

grov.io

Automated Intelligent Plant Monitoring & Waste Management System

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Grovio installed at SCMS College Canteen to manage canteen waste.

WHAT IS GROVIO?

The product makes use of food waste to produce organic fertiliser to grow vegetables organically. The automated system uses an Intelligent Plant Monitoring System (IPMS) to nurture vegetables organically.

A mobile application stores the plant database that is connected to the IPMS which delivers the required amount of fertiliser according to each plant whenever required. This versatile system doesn't require human intervention besides in the stages of dumping waste, sowing seeds & harvesting vegetables. System also uses a soil-substitute to nurture any plant other than tubers.

WHY NOW?

Waste management is one of the biggest problems that pose before mankind. Food waste generation, in particular, is ironically rising when it is one of the easiest to manage. Across educational institutions, hotels, convention centres, food waste disposal is a major concern.

Despite the negligence we have towards it, it is very important given the market value of a sustainable solution to it and its social relevance. The solutions at present are centralized waste management systems which deals with a large amount of waste, while a decentralized waste management solution in households, schools,

colleges, etc would be a viable and sustainable one. Also integrating it directly to an agriculture system helps spread awareness and effectively implement a healthy practice of food waste disposal.

This is an integrated-sustainable solution to food waste disposal, primarily, in educational institutions, hotels and similar institutions housing canteens or mess facilities. The system integrates a vertical organic garden which utilises the manure produced from the food waste.

The innovation lies in effectively converting the food waste using purely biological methods and simultaneously using the liquid manure generated from the food waste to the drip-irrigated hydroponic system as organic nutrient supplements.



WHY GROVIO?

Grovio focuses on 3 major problems.

- 1) **Inconvenience** of managing plants, procuring manure from waste
- 2) **Time** invested in managing & nurturing plants
- 3) **Lack of knowledge** in Agriculture, Organic farming & composting



BENEFITS OF GROVIO?

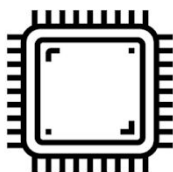
Grovio has multiple benefits.

- 1) Effective food waste disposal - production of commercial grade liquid & solid manure (No sorting required between Non-Veg & Veg)
- 2) Fresh organic plants in minimum floor space
- 3) Odor free operation - Aerobic process eliminates fermenting smell
- 4) Conversion of food waste to liquid manure - Elimination of chemical fertilisers
- 5) Soil is not used to grow - Plants grown will be free from pests and soil borne diseases
- 6) Sub-surface drip system - Controlled irrigation reduces water usage
- 7) High yield of crops - Concentrated supply of nutrients
- 8) Automated system from Waste conversion to Crop irrigation
- 9) Any type of crops (Except tubers) can be grown by this method
- 10) Eco-friendly - 100% Biologic method - Free from any sort of chemicals

HOW GROVIO WORKS?



Dump, Sow, Reap
at the push of a
button



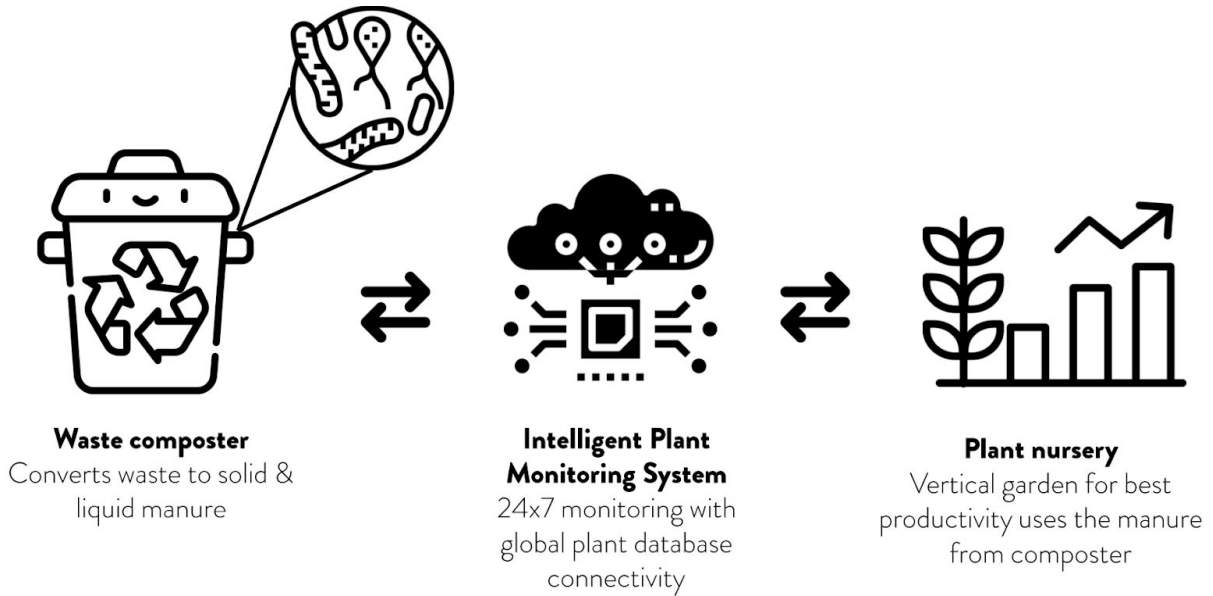
**Intelligent Plant
Monitoring System**
24x7 monitoring with
global plant database
connectivity



Liquid Manure
Production of liquid manure
from organic waste

Grovio main components.

Grovio detailed working flow diagram.



COMPETITIVE ADVANTAGE



Ease of use

automated with intelligent monitoring system



Cost

one time investment with benefits



Odor & Hygiene

odorless operation ensures hygienic environment



Scalability

can be scaled to any size



Productivity

increased growth rate



Eco-friendly

100% biologic methods

PRODUCT VERSIONS & COST

Grovio has multiple versions based on quantity of waste generated.

Variants	Product Cost	Plant Nursery Capacity	Usual Average Expenditure on vegetables	Operational Charges
Domestic Unit (25L)	Rs.5000	Upto 24 Plants can be connected ~ 2-5kg/plant	Rs.460/week Rs.1840/month Rs.25000/year	Rs.5000-OTP +Rs.5/month + Rs.50 misc
Domestic Unit (50L)	Rs.10000	Upto 48 Plants can be connected		Rs.10000-OTP +Rs.5~10/month +Rs.50 misc
Commercial Unit (500L)	Rs.25000	Upto 192 Plants can be connected	Labor > Rs.500/day Rs.300~500/day >Rs.3000/week >Rs.6000/month >Rs.72000/year	Rs.25000 - OTP +Rs.50~75/mnth +Rs.100~150*
Commercial Unit (1500L)	Rs.50000	Upto 280 Plants can be connected		Rs.50000 - OTP +Rs.100~200/m +Rs.150~200*

COMMERCIAL VERSION (300L)

Grovio 300L can handle 300Litres of waste & connect upto 96 plants.



Different views of 300L Commercial Model of Grovio & Vertical garden with IPMS(Intelligent Plant Monitoring System)

PRODUCT GALLERY



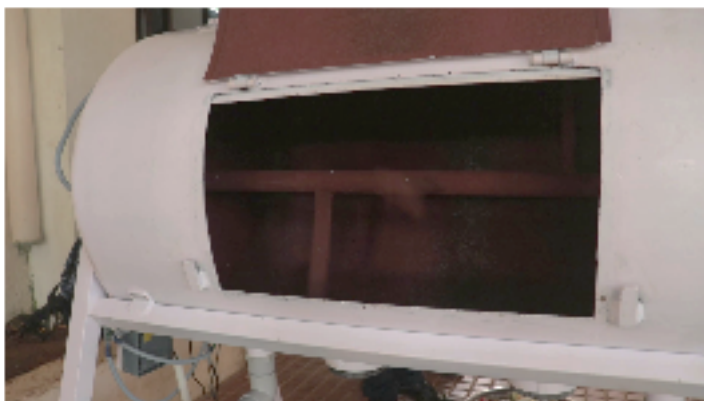
Grovio

The object in the front is the vertical garden integrated with IPMS(Intelligent Plant Monitoring System) & the white object is the Compost tank. The model shown here is the 300Ltr Commercial model.



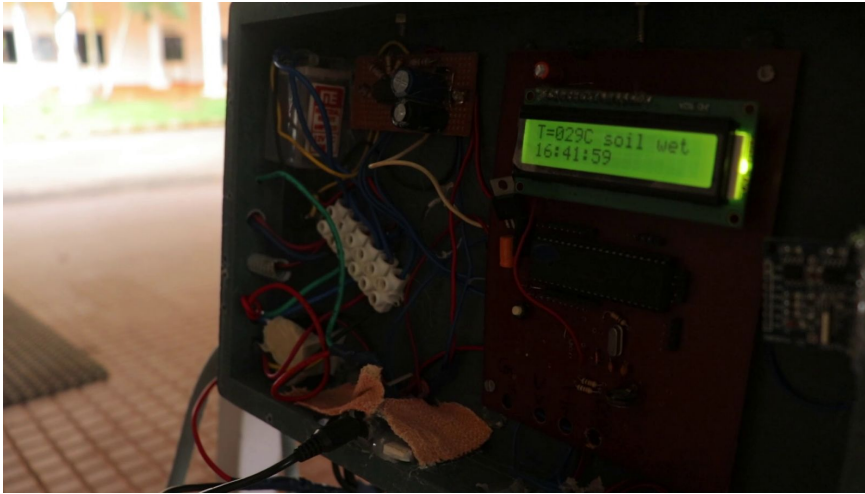
Grovio Composter

The compost tank uses thermo-cyclic evaporation & condensation methods along with Aerobic bacteria to decompose the waste to manure. It is automated with 2 minutes of agitation every 1 hour. It is also provided with temperature control & forced ventilation.



Grovio Composter

The image shows the mixing shaft with paddles for optimum mixing the organic waste to provide constant aeration & proper mixing.



Grovio IPMS

This is the brain of Grovio's IPMS or Intelligent Plant Monitoring System which supplies the right amount of nutrients in the liquid form via Drip irrigation system based on the Data available from Plant database stored in the Web Database.



Grovio Fertigation System

This is the fertigation system which delivers the nutrients in liquid form from the compost tank. The drip system will work only when the sensor detects & analyses the moisture content below a critical value.



Grovio Vertical Garden

This is an optional addition to the Grovio Integrated System to increase the productivity & reduce space consumption.



Grovio Shredder

A shredder is used to shred bones, larger waste particles to smaller ones to increase the surface for the bacterial action. Shredding increases the compost rate & efficiency.



Grovio waste inlet

An inlet is provided to dump the waste into the compost tank.



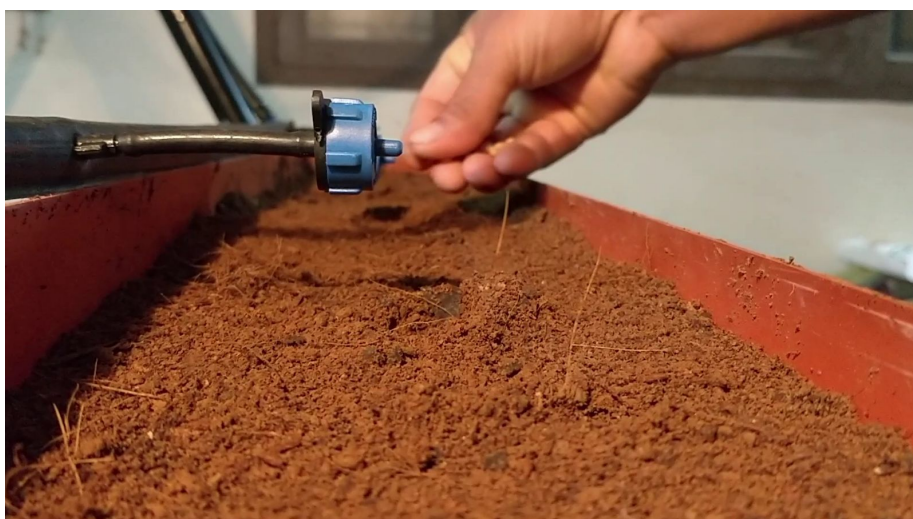
Grovio Shredder

The shredder automatically turns on upon opening the shredder door & turns off upon closing. The shredder also sounds an alarm as a safety feature.



Grovio Manure collection

The composter has two outlets underneath to allow easy manure collection. The mixer shaft is turned on while collection to enhance the removal.



Grovio Manure

The solid manure can be used as a potting mix for growing plants.



Grovio Vertical Garden

A vertical garden setup can be used to increase productivity, reduce space consumption, reduce soil-borne diseases.

GROVIO IN THE NEWS

Grovio - the details of the project were published in Deccan Chronicle, 15 May 2019 Edition.

When technology meets agriculture

DC CORRESPONDENT

Waste management, especially food waste management, is one of the biggest problems mankind faces. A team of three mechanical engineering students — Lijo Mon George, K.S. Adithyan and Srinath Kamath — from SCMS School of Engineering and Technology, Karukutty, has found a solution to this problem by integrating technology with agriculture. They have developed a product that uses pure biological methods to manage waste and grow vegetables organically.

The project developed under the guidance of Sajith E., assistant professor, mechanical engineering, was placed second in the Kerala Startup Mission's Idea Fest. The members also received a direct entry to the grand finale of the fest scheduled towards the end of May.

The product makes use of the food waste from the college canteen to produce organic fertilizer to grow fresh organic vegetables on the campus. The automated system uses an Intelligent Plant Monitoring System to nurture vegetables. A mobile application stores the



plant database that is connected to the Intelligent Plant Monitoring System. This versatile system doesn't require human intervention besides in the stages of dumping waste, sowing seeds and harvesting the vegetables. The system also makes use of soil-substitute to nurture any plant other than tubers thereby eliminating soil-borne diseases. The system ensures zero investment agriculture with high returns.

The idea was inspired from the amount of food waste that was left to rot in the landfills causing health hazards. As of now, the team has developed an indoor model to process 50 litres of waste and grow at least 50-100 plants whereas the larger 300-litre model can help grow 150-300 plants. The system allows food crops as well as horticulture plants to grow in this manner. They aim to hold workshops to spread more awareness on it.



WHAT ELSE DO WE INTEND?

We aim to popularise & encourage Organic farming & waste management through grovio. We also aim to conduct Organic farming workshops & classes to Students, Residents's Associations, Farmers & Self-help groups like Kudumbasree.