus developing a greener ecosystem.
  - The project will add to institute revenue generation.
  - The technology developed will be transferred to nearby farmers thus helping them to start organic farming in a larger scale.
  - The chemistry behind the organic compost needs to be studied in detail to understand the reason of the increased productivity. A group of scientists including organic chemists, food technologists and other interdisciplinary areas will work as a team in the institute towards the project implementation.

Our Common Goal

Years of poor soil management can lead to severe erosion. Rotation of annual and perennial crops in contour strips, and sufficient organic inputs keep sloping fields healthy.

Green Revolution
Nutrient Management: the Organic Approach

- Based on soil life: “feed the soil, and the soil will feed the crop.”
- Legumes for N
- Slow-release organic fertilizers as supplements
- Less emphasis on soluble fertilizers

Sweetclover feeds the soil life, adds N, makes P more available, recovers leached nutrients.

3 R’s- Reduce, Recycle & Reuse

Fallen leaves

Present Population in the campus-
Organic manure required per year in huge amounts-
Huge Compostable Waste available

10,000 approx.
in Hostels, Guest House, Academic area.
How we would do it:
Different Phases of the compost: A site for Multidisciplinary study

Compost pile or volume- Parameters

- The size of the compost pile, especially height, directly affects the moisture and Oxygen content and temperature.
- Piles of low height and wide base, despite having good initial moisture and good C:N ratio, easily lose heat generated by the microorganisms so, the few degrees of temperature achieved, is lost.
- The size of the pile is determined by the amount of material to be composted and the available area to perform the process.
- Normally, compost piles are 1.5 - 2 meters high to ease turn over, and 1.5 - 3 meters wide.
## Carbon-Nitrogen Levels in Organic Compost

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Material</td>
<td>C:N</td>
<td>Material</td>
</tr>
<tr>
<td>Fresh liquid manure</td>
<td>5</td>
<td>Cattle dung manure</td>
</tr>
<tr>
<td>Poultry litter</td>
<td>7:1</td>
<td>Kidney bean leaves</td>
</tr>
<tr>
<td>Pig Manure</td>
<td>10:1</td>
<td>Crotalaria</td>
</tr>
<tr>
<td>Kitchen wast</td>
<td>14:1</td>
<td>Coffee pulp</td>
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<tr>
<td>Poultry litter with pen bedding</td>
<td>18:1</td>
<td>Cow dung</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Banana leaves</td>
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<tr>
<td></td>
<td></td>
<td>Vegetable wastes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coffee leaves</td>
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<td></td>
<td>Pruning</td>
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### Air Cushion Technique of Compost Preparation

<table>
<thead>
<tr>
<th>Investment</th>
<th>Handling</th>
<th>Area</th>
<th>Final Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal</td>
<td>Low</td>
<td>Medium Easy</td>
<td>Small</td>
</tr>
<tr>
<td>Vertical</td>
<td>High</td>
<td>Complex</td>
<td>Large</td>
</tr>
</tbody>
</table>
VERMI-COMPOST - MORE EFFECTIVE

Parameter | Ideal Range
--- | ---
Moisture | 70%-80%, this is the maximum moisture, as the worm breathes through the skin, and a higher moisture may prevent breathing
Temperature | 20-30°C
pH | 5-8.5. Verify with a pH strip before feeding the earthworm.
Light | The earthworm is photosensitive so, it will always prefer a dark environment

Organic Farming Site Development
Our Initiatives and where we stand:

- **5 Rs. Lakhs** Initial investment from Institute
- **3.4 Rs. Lakhs** Spent
- **Project Start Date 24th October 2018**
- **1.5 Acres of Stony Land**

**Starting of Vermi Compost**

Core Team

Shri. Uday Chandra Patra
Organic Watermelons Coming up

Stony Land to Greenery
Press Releases:

NIT Rourkela Goes The Organic Way

Rourkela: The intensive use of chemical-based fertilizers and pesticides in agriculture calls for a change although most consumers in India are unaware of the harmful effects of such practices. Annually, the country consumes about 500 lakh tonnes of chemical and 320 lakh tonnes of indigenous fertilizer every year but the organic route is still a faraway dream. Realising the gravity of the situation, the National Institute of Technology, Rourkela, has decided to promote organic farming aiming at a better future for farmers in the region. The institute has already hired a subject specialist and has taken up an ambitious initiation to improvise the organic farming research and provide organic vegetables to the students and campus residents.

Training Programme For Farmers

Having been inaugurated by Jual Oram, Union Minister, Tribal Affairs on November 10, the organic farming project at NIT Rourkela is on its way to become a boon for farmers in the region. Professor Debayan Sarkar of Chemistry department, who has been given the charge of looking into the day to day progress of the project along with Professor Nihar Ranjan Mishra of Humanities and Professor Rama Chandra Pradhan of Food Process Engineering, said, "We have set-up a research laboratory to intensify research in organic farming. We have taken this project very seriously. If everything goes properly, we will organise training programmes for farmers which will help them in developing vast knowledge about organic farming." Prof Nihar Ranjan Mishra further added, "It is because of the hard work of the team led by director Animesh Biswas that organic farming at NIT Rourkela has become a reality. Hope this project can help farmers learn the techniques of organic farming."

Power Of Organic Farming

A known face in the organic farming business, Uday Chandra Patra of Uday Jaivic Research has been hired by the institute as an advisor for the project implementation. He has been an expert in this field and has developed his own organic farming site of three acres at Kuarmunda, Rourkela along with some other sites. Expressing his strong belief in the power of organic farming, he said, "Many believe that organic farming is only a dream and in reality, without using chemicals and pesticides, one cannot pursue healthy farming but it is a myth. There are certain compositions in organic products and if you mix them, they it will work better than pesticides. Like by mixing up some dry leaves, better food for saplings can be prepared. Nature has the solution for every problem and that is what I am focusing on for this project."

Better Techniques For Future

The institute aims to improvise the techniques of exhaustive multidisciplinary research which will involve fields like organic chemistry, biotechnology, food process, life sciences, chemical engineering and humanities which exist under one roof at NIT Rourkela.

With satisfactory progress achieved under the project, the institute now aims to start training programmes and lecture sessions to train farmers of the nearby region. The institute is looking forward to training farmers in the art of organic farming and providing them with techniques for sustainable agriculture.
Research can be multidisciplinary

**NEEM OIL SPRAY**

**Action Plan**
Natural Products, Bioactivity, Isolation

**Increased Herbicide Activity**

- **Azoxystrobin**
- **Pyracnol**
- **Oxadiargyl**
- **Fluazipof-butyl**
- **Glycophosphate**
- **Bilanaphos**

**Research can be multidisciplinary**

**Neem Oil**
Methodology:
Although the solution what our research group prescribes for this problem, is being practised in developed parts of the world, it’s new to this part of the Country. A sustainable growth in Agricultural productivity, but the suggested pathways are multidirectional but has a single destination. The multidirectional approaches can be subdivided into the following two parts:

a) Green Chemistry

b) Considering Operational Allelopathy as a major target - Understanding The Soil – Plant Chemistry

Deliverables and Technical Support

Also “Operation Allelopathy: An Experiment Investigating an Alternative to Synthetic Agrochemicals” - To be explored in Wider Context - These include Biocommunicators like phenolics, terpenoids, alkaloids, coumarins, tannins, flavonoids, steroids and quinines (Einhellig and Leather 1988). Phenolic acids and flavonoids show strong inhibition in bioassays, but they exhibit weak phytotoxicity in soil and less selectivity - to be characterised with NMR, GC and other techniques - BULK PRODUCTION NECESSARY
Plant-based food
- Harvesting and grading
- Cleaning
- Removal of leaves, skin and seeds
- Blanching
- Washing and cooling
- Packaging
- Clean up

Animal-based food
- Procurement
- Rendering and bleeding
- Scalding and/or skin removal
- Internal organ evisceration
- Washing, chilling and cooling
- Packaging
- Clean up

Solid waste

Liquid waste

Segregation and processing

Treatment and land applications

Energy recovery

Recycle and reuse

Valorization for market value products

Food and Organics

Grow More Food

Soil Amendments

Collection

Processing

Scraps
Processing of Organic Agricultural Products:
Utilization of Oilseed Processing By-Products:

- **Deoiled Cake/Meal**
  - Feed
  - Fertilizer
  - Oil Cakes as Substrate for Deriving Value-Added Products

**Bagasse as Various Value added products:**
- **Lignin**
  - A great potential exists for its use in the chemical industry.
- **Composites of Natural Fibers**
  - It can be used as an alternative to synthetic and/or low biodegradable fibers, such as glass, aramid, and carbon.
- **Methane**
  - Use as Biogas
- **Low-Cost Sorbent**
  - Can be used as an adsorbent in sugar refining, chemical and pharmaceutical industries, water treatment and wastewater treatment, etc
- **Hydrogen**
  - Use as energy
- **Cellulase**
  - The main applications of cellulase enzyme include textile, paper and pulp food, animal feed, fuel, and chemical industries.

**Application of Fruit and Vegetable By-Products:**
- Pigments
- Antioxidants
- Fibers
- Adsorbent for Metal and Dye
- Enzymes
- Biofuels
- Organic Acids
- Aroma Compounds
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