



Project on

# ORGANIC FARMING

at NIT Rourkela

A WASTE TO WEALTH MECHANISM



REDUCE RECYCLE REUSE (3R'S)



# Organic farming Project NIT Rourkela



**Prof. Animesh Biswas**  
Director NIT Rourkela

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.

## 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 R's- 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.



**Prof. Nihar Ranjan Mishra**

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 attempt 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.



**Prof. Rama Chandra Pradhan**

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.



**Shri. Uday Chandra Patra**  
Advisor

Shri Uday Chandra Patra, is a renowned farmer in Odisha who has been practicing organic farming and improvising the techniques with his self interest for the last 40 years. He has been a Governor awardee and has been a recipient of many prestigious accolades. He has been in the charge of the day-to-day activities of the organic farming project.

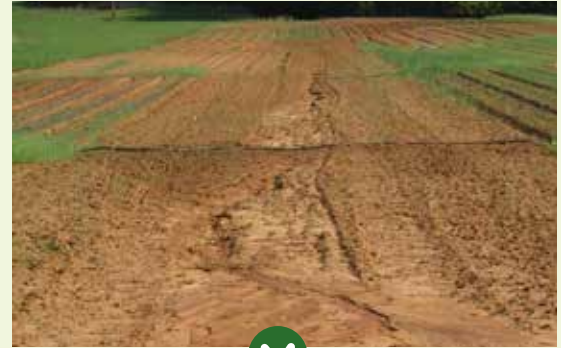


## What we want to do?

### 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 an 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



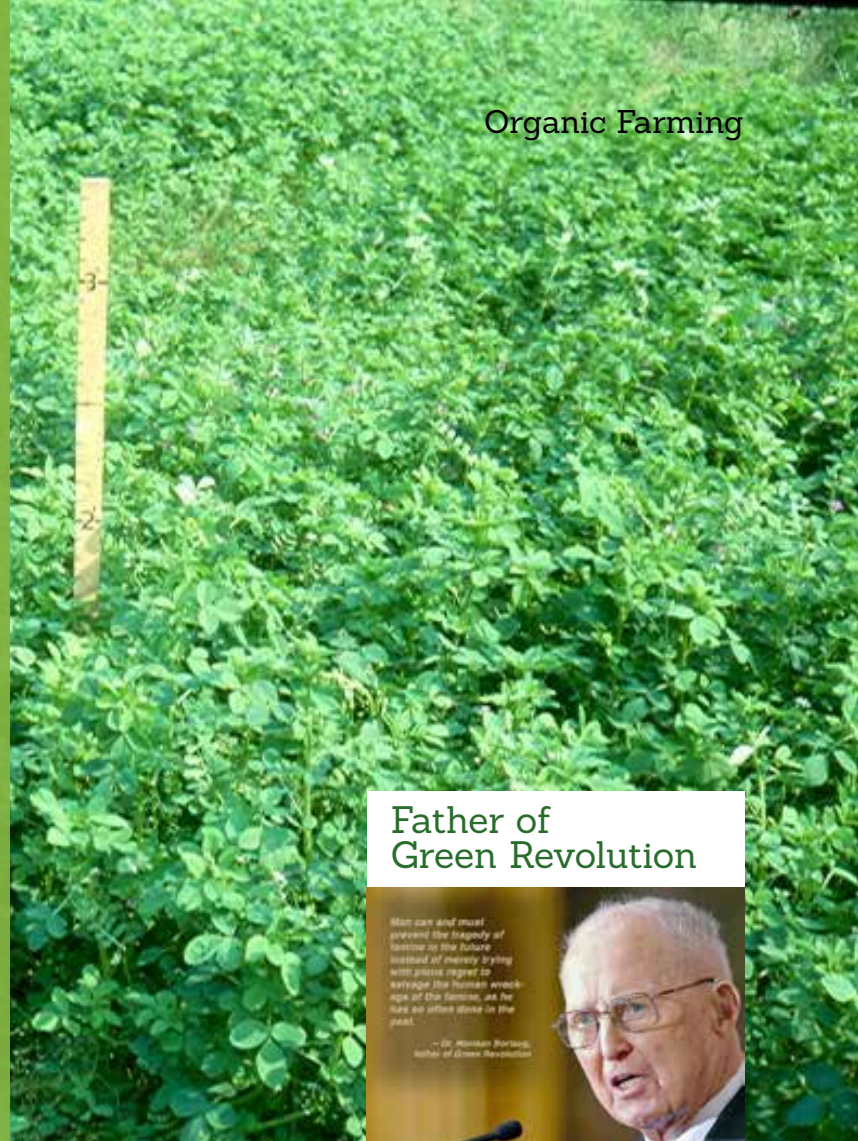
From a grain deficient nation to food security for all



# 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



Organic Compost

10,000 approx. in Hostels, Guest House, Academic area.



# Monitoring during Compost Formation is a Prerequisite

For Example: pH Control

pH

Related causes

Solutions

<4,5

Excess of organic acids Plant materials such as kitchen waste, fruit,

release many organic acids and tend to acidify the medium. Add material rich in nitrogen until an appropriate C: N ratio is achieved.

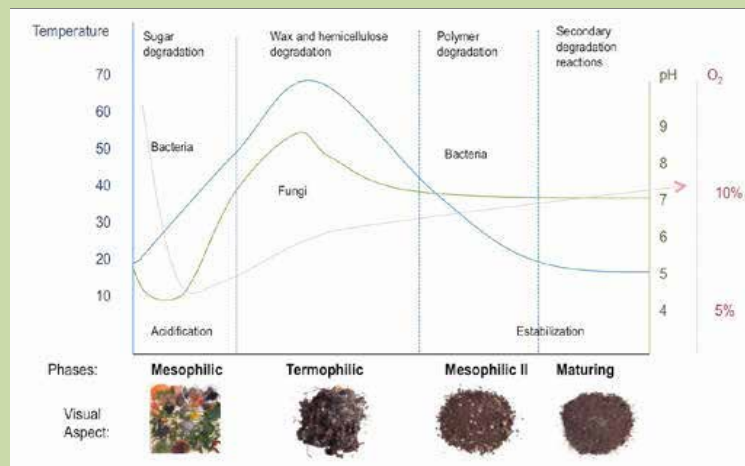
4,5 – 8,5 ideal range

>8,5

Excess of N When there is excess of nitrogen in the source material, with poor C: N ratio related to moister and high temperatures, ammonia is produced and the medium is alkalisied. Add dry material with high carbon content (pruning, dry leaves, sawdust)

# How we would do it:

Different Phases of the compost: A site for Multidisciplinary study



# Compost pile or volume- Parameters

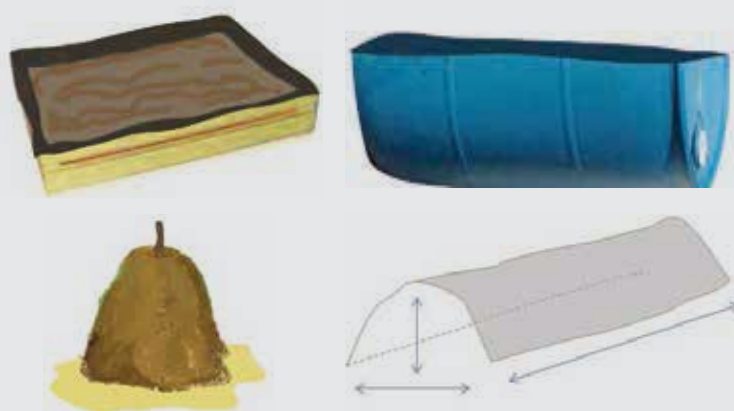
- The size of the compost pile, especially height, directly affects the moisture and Oxygen content and temperature.
- Piles of low height and wide base, despite having good initial moisture and good C:N ratio, easily lose heat generated by the microorganisms so, the few degrees of temperature achieved, 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.



Compost Piles

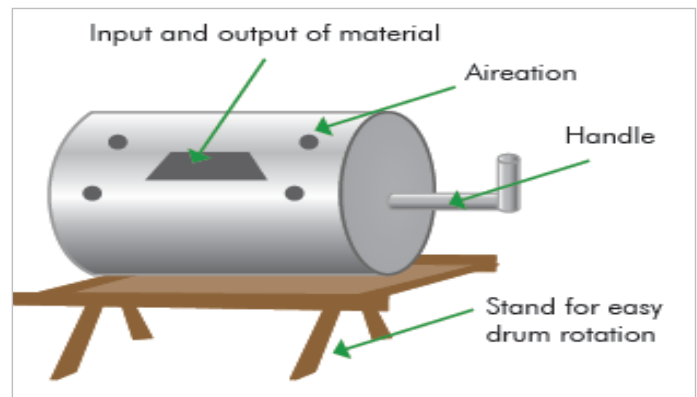


Calculations



# Carbon-Nitrogen Levels in Organic Compost

High nitrogen level 1:1 - 24:1		Balanced C:N 25:1 - 40:1		High carbon level 41:1 - 1000:1	
Material	C:N	Material	C:N	Material	C:N
Fresh liquid manure	5	Cattle dung manure	25:1	Recently mown grass	43:1
Poultry litter	7:1	Kidney bean leaves	27:1	Tree leaves	47:1
Pig Manure	10:1	Crotalaria	27:1	Sugar cane straw	49:1
Kitchen wast	14:1	Coffee pulp	29:1	Fresh urban garbage	61:1
Poultry litter with pen bedding	18:1	Cow dung	32:1	Rice husk	66:1
		Banana leaves	32:1	Rice straw	77:1
		Vegetable wastes	37:1	Dry grass (grasses)	81:1
		Coffee leaves	38:1	Bagasse	104:1
		Pruning	44:1	Com cob	117:1
				Com straw	312:1
				Sawdust	638:1



## Air Cushion Technique of Compost Preparation

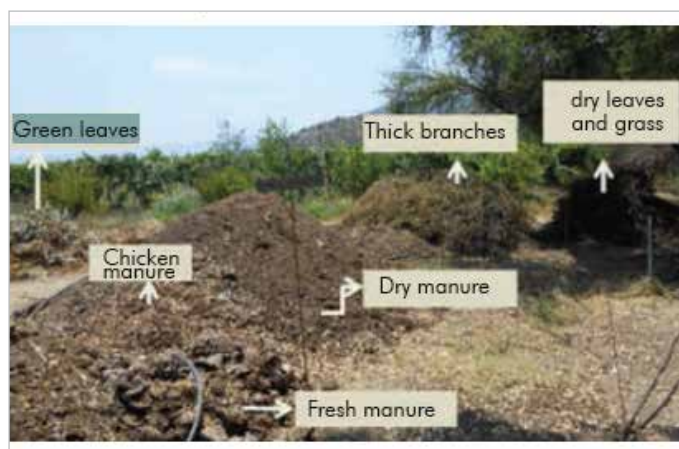
	Investment	Handling	Area	Final Material
Horizontal	Low	Medium Easy	Small	Heterogeneous
Vertical	High	Complex	Large	Heterogeneous

# VERMI-COMPOST- MORE EFFECTIVE



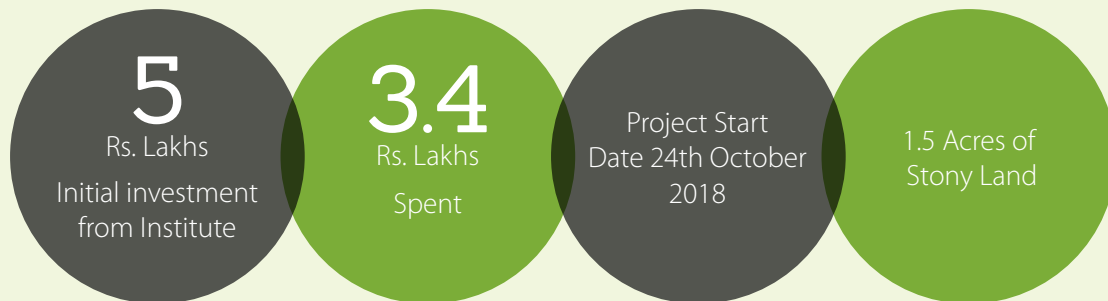
Parameter	Ideal Range
Moisture	70%-80%, this is the maximum moisture, as the worm breathes through the skin, and a higher moisture may prevent breathing
Temperature	20-30°C
pH	5-8.5. Verify with a pH strip before feeding the earthworm.
Light	The earthworm is photosensitive so, it will always prefer a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

## Organic Farming Site Development



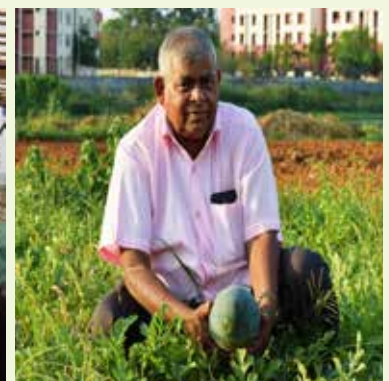


## Our Initiatives and where we stand :



Core Team

## Starting of Vermi Compost



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 fertilisers 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 fertiliser 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 improve 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 Jaivik 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 organic farming site of three acres at Kuarmunda, Rourkela along with some strong belief in the power of organic farming, he said, farming is only a dream and in reality, without using cannot pursue healthy farming but it is a myth. There organic products and if you mix them, they it will mixing up some dry leaves, better food for saplings solution for every problem and that is what I am for

**Better Techniques For Future**  
 The institute aims to improve the techniques of exhaustive multidisciplinary research which will biotechnology, food process, life sciences, chem which exist under one roof at NIT Rourkela.

With satisfactory progress achieved under the to start training programmes and lecture sessio

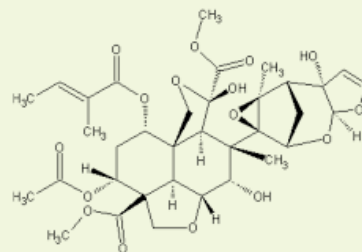




# Research can be multidisciplinary



Neem Oil

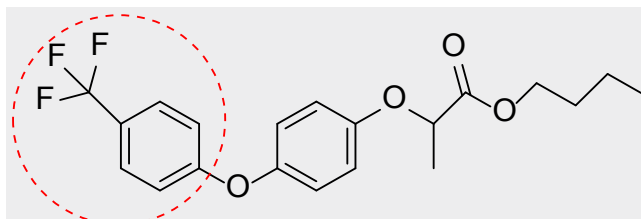
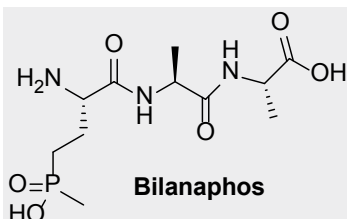
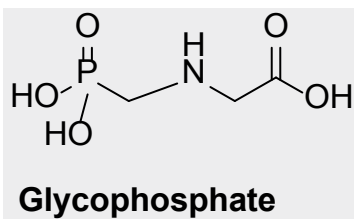
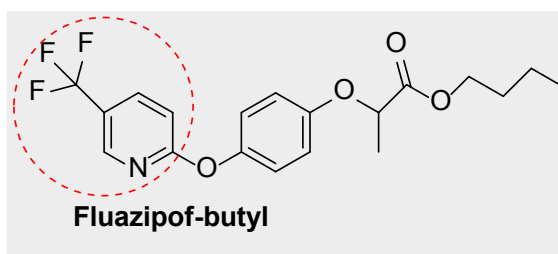
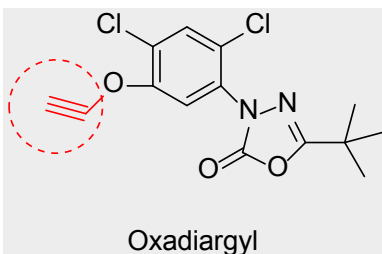
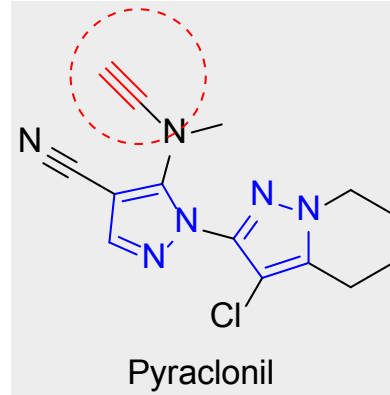
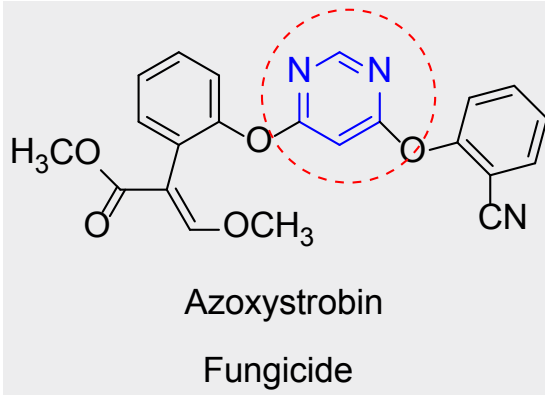


Actually

## Action Plan

Natural Products, Bioactivity, Isolation

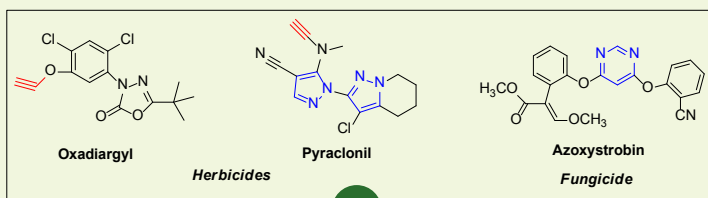
Increased Herbicide Activity



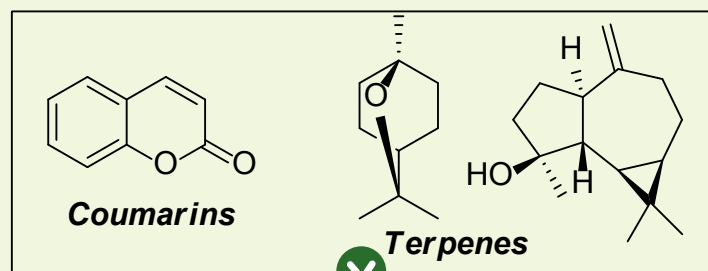
# Heterocyclic Scaffold: Compost Composition



## Deliverables and Technical Support



The Pyrimidine Core

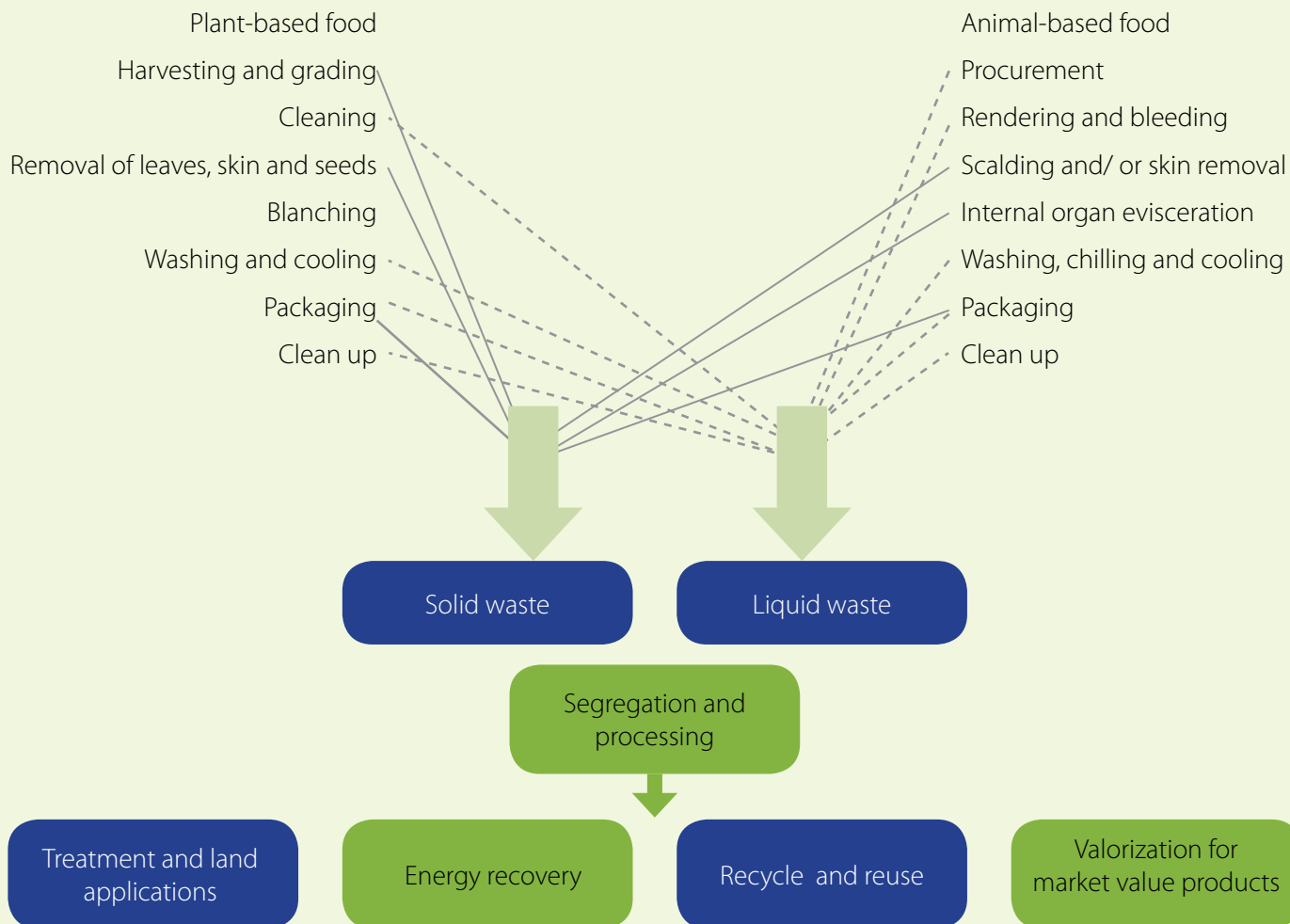


## Methodology:

Although the solution what our research group prescribes for this problem, is being practised in developed parts of the world, its 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:

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

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**



## 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 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



Social Scientific Responsibility can be Manyfold



Soil Health Card



Training Programmes



## TEAM OF INVESTIGATORS AND OFFICERS



Prof. Anup Kumar Panda



Prof. Abanti Sahoo



Prof. Seemita Mohanty



Prof. Rajeev Kumar Panda



Prof. Binod Bihari Sahu



Prof. Ananta Chandra Pradhan



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Prof. Ramakrishna Biswal



Prof. Santos Kumar Das



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