

## Organic Farming

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### Abstract

Organic farming, as a key to sustainable agriculture has captured the attention of many countries worldwide. Interest in organic agriculture methods is growing especially where there is evident degradation of resources essential to agricultural production, such as land, due to conventional farming system because it minimises the dependence on chemical inputs (fertilisers; pesticides; herbicides and other agro chemicals) thus safeguards/improves the quality of resources and environment. Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity, and this is accomplished by using on-farm agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs. In this paper emphasis has been given to the practice of organic farming using bio-pesticides and Integrated Pest Management (IPM) techniques to control the insects, weeds and other pests. This paper also focuses on the benefits of inter cropping, crop rotation, use of organic manures and legumes to maintain soil productivity and supply plant nutrients. Crop selection has been done based on the results of soil and weather analysis of the locality where farming was done. The plants were watered using grey water after its primary treatment using Effective Microbes (EM). Thus the water used for watering was free of chemicals. A detailed study on the effect of EM in pest control and plant growth has also been done. A comparison between the net input cost and the amount obtained on the yield from the crops has been done.

**Keywords:** Sustainable agriculture; herbicides; agro-ecosystem; Integrated Pest Management; Effective Microbes; grey water.

## 1. Introduction

Organic farming is a method of farming which is aimed at cultivating the land and raising crops in such a way that the soil is kept alive and in good health by the use of organic waste and other biological materials along with beneficial microbes to release nutrients to crops for increased sustainable production in an eco friendly pollution free environment[1].The scientific literature shows that organic farming practices build soil quality, maintain water quality, support biodiversity, and have potential to mitigate global climate change while supporting an economic bright spot. Organic farming is comprised of an integrated suite of practices that provide these benefits in addition to producing food, fiber and feed. Organic farming includes many key features which include protecting the long term fertility of soil, providing crop nutrients, weed, disease and pest control relying primarily on crop rotations [2], natural predators, diversity, organic manuring, resistant varieties and limited (preferably minimal) thermal, biological and chemical intervention, careful attention to the impact of the farming system on the wider environment and the conservation of wildlife and natural habitats. Food from organic farming is generally more expensive because crop productivity is lower, and as such it serves a small market segment. Despite the obvious benefits, several key challenges have slowed the growth of organic agriculture. Increasing public awareness of the value of organic farming, implementing public policy changes that support organic growers and conducting research to advance the industry are essential in overcoming the challenges of organic agriculture[3]. Organic foods can play an important role in keeping people healthy [4].Organic farming practices protect water quality by using biological forms of fertilizers that release nutrients slowly, reducing nitrate leaching into ground and surface waters. Organic farming helps mitigate the threat of global warming by sequestering carbon and reducing greenhouse gas emissions from energy-intensive chemical fertilizers. For farmers, organic farming is profitable because organic foods are in demand, and as a result of the price premiums they receive. For communities, organic agriculture provides economic benefits by expanding employment opportunities within the industry. All of these elements come together as we seek to protect our health, the health of our families, the prosperity of communities and our environment.

This paper is divided into many sections, section 2 being background study, section 3- Proposed Approach, section 4- Implementation, section 5- Challenges faced followed by result, conclusion and reference.

## 2. Background Study

The main factors explaining output variations due to the adoption of organic farming are basically organic land area and organic land-use patterns and yields. Yield depends on a certain number of variables, like environmental conditions, farmers' skills, the period of conversion, the country considered, farm location and structure, and so on. To keep and build good soil and fertility, recycled and composted crop wastes and animal manures, right soil cultivation at the right time, crop rotation, green manures and legumes, mulching on soil surface has to be done. To control pests, diseases and weeds: careful planning and crop choice, use of resistant crop, good cultivation

practice, crop rotation, using natural pesticides. From a study done on the soil and weather conditions of Coimbatore, information about the climatic conditions of the place was obtained. Air temperature is 30.5° C at the maximum and 22.8° C at the minimum. Humidity is 47.8%, soil moisture is 14.5%, soil temperature is 33.4° C and rainfall is 11.3 mm. All these conditions form a major criterion for selection of crops. Each crop and crop variety has its own specific needs. Crops are affected by soil type, rainfall, altitude, temperature, type and amount of nutrients required, the amount of water required. Weed control means reducing the effects of weeds on crop growth and yield[6]. On an organic farm, weeds are controlled using crop rotation, mulches, hand-weeding or by the use of mechanical weeders. Mulching means covering the ground with a layer of loose material such as compost, manure, straw, dry grass, leaves or crop residues [7]. Green manures, often known as cover crops, are plants which are grown to improve the structure, organic matter content and nutrient content of the soil. They are a cheap alternative to artificial fertilizers and can be used to complement animal manures[8]. Compost is organic matter (plant and animal residues) which has been rotted down by the action of bacteria and other organisms, over a period of time. Materials such as leaves, fruit skins and animal manures can be used to make compost to improve soil and crop quality. Then comes sowing followed by management and cleaning. Effective Microbes (EM) is a microbial soil inoculant that is totally organic and totally safe to use. EM helps to maintain an efficient productive micro flora environment in which plants flourish and pathogenic bacteria and pests are removed from their habitat. EM helps to convert organic materials into nutrients that are available for plants to uptake organically. It creates a healthy environment in which the all plants thrive by significantly increasing soil fertility. This in turn increases plant growth and the effective microorganisms improve the plants' ability to resist disease naturally.

### **3. Proposed Approach**

The selected crops were cluster beans which is a legume aids nitrogen fixation in the soil, Spinach which is extremely rich in anti-oxidant, Fenugreek leaves, Chilly which is a natural pest repellent, Sorrel leaves which has anti-oxidants and anti-bacterial properties, Lady's finger, Amarnath leaves, Green gram, Tomato, Brown gram and Corn which acts as a sacrificial crop. On the selected land, first weeding was done, followed by mulching, manuring and composting. The above seeds were then sown. Regular watering of the plants and weed removal was done to ensure proper growth. Vermi compost was added to the soil to improve the soil fertility. The water used for watering the plants was grey water which was treated organically using EM. On a small portion of the plot the seeds of spinach, sorrel leaves and amaranth leaves were sown again and EM along with vermi compost was used in this portion of the land to control pest attack and also increase soil fertility and growth rate of plants.

### **4. Implementation**

An appropriate area was chosen for doing the farming activity. In the chosen area a plot of area 10ft\*10ft was then cleared and subdivided into four sections. After weeding

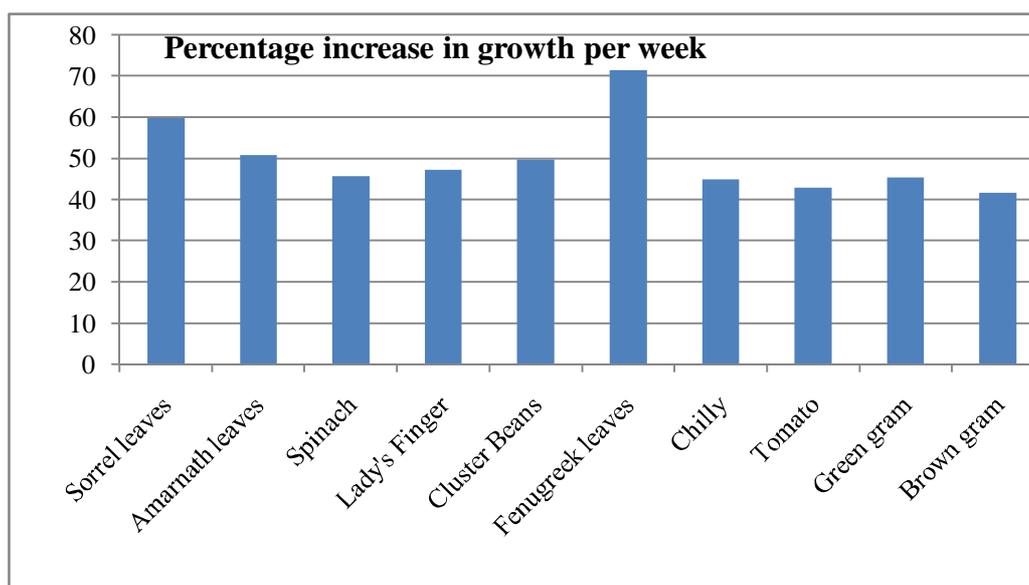
and division of the plot, the plot was watered for two days so that moisture was trapped in the soil. After that tilling and mulching was done to loosen the soil as well as to increase its porosity. In the first section of the plot seeds of lady's finger and cluster beans were sown. This part was again sub-divided into different sections of alternate parallel raised (4 inch height) and low level platforms and on the raised section the seeds were sown at a depth of 1.5 inches leaving a gap of 1.5 ft between each seed. In the second section, in one half chilly seeds were spread on top of the soil. And in the other half fenugreek and spinach seeds were spread on top of the soil. The third section was further divided into four parts in which in the first part seeds of sorrel leaf was mixed with loose sand and spread on the soil. The seeds of black gram were sown in the second part in a depth of 1.5 inches with a gap of 1.5 feet between each seed and seeds of tomato were sown in the similar way in the third part and seeds of amaranth leaves were mixed with loose sand and spread on top of the soil. The fourth section was further divided into four sub-parts in which seeds of amaranth leaves, spinach and sorrel leaves were mixed with loose sand and spread on top of the soil in three parts. In the fourth part green gram seeds were sown 1 inch deep with a gap of 1 ft between each seed. Spinach seeds were mixed with loose sand and then sown. Some of these seeds were mixed with loose sand and then spread on the soil surface in order to ensure uniform distribution of the seeds in the soil so that the plants do not cluster in one region to prevent the hindrance in the proper growth of the plant. The plot was watered twice everyday and organic manure and vermi compost was added once in fifteen days to maintain soil fertility and increase productivity. In order to increase the growth rate and also reduce the pest attack, regular check was kept on the growth of weeds in the plot and the weeds were removed regularly so that growth of the plants is not affected. Grey water which was treated organically using EM was used to water the plants. Concentrated EM solution was mixed with water and sprinkled on the soil and plants in the fourth section of the plot EM, which was diluted in the ratio 1: 200 was sprinkled on the crops in order to reduce the pest attack and increase the growth rate.

#### **4.1 Challenges faced and remedial measures taken**

Due to the heavy rains, many seeds were washed away and water was stagnant in the plot which led to the rotting of the seeds. Some seeds were also eaten away by ants which required us to sow the seeds again. Wild boar trespassing in the plot eating away the spinach leaves and green gram plant was a major problem faced. Small water outlets were created to prevent water stagnation in the plot during heavy rains. Neem leaves were crushed and spread across the plot, turmeric powder was diluted in water and also concentrated EM was diluted with water and sprinkled on the leaves of the plants to keep insects and pests away. Coconut fibers were spread on the surface of the soil in order to maintain the moisture level. A thorny fence was built around the plot in order to prevent the entry of animals like wild boar in the plot.

**Table 1:** Table indicating the plant's growth without using EM from the date of sowing.

Week No.	Weekly growth in cm							
	1	2	3	4	5	6	7	8
<b>Plant Name</b>								
Lady's finger	1	5.1	9	20	27.7	35	41.7	49
Cluster beans	3.7	8.5	11	22	33.1	40.2	47.8	56
Fenugreek leaves	1.5	4	9.5	15	21			
Chilly	1.2	4.6	7.2	8.7	11.7	16.2	20.1	27
Brown gram	0.9	2.2	5.6	8.7	12.3	19.7	23.1	27
Tomato	1.7	4.3	7.9	10	13.4	19.3	22	35
Green gram	1.4	3.4	6.7	10	16	19.7	21.3	25
Amaranth leaves	2.6	5.5	11	19	27	35.2	49	
Sorrel leaves	4.1	9.3	14	26	37	51		
Corn	2.5	7	16	28				
Spinach	6	13	25	39	46	55	67	

**Figure 1:** Percentage increase in plant growth per week without using EM.**Table 2:** Table indicating the plant's growth using EM from the date of sowing.

Week No.	Weekly growth in cm						
	1	2	3	4	5	6	7
<b>Plant Name</b>							
Amaranth leaves	4	10.5	19.7	27.6	36.2	44.9	54.2
Sorrel leaves	6.1	15.3	24.6	32.3	43.5	55	
Spinach	9	18	29	44	53	64	72

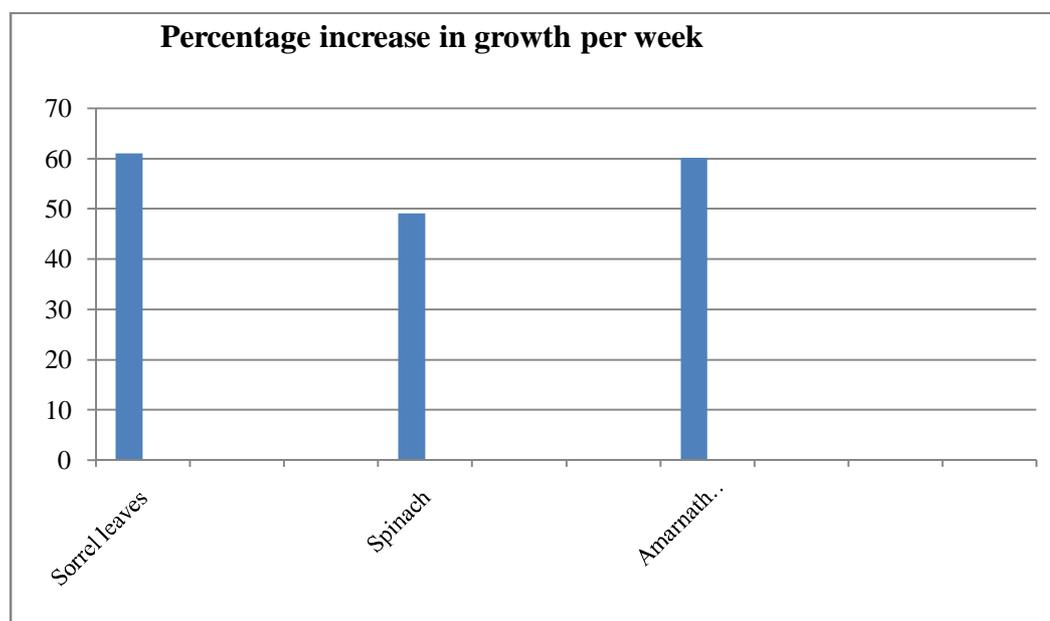


Figure 2. Percentage increase in plant growth per week using EM

## 5. RESULT

Table 3. Table indicating the yield obtained

Plant name	Yield Taken	Market Rate (Per Unit)	Total Amount
Sorrel leaves (without using EM)	9 bundles	Rs.15/-	Rs. 135/-
Sorrel leaves (using EM)	12 bundles	Rs.15/-	Rs. 180/-
Amarnath leaves (without using EM)	4 bundles	Rs.15/-	Rs.60/-
Amarnath leaves (using EM)	6 bundles	Rs.15/-	Rs.90/-
Spinach (without using EM)	12 bundles	Rs.15/-	Rs.180/-
Spinach (using EM)	15 bundles	Rs.15/-	Rs.225/-
Fenugreek leaves	2 bundles	Rs.15/-	Rs.30/-
Lady's finger	5.8 kg	Rs.40/-	Rs.232/-
Cluster Beans	6.5 kg	Rs.30/-	Rs.195/-

Input cost for the seeds = Rs. 110

Cost of vermi compost = Rs. 100

Total input cost = Rs. 210

Total amount obtained on the yield = Rs. 1327

## 5. Conclusion

Organic farming has been done and the cultivated crops are lady's finger, cluster beans, fenugreek, chilly, tomato, green gram, brown gram, amaranth leaves, sorrel leaves and corn and spinach. The water used to water the plants is grey water which was treated organically using EM (Effective Microorganisms). Vermicompost was also used. From the increase in the growth rate of the plant it is observed that Leafy

vegetables especially Sorrel and Fenugreek leaves as well as Lady's Finger and Cluster Beans are well suited for the soil and climatic condition in Ettimadai. The yield obtained was more than 500% with respect to input. Since organic farming does not involve the use of any chemical inputs, it is good for human health, economic prosperity, the environment and for slowing climate change. Organic farming will find wider scope in future because of increasing demand for organic food. It can also serve as a source of additional income if extended to a larger scale. With the use of EM, there was an improvement in the plant's health and growth and there was also an increase in the yield obtained.

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