

Efficacy of Organic Fertilizer on Growth of Greens in Grow Bags

By

S.Preethi

(20PIR008)

**Thesis Submitted to
Avinashilingam Institute for Home Science and
Higher Education for Women
Coimbatore – 641 043.**

**In partial fulfilment of the requirement for the Degree of
Master of Science in Interior Design and Resource Management**

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Certified as Bonafide Research work


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**Signature of the
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**Signature of the
Head of the Department**

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INTRODUCTION

Organic farming envisages a comprehensive management approach to improve the health of underlying productivity of the soil. It is a productive system which largely avoids the use of pesticides, growth regulators, preservatives and genetically modified organisms to influence the growth of crops. The organic agriculture practices rely to the maximum extent of crop residues, animal manures, crop rotations, green and green leaf manures, off farm organic wastes and bio fertilizers to supply plant nutrients and adopt biological methods to control pests, diseases and weeds. This technique will helps to enhance the organic content of the soil, thereby reducing the bulk density and decreasing compaction. It is meant by giving back nature what was taken back from it (Parvatha, 2012).

Gehlot (2015) states that organic farming is the process of producing food naturally. The major concept of organic farming is to create zero impact on the environment which means to protect the earth's resources of land, water and plant to produce safe and healthy food. It emphasizes appropriate land management which aims to achieve ecologically the balance between animal life, the natural environment and food crops. The product that is produced through organic farming is almost at its natural state. Thus, the basic rule that regulate organic food production is that they are chemical free.

Pearson (2017) says that organic farming system in India is not new and is being followed from ancient time. In these days they primarily aimed at cultivating the land and raising crops to keep the soil alive and in good health by use of organic wastes (crop, animal farm wastes and aquatic wastes) and other biological materials along with beneficial microbes to release nutrients to crops for increased sustainable production in an eco- friendly pollution free environment.

Organic farming is a production system, which avoids or largely excludes the use of synthetically compounded fertilizers, pesticides, growth regulators, and livestock feed additives. To the maximum extent possible, organic farming is considered as a solution to restore the health of natural resources, bring cost-effectiveness in production systems and enhance farm income and marginal farmers by way of exploiting upcoming global market of organic food.

Organic fertilizers are natural products used for the plants growth. They are farmyard manure, green manures, compost prepared from crop residues and other farm wastes, vermicomposting, oil cakes, biological wastes, biogas slurry, agricultural wastes, bio fertilizers, slaughter house refuse and amount of urine concentrated with the manure and so on ([https:// www. bighaat. com](https://www.bighaat.com))

Manure is an excellent fertilizer containing nitrogen, phosphorous, potassium and other micro nutrients. It acts as a source of crop nutrients and soil amendment. Soil organic matter is considered as nature's signature of a productive soil. Organic carbon from manure provides the energy sources and make those nutrients available to crops. It also adds organic matter to the soil which may improve soil structure, aeration, soil moisture- holding capacity and water infiltration. To determine how much manure is needed for a specific application, the nutrient content of fresh manure varies with the type of animal feed ratio, amount of litter, bedding or soil included (<http://articles.extension.org>).

According to Manibushan (2015) compost is made up of decomposed cattle dung, horse dung or poultry droppings along with vegetable matter and other garden refuse, generally mixed with a substantial proportion of soil. Compost is added to the soil to increase the contents of organic matter that enrich the soil nutrients. The composting is a natural recycling process of the plant remains into dark earthy material which enriches the soil. So, the kitchen waste which is usually the combination of plants, leaves or any organic material can be easily converted into organic manure if proper environment is provided.

Different substances are used for organic manure preparation. For this research study oilcake is used as an important ingredient. Oil seeds are generally rich in manurial ingredients. Oil cakes are residues left behind after the oil has been extracted from the oil seeds, namely, neem, cotton, groundnut and castor. After oil extraction, the oil cakes are rich in nitrogen and also contains phosphorous and potash. Cultivators apply both edible and non-edible oil cakes to the soil as manure. Edible oil cakes are more profitable like cattle feeds. As such, non-edible cakes should be used as manures. Oil cakes though insoluble in water are quick acting organic manures, their nitrogen content is rapidly available to the plants in about a week or ten days after application. Oil cakes need to be well powdered before

application so that they can be spread evenly and are easily decomposed by microorganisms. (Himadri and dharamvir, 2018).

Jayaraman (2012) says that neem can be used as a fertilizer for both food crops and cash crops, as it acts as a bio fertilizer and helps in providing required nutrients to the plants. It is widely used to ensure a high yield of crops. Neem seed cake performs the dual function of both fertilizer and pesticide, acts as a soil enricher, reduces the growth of soil pest and bacteria, provides macro nutrients essential for all plant growth, and helps to increase the yield of plants in the long run. Neem cake is the best manure as it has trace of neem oil which acts as a nematicide, termite repellent and only a small quantity is required to have its effects on plant. A teaspoon per pot or 300 g per square meter area mixed with other organic manures, namely, compost or organic fertilizers like urea gives excellent results.

In addition to oil cake the processed, coir pith which resembles peat and has got many characteristics as that of sphagnum peat is used for manure preparation. It is the most common potting media used in horticulture and hence it is commercially known as coco peat. With the development of commercial horticulture and reduction in the availability of sphagnum peat, coco peat has become internationally recognized as an ideal soil amendment and component of soilless container media for horticulture plants. Coco peat finds use in propagation methods, hardening of tissue and embryo cultured plants, hydroponic system of plant cultivation. In coco peat media add more nitrogen as microorganism to break down the few easily degradable substances present in peat soil mixtures for container growing plants. (thiraviyamcocopeat.com).

Coir industry in Tamilnadu generates nearly 4.5 lakh tones of organic waste every day which needs safe disposal. Hence this coir pith could be used as compost which is a good source of organic manure for dry land agriculture as well as terrace garden and home garden to conserve water. It can absorb five times its weight and thereby when applied to soil increase the water holding capacity. (www.cswertiweb.org)

According to Hari ram (2018) major oilseeds occupy an important position in the agricultural economy and are grown in area about 16 million hectares. Groundnut is the most important crop followed by mustard, sesame and castor. Oilseed crops are essential part of human diet as well as provide important industrial raw material.

Oilcakes obtained as byproducts are mostly used as cattle feed and manure. Groundnut hulls obtained during the shelling of groundnut can be used as manure

Cow's dung is a most important source of bio-fertilizer and used in many developing countries for generating energy. It is very effective alternatives to chemical fertilizers by enhancing productivity in long term with maintaining the soil health and enhances the microbial population. Cow dung manure and vermicompost increases soil organic matter content, and this leads to improved water infiltration and water holding capacity as well as an increased cation exchange capacity (Abishek et al., 2014).

The importance of consuming greens in human life is an important part of a healthy diet. It is embedded with mineral matters, phytochemicals and provitamins be in substantial proportion for balanced diet. It is also a good source of fibre which helps in the functioning of digestive system. Consuming plenty of greens will assist in protection against the bowel cancer which is one of the most common cancer (Pandey, 2016).

Green leafy vegetables are vital for growth and good health as they contain all important nutrients. In India, a wide range of greens are consumed. The most popular ones being spinach, amaranth, fenugreek, drumstick leaves and mint. These are particularly rich in mineral nutrient and iron and also rich source of calcium, high in dietary fiber, low in lipids, and rich in folate, ascorbic acid, vitamin K, Mg, beta carotene and vitamin c. Iron deficiency leads to anemia, a common health problem among pregnant and lactating women and also children. Inclusion of greens in daily diet would help prevent anemia and promote good health ([www.nutritivevalueof foods.org](http://www.nutritivevalueoffoods.org))

Watson (2015) points out that green leafy vegetables (GLVs) are a blessing for a safe and healthier life and have been in use for centuries. They are considered as an essential part of the diet to meet the daily nutrient requirements. These green leafy vegetables can be used fresh eg: as a salad or can be cooked/processed as per the interest of the consumer. They are becoming more popular among the people day by day. These possess a high place in the food pyramid and are an essential part of a balanced diet. The low caloric value of leafy vegetables make them ideal for weight

management. Green Leafy Vegetables are a rich source of nutrients, high in dietary fiber, low in lipids, and rich in folate, ascorbic acid, vitamin K, Mg, and K.

As per Gowthami et al. (2016) greens are naturally available important constituent of Nutraceuticals and are also called as pot herbs, greens, vegetable greens, leafy greens or salad greens. It is said to tone up the energy and vigour in human beings. Though greens are low in calorie and fat but high in dietary fiber, iron, Phosphorous, calcium, magnesium, photochemical such as vitamin (A, B, C and K), carotenoids, lutein, folate, and magnesium, it has been found that the person who consumes less amount of vegetables suffer from malnutrition, which in turn hampers the immune system. Green leafy vegetables are the cheapest of all the vegetables within the reach of poor man, being richest in their nutritional value. Most commonly cultivated greens are coriander, Ponnanganni, Manathakkali, Palak, mint, Drumstick, Red spinach, Fenugreeks and Thuthuvalai.

Gardening is one of the earliest hobbies, which is absorbing as well as stimulating for the joy of creation. Secondly through it one gets immense pleasure and make a sizeable profit, but for that one must be conversant with the art of horticulture science. It comprises the culture of flowers, fruits and vegetables. The amateur growers will take up mainly for pleasure and to utilize the cultivated produce for own use. On the other hand, the market growers use more land and invest much money for making profits. Both the classes of growers need to know the technology involved in gardening. Gardening to be successful the plants need a growing medium which is soil. Therefore the soil factors should be favorable for the growth of the plant. The use of other planting materials like vermicompost, farmyard manure and green manure are the key to success (Day, 2012).

Globally, home gardens have been documented as an important livelihoods contributing to food and nutritional security. Food production on small plots adjacent to human settlements is the oldest and most enduring form of cultivation. For centuries, home gardens have been an integral component of family farming and local food systems. It is an ancient and widespread practice all over the world. In the literature, home gardens are classified as mixed, kitchen, backyard, farmyard, compound or homestead garden. These gardens take on many forms, from a few plants in containers to large garden plots in the backyard. Beyond the reward of

homegrown produce, the benefits of gardening as a hobby include health, environmental and enjoyment for the gardener (<http://homegarden.org>).

According to Jonathan(2013) home gardening is the practice of planting crops in an area of land/ space , individually owned , surrounding a house, and usually planted with vegetables, fruits, greens and medicinal plants. The cultivation and consumption of organically grown greens at home will not only provide nutrition but also will ensure good health because of organic origin. The progressive growth of human population may not fulfill due to the progressive growth of human population the land area cannot be extended to meet the requirement of greens production, hence any one can grow within the available households.

Growing plants in ground or grow bags will produce a healthier root system when organic fertilizers are used. It is easy to use and are breathable allowing good air circulation. Grow bags are lightweight and can be moved around very easily and it has good water drainage. It controls temperature helping the plant, not to overheat. These bags can be installed in small spaces also (<http://gardenofedengardencenter.com>)

In those days many of them especially those who are living in rural areas had an opportunity to grow greens and vegetables in their own farm . Even they supply these to their neighbors . At present many of them are aware of the nutritional significance of greens. But in cities and main towns due to scarcity of land, unable to cultivate the greens. Hence they have to purchase from market or street vendors which were grown in unhygienic environment that leads to some health problem. They can grow healthy greens for their family using organic fertilizer which comprised of groundnut and neem oil cake, coco peat, cow dung, which is the formulated organic fertilizer for this research. As an alternative to this problem, one can grow their own preferred greens in their households using available containers, pots, bags, bucket and so on. To enhance growth from the health and environment point of view it is the need of an hour to develop home gardening which is more sustainable. The aim of this study is to investigate the effects of two different organic fertilizers on the growth and productivity of greens.

The study on “**Efficacy of Organic Fertilizers for Growth of Greens in Grow bags**” with the following objectives: To

- Perform household survey to identify the type of greens cultivated
- Carry out trial experiment on selected greens in grow bags
- Find out the growth parameters of greens
- Conduct awareness programs for the selected home makers.

II REVIEW OF LITERATURE

The literature pertaining to the study on “**Efficacy of Organic Fertilizer on Growth of Greens in Grow Bags**”, is discussed under the following headings:

- A. Importance of Organic Fertilizers and its Types**
- B. Need for Application of Organic Fertilizer to the Plants**
- C. Producing Fertilizer from Organic Waste**
- D. Types of Greens Grown**
- E. Studies Related to the Research**

A. Importance of Organic Fertilizers and its Types

Organic fertilizers are those fertilizers which are manufactured using organic substances which are bio-degradable, i.e. Organic fertilizers are naturally occurring fertilizers and nutrient enhancers of the soil . Therefore every substance that occurs naturally and is easily bio-degradable is organic and if this organic material enhances the richness of the soil, it is termed as organic fertilizer. These organic substances are further decomposed and broken into smaller and soluble particles by numerous microorganisms. After being turned into soluble and simpler compounds, these fertilizers are taken in by the roots. Manure, slurry, worm castings, peat, seaweed, sewage, and guano are the naturally occurring Green manure and compost, blood meal, bone meal and seaweed extracts, etc. are manufactured organic fertilizers (Bokhtiar et al., 2005).

Bhatt (2019) views that fertilizers are materials containing one or more nutrient elements in the form of chemical compounds of the organic and inorganic nature. These occur either as natural deposits or a synthesized in a chemical factory. Fertilizers are two types 1) organic fertilizers 2) inorganic (chemical) fertilizers. Organic fertilizers are natural materials of either plant or animal source , including livestock manure, green manures, crop residues, household waste, compost that works directly as a source of plant nutrients and indirectly influences the physical, chemical and biological properties of soil. Microorganisms from the soil decay the organic fertilizers to make its nutrients available for plants which added into the soil have the characteristic nature of the slow release of nutrients.

Chen (2006) quotes that the chemical composition of various essential minerals and elements meant for the regular as well as hastened growth and nourishment of all plants is termed as fertilizer. As these fertilizers have been used invariably to promote and enhance the productivity of commercial crops, therefore they are called agricultural fertilizers. Fertilizers enhance the richness of the soil and nourish it with required nutrients. By enriching the soil, fertilizers also increase the productivity of the crops. Fertilizers are the nutrient filled sources which nourish the plants with essential nutrients and soil acts as a medium between the crops and the fertilizers.

Organic manures are the valuable by-products of farming and allied industries derived from plant and animal sources. Organic manures are broadly classified as bulky organic manure and concentrated organic manures. Bulky organic manures are applied as large quantities and contain low amount of plant nutrients concentrated organic manure contain higher percentage of major plant nutrients (Manimuthu,2015).

1. Human habitation wastes-night soil, human urine, town refuse, sewage, sludge and sullage
2. Poultry litter, droppings of sheep and goat
3. Slaughterhouse wastes-bone meal, meat meal, blood meal, horn and hoof meal, Fish wastes
4. Byproducts of agro industries-oil cakes, bagasse and press mud, fruit and vegetable processing wastes etc
5. Crop wastes-sugarcane trash, stubbles and other related material
6. Water hyacinth, weeds and tank silt, and
7. Green manure crops and green leaf manuring material

http://www.agritech.tnau.ac.in/org_farm/orgfarm_manure.html

Different types of organic manures are listed below:

Farmyard manure

Farmyard manure refers to the decomposed mixture of dung and urine of farm animals along with litter and left over material from roughages or fodder fed to the cattle. The present method of preparing farmyard manure by the farmers is defective.

Urine, which is wasted, contains one per cent nitrogen and 1.35 per cent potassium. Nitrogen present in urine is mostly in the form of urea which is subjected to volatilization losses. Even during storage, nutrients are lost due to leaching and volatilization. However, it is practically impossible to avoid losses altogether, but can be reduced by following improved method of preparation of farmyard manure. Trenches of size 6 m to 7.5 m length, 1.5 m to 2.0 m width and 1.0 m deep are dug. All available litter and refuse is mixed with soil and spread in the shed so as to absorb urine. The next morning, urine soaked refuse along with dung is collected and placed in the trench. A section of the trench from one end should be taken up for filling with daily collection. When the section is filled up to a height of 45 cm to 60 cm above the ground level, the top of the heap is made into a dome and plastered with cow dung earth slurry. The process is continued and when the first trench is completely filled, second trench is prepared.

The manure becomes ready for use in about four to five months after plastering. If urine is not collected in the bedding, it can be collected along with washings of the cattle shed in a cemented pit from which it is later added to the farmyard manure pit. Chemical preservatives can also be used to reduce losses and enrich farmyard manure. The commonly used chemicals are gypsum and superphosphate. Gypsum is spread in the cattle shed which absorbs urine and prevents volatilization loss of urea present in the urine and also adds calcium and sulphur. Superphosphate also acts similarly in reducing losses and also increases phosphorus content. Partially rotten farmyard manure has to be applied three to four weeks before sowing while well rotten manure can be applied immediately before sowing. Generally 10 to 20 t/ha is applied, but more than 20 t/ha is applied to fodder grasses and vegetables. In such cases farmyard manure should be applied at least 15 days in advance to avoid immobilization of nitrogen. The existing practice of leaving manure in small heaps scattered in the field for a very long period leads to loss of nutrients. These losses can be reduced by spreading the manure and incorporating by ploughing immediately after application.

Compost manure

Compost manures are the decayed refuse like leaves, twigs, roots, stubble, crop residue and so on. The process of decomposition is hastened by adding nitrogenous material like cow dung, night soil, urine or fertilizers. A large number of

soil micro-organisms feed on these wastes and convert it into well-rotted manure. The final product is known as compost. (Himadri, 2012).

According to Manibushan (2015) compost is decomposed organic matter. In simple terms, compost is decomposed organic matter. Fruit and vegetable scraps, grass clippings, manure, leaves, sawdust, eggshells, and straw are all examples of organic matter that can be used to make compost. However, it's important to know that certain types of organic matter—such as dairy products, meat, fish, bones, fats, oils, pet waste, diseased or insect or plants that have been chemically treated—should not be used to make compost.

Sheep and goat manure

The droppings of sheep and goats contain higher nutrients than farmyard manure and compost. On an average, the manure contains 3 per cent N, 1 per cent P₂O₅ and 2 per cent K₂O. It is applied to the field in two ways. The sweeping of sheep or goat sheds are placed in pits for decomposition and it is applied later to the field. The nutrients present in the urine are *wasted* in this method. The second method is sheep penning, wherein sheep and goats are kept overnight in the field and urine and fecal matter added to the soil is incorporated to a shallow depth by working blade harrow or cultivator or cultivator.

http://www.agritech.tnau.ac.in/org_farm/orgfarm_manure.html

Poultry manure

This is rich organic manure since liquid and solid excreta are excreted together resulting in no urine loss. Poultry manure ferments very quickly. If left exposed it may lose up to 50 per cent of its nitrogen within 30 days. The average nutrient content is 3.03 per cent N; 2.63 per cent P₂O₅ and 1.4 per cent K₂O. http://www.agritech.tnau.ac.in/org_farm/orgfarm_manure.html

Poultry manure can be applied to the soil directly as soon as possible. After application it should be worked into the surface of the soil. If the droppings come from the cages or dropping pits, super phosphate may be added to these at the rate of 1 kg per day. Per hundred birds. This improves the fertilizing quality and helps the control of flies and odour (Himadri, 2012).

B. Need for Application of Organic Fertilizer to the Plants

Organic manure provides all the nutrients that are required by plants but in limited quantities. It helps in maintaining C:N ratio in the soil and also increases the fertility and productivity of the soil. So the manures which will be used for growing garden plants are .

- Groundnut oilcake
- Neem oilcake
- Coco peat
- Cow dung

Groundnut oil cake

Ground nut oil cake is an extract of ground nut seeds. This is a by product produced as a result of oil extraction from ground nut seeds. Also it is used for further extraction by solvents to remove the remaining oil present in it. Generally specification of ground nut oil cake varies with the quality of the seed used for the oil extraction. Protein content is high when the outer shell is completely removed and the inner skin is also removed. If the shell and skin are not sorted correctly the fiber content increases and protein content decreases. The seeds are also to be dried correctly else the moisture content in the cake will increase.

Neem oil cake

Neem cake is the de-oiled residue that is used after Neem kernels are crushed for their oil. In this kernel, there are some nutrients such as NPK means nitrogen-phosphorus-potassium as well as nortriterpenoids and isoprenoids. These nutrients are nematicidal in nature so the Neem cake ends up with these properties. Neem cake fertilizer is the favored product used for plant fertilization by farmers and gardeners. It acts as a biofertilizer by providing the required nutrients, nitrogen, and phosphorus necessary for growing crops and plants. Its use ensures a high yield of the crop. Neem cake is used for both cash and food crops, such as sugarcane and vegetables. It is the de-oiled residue of neem seeds. Once the neem seeds are crushed and neem oil is removed what we are left with is known the Neem cake. Neem cake is a good source for organic N-P-K and is widely used to fertilize various crops (<https://www.agrifarming.in/neem-cake-fertilizer-uses-application-benefits>).

Neem cake is the residual neem seed meal obtained as residue while extracting neem oil from Indian neem seed kernels by cold pressed extraction process. The nature neem cake is used as good organic manure in agriculture and also acts as pest repellent . The high Azadirachtin content in nature neem cake helps the crops against parasitic nematodes and as best soil conditioner. The dual activity of nature neem cake as fertilizer and pest repellent, has made it a favored input. It is widely used to fertilize cash crops. When it is ploughed into the soil it also protects plant roots from nematodes white ants and other soil insects (<https://www.hcms.org.in/neem-cake.php>)

Coco peat

Kumari (2015) states that the waste material in the coir industry is a potential source of organic manure. The estimated annual production of coco peat in India is about 7.5 mt. The high ligno- cellulose content, presence of soluble tannin related phenolic compounds and its resistance to bio degradability are some of the problems associated with the direct application of coco peat to field crops .Coco peat can same as a substitute for FYM or similar to other organic manure in addition to solving the environmental pollution problems associated with its dumping on the road sides and agricultural lands. Coir dust an important by product from coir industry having more moisture retention property and higher K content could be exploited for agricultural use. Under rainfed condition , the yield of groundnut , sorghum, maize and cotton increased to the extent of 10- 30%. Under dry land condition application of coco peat is much useful due to its high moisture conservation efficiency.

Cocopeat is natural fiber made out of coconut husks. The extraction of coconut fiber from husks gives us this byproduct called coco-peat, which is a 100% natural growing medium. This is dried in the natural sun is processed to produce different items namely cocopeat block, coco peat briquettes, cocopeat tablets, etc. (<http://www.ugaoo.com>).

Cow dung

Cow dung manure for plants is an excellent fertilizer highly rich with organic matter which help to improve aeration and break up compacted soils. The manure can provide the right fertility for the plants to grow and flourish in the garden. Cow dung is a very effective natural fertilizer. This process generates organic fertilizer that enhances soil fertility and increases crop yields and quality. Animal manure, such as

chicken manure and cow dung, has been used for centuries as a fertilizer for farming. It can improve the soil structure (aggregation) so that the soil holds more nutrients and water, and therefore becomes more fertile. Cow manure is rich in minerals, especially nitrogen, phosphorus, and potassium. It can support the growth of beneficial microorganisms when it's mixed with soil. Manure can also improve the texture of the soil and help it to maintain moisture. Phosphorus (P %) ranges 1.3% to 1.6% and maximum in *Azadirachta indica* vermicompost. Potassium (K %) ranges 0.8% to 15.8% and all four vermicompost has significantly higher K contents than the cow dung compost. A nutrient-rich organic fertilizer made from Cow Dung using earthworms. Compost made from using earthworm is 4-5 times stronger than any other compost. It is a complete fertilizer free of weeds, termite & waste (<https://ameliadanver.com/is-cow-dung-good-for-plants/>).

Cow manure has relatively less nitrogen than some other manures, so it can be added directly to the soil without damaging plants. It also adds plentiful amounts of organic matter and beneficial microorganisms. Some fresh cow manure, however, may contain harmful microorganisms, weed seed and too much salt for dry soil. Cow dung provides organic nutrients to the soil which increases the fertility of the soil, thus helps plants to grow. Cow manure is rich in minerals, especially nitrogen, phosphorus, and potassium. It can support the growth of beneficial microorganisms when it's mixed with soil. Manure can also improve the texture of the soil and help it to maintain moisture. (<https://neeness.com/is-cow-manure-vegan>)

Advantages of organic fertilizer

Improve soil fertility

Ninety five percent of the trace elements in the soil are in insoluble form and cannot be absorbed and utilized by plants. Microbial metabolites contain a large amount of organic acids. These substances are like hot water added to ice. It can dissolve trace elements such as calcium, magnesium, sulfur, copper, zinc, iron, boron, molybdenum and other essential mineral elements of plants, and turn them into nutrient elements that can be directly absorbed and utilized by plants, greatly increasing the soil's fertility supply capacity.

Improve soil quality and promote the reproduction of soil microorganisms

Organic fertilizers can multiply the microorganisms in the soil, especially many beneficial microorganisms, such as nitrogen-fixing bacteria, ammonifying bacteria, cellulose decomposing bacteria, etc.... These beneficial microorganisms can decompose the organic matter in the soil, increase the soil aggregate structure, and improve Soil composition.

Microorganisms multiply very fast in the soil, they are like an invisible web, intricately intricate. After the death of the microbial cells, many tiny pipes are left in the soil. These tiny pipes not only increase the air permeability of the soil, but also make the soil fluffy and soft, and the nutrients and water are not easily lost, which increases the water storage of the soil. Fertilizer capacity avoids and eliminates soil compaction.

Provide comprehensive nutrition for crops and protect crop rhizomes

Organic fertilizer contains a lot of nutrients, trace elements, sugars and fats needed by plants. The CO₂ released from the decomposition of organic manure can be used as a material for photosynthesis. Organic fertilizer also contains 5% of nitrogen, phosphorus, and potassium, and 45% of organic matter, which can provide comprehensive nutrition for crops. At the same time, it must be mentioned that the organic fertilizer is decomposed in the soil and can be transformed into various kinds of humic acid. It is a kind of macromolecule substance with good complex adsorption performance and a good complex adsorption effect on heavy metal ions. , Can effectively reduce the toxicity of heavy metal ions to crops.

Enhance crop resistance to disease, drought, and flood tolerance

Organic fertilizer contains vitamins, antibiotics, etc., which can enhance crop resistance and reduce or prevent diseases. After the organic fertilizer is applied to the soil, it can enhance the water retention capacity of the soil, and can enhance the drought resistance of crops in drought conditions.

At the same time, organic fertilizer can also loosen the soil, improve the ecological environment of crop roots, promote root growth, enhance root vitality, improve crop tolerance to waterlogging, reduce plant mortality, and increase the survival rate of agricultural products.

Improve food safety and greenness

The country has long clearly stipulated that the excessive use of inorganic fertilizers must be restricted in the agricultural production process, and organic fertilizers are the main source of fertilizer for the production of green food. Since the various nutrients in organic fertilizers are relatively complete, and these substances are completely non-toxic, harmless, and non-polluting natural substances, this provides the necessary conditions for the production of high-yield, high-quality, and pollution-free green food.

Increase crop yield

The beneficial microorganisms in organic fertilizer use the organic matter in the soil to produce secondary metabolites, which contain a lot of growth-promoting substances. For example, auxin can promote plant elongation and growth, abscisic acid can promote fruit maturity, gibberellin can promote flowering and fruit setting, increase the number of flowering, fruit retention, increase yield, make the fruit plump, fresh and tender, and can be marketed early. Increase production and income.

Reduce nutrient loss and improve fertilizer utilization

The actual utilization rate of chemical fertilizers is only 30%-45%. Part of the lost fertilizer is decomposed and released into the atmosphere, part is lost with soil and water, and part is fixed in the soil and cannot be directly absorbed by plants. When organic fertilizer is applied, the beneficial biological activities improve the soil structure and increase the soil's ability to retain water and fertilizer, thereby reducing the loss of nutrients. Coupled with the effect of the beneficial microorganisms to dissolve phosphorus and potassium, the effective utilization rate of fertilizers can be increased to more than 50% (<https://tdfertilizergranulator.com/>).

C. Producing Fertilizer from Organic Waste

Production of organic fertilizer from solid waste. Recycling of solid wastes into organic manure. Organic fertilizers are those sourced from natural substances which includes plants, mineral or animal sources. Unlike the traditional chemical fertilizers, natural fertilizers need to arise naturally. The organic fertilizers vary based totally at the nutrient necessities for the firm, however in maximum cases, the organic fertilizers are constituted of a single ingredient. The biological process and ingredient price of organic fertilizers doesn't give immediate fix compared to the chemical

fertilizers. Instead, they slowly break down by the action of organisms and biological processes so as for the plants to amass the nutrients whereas at identical time learning and rejuvenating the soil. Organic fertilizers are therefore eco-friendly and that's why they are preferred in organic and healthy farming. The chief examples of organic fertilizers include fish extracts, plant waste from agriculture, animal waste, treated sewage sludge, and peat.

Organic fertilizers increase the soil, plants and it also benefits the insects. These fertilizers are sustainable, perishable and surroundings friendly. Farmers are adopting natural fertilizers because of their low value and wholesome long lasting impact on soil. Apart from performing as a fertilizer to the vegetation, organic fertilizer also conditions the soil. Organic food industry has witnessed augmented demand for organic foods among consumers in recent years. This can be attributed to various benefits of organic farming such as safety from pesticides and chemicals. This rising demand for organic foods is fostering the growth of global organic fertilizers market (<https://niir.org/>).

Steps to prepare groundnut oil cake:

- 1) Take 2 kg of peanut and extract the oil now the remaining we have 1.2 kg of groundnut cake.
- 2) Then take 1kg of groundnut oil cake with 5 litre of water and soak it.
- 3) Keep the same for 5 to 7 days.
- 4) After 5 to 7 days we can take that and mix with 1-2 times of water and apply to the greens.

Steps to prepare cow dung:

- 1) Spread it out in full sun for 2 to 3 days.
- 2) Next take a big container with lid and keep broken down manure pieces and fill it with water.
- 3) Now we will get manure like consistency

Steps to prepare coco peat:

- 1) Collect coconut husk and store them in a clean place
- 2) After pulling out dry them .Then chop them into small pieces

- 3) Grind them in a mixer to fine powder the coco fibre will be separated
- 4) Remove the fibres out of coco peat powder.
- 5) Soak the peat into water for an hour.
- 6) Squeeze out excess water with hands.
- 7) Dry it in direct sunlight for a day.
- 8) Now coco peat is getting ready.

D. Types of Greens Grown

Grow bags get their name because a variety of plants can be grown in bags that are filled with potting soil. It's a growing technique that's been around since the '70s, originally used by commercial farmers as an alternative to greenhouse growing, then gained momentum with home gardeners due to the versatile nature of grow bag gardening. It's similar to container gardening, but instead of plastic containers, people growing in bags. Different types of bags are available, as are different sizes. The best type of grow bag for many a plant is the fabric type as it's the better draining of them all, preventing water rot in the roots of plants. The benefits of grow bags are exponential. Especially if they have limited garden space or live in an upstairs apartment as people can use these indoors, and easily move them outdoors, pack them away when not in use, or use them year-round. They can be used to grow healthy veggies, flavorsome strawberries, herbs and other salad foods regardless of space limitations, or being reliant on good garden soil (<https://thepracticalplanter.com/grow-bag-gardening>).

Growing plants in grow bags will produce a healthier root system. These bags are easy to use. It can be planted directly into the ground. These bags are breathable allowing good air circulation. Grow bags are lightweight and can be moved around very easily and it has good water drainage. It controls temperature helping the plant, not to overheat. These bags can be installed in small spaces. (<https://thepracticalplanter.com/grow-bag-gardening>)

A relatively new concept for the domestic market is grow bags and these are strong and very cheap considering the volume they hold are lightweight and many have handles. So are easy to move are UV resistant (usually made from woven UV treated polypropylene) which makes them quite durable. Very compact they fold up

like a shopping bag so easy to transport and due to their flexibility makes re – potting easy. Have good drainage holes and are strong so can take a wide variety of plants from shallow veggies and herbs to trees come in a variety of plants from shallow veggies and herbs to trees come in a variety of sizes, colour and shapes. Generally green is the most popular colour but they can be put inside another decorative pot is desired for aesthetics (Pandey, 2008).

Grow bags are an interesting and popular alternative to in-ground gardening. They can be started indoors and moved out, repositioned with the changing light, and placed absolutely anywhere. If the soil in your yard is poor or just nonexistent, grow bags are a great choice. Keep reading to learn more about gardening with grow bags. Grow bags are just what they sound like – bags you can fill with soil and grow plants in. When sold commercially, they are usually made of thick, breathable fabric, much like a reusable grocery bag. The bags are usually rectangular and come in a wide array of heights and widths, making them much more versatile and easily arrangeable than most hard plastic containers (<https://www.gardeningknowhow.com>).

Role of greens in daily life

Sharma (2010) indicates that vegetables are plants or parts of plants served at every meal as a preparation in the main course. They contribute nutritionally to the diet, also supplementing the texture, color and appearance of food. Vegetables are classified on the basis of many parameters like the part of the plant used, the growing season, area where they grow (aerial, sub-aerial and underground). Vegetables are studied under three groups.

Kumar et al. (2013) says that green leafy vegetables are used since ancient periods as source of food as they contain many nutrients and minerals which are helpful in maintaining human health. The health and nutrition of expanding world populations are major upcoming challenges especially in developing countries. Plant foods are sources of energy, micronutrients and nutrients essential to health, in addition to phytochemicals with further health benefits including glycemic control, immune-stimulation or antioxidant. Man has tremendous knowledge on edible plants since before civilization. It hold an important place in well-balanced diets. Green leafy vegetables are the cheapest of all the vegetables within the reach of poor man, being richest in their nutritional value. The lack of knowledge especially on the

nutritive value of these green leafy vegetables among the public in general is the main drawback in their lower consumption. These are found mainly in south India, used as a source of food have many health benefits like protection from eye problems, iron deficiency and oxidative damage. They are most inexpensive sources of several phyto nutrients like pro-vitamin A, vitamin C, folic acid and minerals like calcium, iron, phosphorus, sodium and potassium. These are of great medical importance due to the health benefits produced. It contain several chemical constituents which are pharmacologically important as they have been proved to be beneficial in many specific diseases like cancer, diabetes, hepatotoxicity, nephrotoxicity and many microbial attacks.

Gajalakshmi (2015) denotes green-leafy vegetables are the manufacturing organs of the plant where the life-giving process of photosynthesis takes place. In the cells, photosynthesis transforms elements into carbohydrates which are carried to other parts of the plant. Green leafy vegetables deliver a bonanza of vitamins, minerals, and phytonutrients. They are rich source of minerals (including iron, calcium, potassium and magnesium) and vitamins, including vitamins K, C, E, and many of the B vitamins. They also provide a variety of phytonutrients including β -carotene, lutein and zeaxanthin, which protect our cells from damage and our eyes from age- related problems, among many other effects. Greens have a very little carbohydrate in them, and the dietary carbohydrates that are there are packed in layers of fiber, which make them very slow to digest. That is why, in general, greens have a very little impact on blood glucose. Greens are very good source of folic acid.

Types of greens

- Agathi keerai
- Arai keerai
- Karisalankanni
- Keelanelli
- Manathakkali keerai
- Mint
- Modakathan keerai
- Mulai keerai
- Murungai keerai
- Musumusukai
- Paruppu keerai
- Palak keerai
- Pasalai keerai
- Pulicha keerai
- Ponnanganni
- Thuthuvalai
- Thandu keerai
- Vallarai keerai
- Vendhaya keerai

Agathi keerai

Agathi refers to ‘fire inside’, i.e. it will ignite the fire inside all organs and equalize the blood circulation throughout the body. It is a cleansing agent also. Normally, this agathi keerai plant is used for proper rearing of betel leaves creeper and pepper creepers. There are different kinds of agathi spinach such as sazhai agathi, sitragathi, seemai agathi and pei agathi and all belong to the agathi family only. However, there are two specific kinds based on the color of flowers that spring from agathi. One is in white color and the other is in the red color known as sevvagathi. The leaves, flowers, roots and outer cover are widely used for medicinal purposes (<https://www.vikatan.com>).

Arai keerai

Arai keerai has the power of preventing some common diseases like phlegm, fever, gastric trouble and diseases related to fever. It acts as a stimulant and aphrodisiac. As I have mentioned earlier that this variety has more properties that increases body heat (stimulant). So, It is not advisable for people who are prescribed with medicines to reduce body heat and complications caused by increased body heat. From the nutrition chart, the fiber content in spleen amaranth is higher, it helps to cure constipation. The medicines that are prepared with seeds of arai keerai denotes rapid hair growth. Liver related diseases can be prevented if you take this variety of this spinach (<https://spinachwonders.blogspot.com/p/blog-page>).

Karisalankanni

Karisalankanni keerai is widely prepared for reaping the various health benefits of bhringraj. Karisalankanni leaves is effectively used for treating liver disorders. It cures many skin related infections like cracked heels and heal wounds and extracts can be used to treat ailments such as cold and cough. People suffering from anemia can take in the form of soups. It is a good remedy to cure sinus infections. (<http://www.pinkandpink.com>)

Keelanelli

Keelanelli is a small plant that grows in tropical and subtropical regions in central and south american countries, India and east asian countries. It is such a joy to write about herbs that are treasured and used for centuries and keelanelli is one such herb that has been used in home remedies for centuries. The botanical name of

keelanelli plant is *Phyllanthus Niruri* and it belongs to the family *Phyllanthaceae* and genus *Phyllanthus*. Keelanelli plant grows to a height of 20 to 25 inches and has ascending branches with small tiny leaves. The fruits are tiny and are found in a line underneath the leaf. Keelanelli is found everywhere in Tamil Nadu. If you can identify this plant, you can easily find it and some times you can even spot it in wastelands in cities and towns.

Manathakkali keerai

Manathakkali or Black Nightshade has excellent medicinal properties and health benefits. All the parts of this plant can be consumed by anyone, including babies and pregnant women. The plant is native to Tropical Indian and Pacific Oceans, including Africa, Indochina, Hawaii, and Madagascar. In India, manathakkali keerai (Nightshade leaves) are commonly used to treat stomach and mouth ulcer, cold, upset stomach, and piles. They make delicious and healthy recipes using manathakkali leaves and fruits like curries, manathakkali gravies, smashed manathakkali leaves, and various side dishes using its fruits and leaves.

Mint

Mint is one of the oldest culinary herbs known to mankind. Its remarkable medicinal properties have made it one of the most commonly known and used herbs ever. Indians especially are no stranger when it comes to mint. Mint has very powerful antioxidant properties. Mint is excellent to manage blood sugar levels and treat skin conditions. In summers, mint should be added on to the diet. Mint is very cooling, aids in digestion and breathing disorders too (<https://food.ndtv.com>).

Mudakathan keerai

Mudakathan leaves are used as a medicine in the Ayurvedic treatment from the ancient days. Balloon vine is one of the common names of this plant, and it is also called Love in a puff, heart seed, heart seed vine, etc. The scientific name of this plant is *Cardiospermum halicacabum*; you can easily find this climbing plant in the tropical and subtropical regions. This mudakathan has amazing nutritional values so it is an excellent ingredient for diet. Due to its medicinal properties and health benefits, it is used for hair growth and helps treat joint pain. The fresh mudakathan leaves and dried mudakathan powders are used for the home remedy.

Mulai keerai

The other names of this spinach are Chinese spinach, edible amaranth, wild blite, careless weed. One of the best variety of spinach that is can be eaten by all the age groups in any forms they wish. This variety of spinach is called as the " Queen " of all the spinach varieties. The best quality of nutrition like lactose, fiber and 80% of water content are present in this variety. It makes the body strong and healthy. It promotes child growth. The magnificent values present in this spinach cures many rare diseases.(<https://spinachwonders.blogspot.com/p/mulai-keerai.html>)

Murungai keerai

Murungai keerai increases appetite It heals the wounds inside the stomach. It Helps to reduce headache and blood diarrhea. It purifies blood and excretes toxins out of the body. It should be taken twice a week to maintain better health. The quantity of nutrients in drumstick are Iron 1.5 mg, phosphorus 30 mg, protein 7g, fat 1g, calcium 8mg, carbohydrate and Vitamin A, C in one ounce of drumstick. Murungai soup builds immunity power against joint pain, mouth ulcer, stomach ulcer, fever, and eye diseases.

Musumusukai

Musumusukai leaf that has a potential of smashing the cold related symptoms like sore throat, Cough, irritative cough, spasm, common cold and asthma. In villages, these leaves are mixed with other herbs and made in the form of concoction. This drink is given to cold affected person for instant relief. It is a tropical annual growing plant that grows 50 cm in height. The roots, seeds and leaves are the edible parts. The flowers are Yellow in colour and it spreads around thorned bushes. The properties of this plant are Astringent, Expectorant, vata, pitham, Adaptogenic, anti oxidant, pungent, sweet, anti inflammatory, hypoglycaemic, antispasmodic, anti pyritic, hepato protective components are present (<https://spinachwonders.blogspot.com>).

Paruppu keerai

Paruppu keerai common variety of plant that can be seen all over the world is common purslane. It can be used in salads, with non veg and veg dishes. This symbolises the characteristics of this variety are refrigerant, diuretic, mild astringent and emollient.It helps to purify the blood and most common diseases which stays for

long time can be healed by taking this variety. Most recommended spinach variety for mothers who lacks mother's milk secretion. The bad cholesterol can be reduced if garlic is added with paruppu keerai while cooking the delicious dish. Take the equal amount of seed under leaf or stonebreaker with common purslane and turmeric. Grind all the things and have it as a medicine for inflammation of the liver (<https://www.tamilxp.com>).

Palak keerai

Palak keerai is a rich source of Vitamin K which helps in promoting a production of a protein called Osteoclast in that is responsible for stabilizing calcium in the bones. In addition to being rich in vitamin K, palak keerai is also a great source of calcium and vitamin D, dietary fiber, potassium, magnesium and vitamin C, all of which are important nutrients that are good for bone health.

Pasalai keerai

Pasalai keerai is spinach. It is used in various Indian recipes, usually cooked with added spices and vegetables. India has a number of keerai or "greens" that are used in traditional meals and for their health benefits. Pasalai keerai is a dark green leafy vegetable that is high in nutritional content. (<https://www.livestrong.com/article/557588-health-benefits-of-pasalai-keerai/>).

Pulichha keerai

Pulichha keerai leaves contain multiple essential nutrients that body needs on daily basis. It is a low calorie food that is highly nutritious and has several medicinal benefits too. It is an excellent source of vitamin A, vitamin B1 (thiamin), vitamin B2 (riboflavin), vitamin B9 (folic acid) and vitamin C. The minerals present in it are Iron, Calcium, Potassium, Magnesium, and Sodium. Flavonoids, polyphenolic acids, and anthocyanin's, the top organic nutrients are present in Gongura leaves. There is a good amount of fiber content and nearly 11 types of amino acids, making it good source of proteins as well (<https://medhyaherbals.com>).

Ponnanganni

Ponnanganni is also known as *Alternanthera sessilis* in English is one of the healthy aquatic plants. It is used as a green vegetable especially in Sri Lanka and some Asian countries. There are many health benefits in ponnanganni keerai. It is

very rich in protein, iron, fiber, minerals, phosphorous, and calcium. Ponnanganni keerai is a good vegetable for eye and skin. Besides, it enhances energy level, removes body heat, cures piles, improves breast milk, and cures asthma. Apart from all, ponnanganni keerai can be used as an herbal medicine, the plant has diuretic, cooling, tonic, and laxative properties (<https://www.topsrilankanrecipe.com>).

Thuthuvalai keerai

Thuthuvalai also called Thoothuvalai Keerai in Tamil is an amazing herb with wonderful medicinal uses and health benefits. Thuthuvalai leaves are traditionally used for treating cold, cough, asthma and also for thyroid. At home, we mainly use thuthuvalai for treating cold and cough. Thoothuvalai is a creeper with plenty of thorns, purple flowers, red colored fruits and it grows easily every where. After the rains last month, many thoothuvalai plants have propped up all over the farm. People can easily identify thuthuvalai plant with the leaves and the beautiful purple flowers (<https://www.wildturmeric.net>).

Thandu keerai

Thandu keerai is one of the natural resources of vitamins, minerals, iron, protein, etc. Having thandu keerai in your routine will keep you healthy. Just remember that overcooking it kills most of its vitamins and calcium. Contains many phytochemicals, including lutein that helps prevent age-related macular degeneration. It is rich in beta carotene which is good for eyes and prevents cataracts. This keerai is a great antioxidant and helps against many diseases. Has abundant potassium to promote good heart function. It regulates blood sugar level as it contains lipoic acid (<https://www.epersianfood.com/thandu-keerai>).

Vallarai keerai

Vallarai keerai abounds in Vitamin C. It is also low in calories to help maintain body weight and supplies adequate essential dietary fibers and proteins. Furthermore, it also offers the key spectrum of B vitamins to regulate metabolism and cellular energy requirements (<https://www.netmeds.com>).

Vendhaya keerai

Vendhaya Keerai have lot of health benefits. It is a very good source of iron and fiber. Fenugreek has herb nutrition in it. If you crush the fresh leaves of

Fenugreek or make a glass of juice out of them, it could be the perfect health drink to control the hormonal level of insulin in the blood. Fenugreek is a kind of similar to bitter melon when we consider the bitter taste and properties of regulating insulin. It is a must note point for diabetics (Venkatesan , 2019).

E. Studies Related to the Research

The study was conducted by gupta et al, “Impact Of Integrated Application Of Vermicompost, Farmyard Manure And Chemical Fertilizers Onokra (*Abelmoschus Esculentus*l.) Performance And Soil Biochemical Properties”. However, there is a lack of information about the performance of vermicompost and farm yard manure in relation to productivity and fertility of soil particularly under okra crop grown in Sub-tropical zone of Jammu, Jammu & Kashmir. Moreover, the field evaluation of vermicompost in vegetable crops is important as the farmers are diversifying from cereals to vegetables. The present study was undertaken with the objective to study the performance of vermicompost and farmyard manure in combination with chemical fertilizers on okra and soil biochemical properties.

Addis (2019) a study of “Organic Fertilizers Use And Application For Cereal Crop Production In Ethiopia” assures that animal manures are valuable sources of nutrients that will have the increase in yield effect Apart from the nutrients in manure, its effects on the improvement of soil organic matter, soil structure and the biological life of the soil are well recognized particularly at high rates of application in on-station trials. Crop quality has also been improved by manure application. When crop improvements with manure were greater than those attained with commercial fertilizer, response was usually attributed to manure supplied nutrients or to improved soil not provided by commercial fertilizer. It is also well known that the use of farmyard manure can reduce nutrient deficiency in soils.

Aanandhakumar (2017) conducted a study on “Comparative study of nutrient content and antioxidant activity of some leafy vegetables of Tamilnadu grown under organic and conventional farming on roof top garden method”. Based on the results of this study, biological fertilizers can reduce the monetary and environmental troubles which are resulting from use of chemical fertilizers. As a result, biological fertilizers can be suggested for the sake of achieving the higher quality manufacture. This investigation shows that productive green roofs should be implemented wherever

potential, due to their crucial contribution to the advancement of urban agriculture and the associated environmental, social and economic gains, all of which reinforce the environment and urban communities. Combined application of organic fertilizers results in a high water use good organization implying a judicious use of water in the combined applications. Combined application of the organic fertilizers results in yields higher than solitary application of each nutrient source. Nutrient uptake values were higher in the combined application than the only application. This study supports the probable application of *C. sativum*, *A. polygonoides* and *M. spicata* as potent natural sources for antioxidants. Also serve as sources of some essential nutrients which are naturally present in them. The green leafy vegetables are consumed either in the cooked form or served as salads.

Nasrin et al. (2019) conducted a case study on “ Women Participation in Roof top Gardening in Some Areas of Khulna City” Almost all of the women had medium to high participation in rooftop gardening. The women had higher participation in preparatory stage and it was least in harvesting stage. Considering 20-issues under 4-aspects of rooftop gardening, the highest participation by the women was in watering the garden and no participation was in marketing.

Martha Clare Morris and colleagues from Rush University in Chicago and the Tufts Human Nutrition Research Center. In the study, consumption of green leafy vegetables was positively and significantly associated with slower cognitive decline. When comparing the highest daily consumption (median 1.3 servings a day) with the lowest (median 0.09 servings a day), the rate of cognitive decline among those who consumed the most to those who consumed the least was equivalent to being 11 years younger cognitively, based on average global cognitive scores over time. There was no evidence that the association was affected by cardiovascular conditions, depressive symptoms, low weight, or obesity. The researchers also examined the relationship between cognitive change and nutrients for which green leafy vegetables are a rich source (folate, phylloquinone, nitrate, α -tocopherol, kaempferol, and lutein). Intake of these nutrients were each individually positively and significantly associated with slower rates of cognitive decline and were not due to other underlying health issues. Further investigation indicated that phylloquinone, lutein and folate likely were the source of the effect seen on cognitive decline. This study indicates that consumption of green leafy vegetables is associated with a slower rate of cognitive

decline in older adults, possibly due to the neuroprotective actions of specific nutrients. As research continues, the researchers suggest that adding a daily serving of green leafy vegetables to one's diet may contribute to brain health.

Subasree (2020) conducted a study on performance of growth promoters for selected greens in roof top garden. Apart from the decorative benefit, roof garden serves the purpose of providing architectural enhancement, temperature control, recreational opportunities, habitats for wildlife and food. The method of cultivating food on the rooftop is referred to as rooftop farming. Growth promoters help in cell division, cell enlargement, flowering, fruiting and seed formation in plants. Organic growth promoters like panchagavya and dasagavya not only facilitate the plants but also assist in improving soil structure, soil quality and soil fertility. This experimental setup of growing greens using plant growth promoters on the roof top, motivated many home makers to grow vegetables and greens on their own, which has greater health benefits and also, saves money as well as it creates sustainable environment.

III RESEARCH DESIGN

Research design is essentially a statement of the object of the inquiry and the strategies for collecting and analyzing the evidences and reporting the findings”. According to Cauvery et al, (2013) research design is to provide for the collection of relevant evidence with minimum expenditure of effort, time and money. A well designed study is based on assumption and working hypothesis formulated before the plan is executed. A research design consists of several prepositions, which are subjected to test and examination. Hence the research study entitled “Efficacy of organic fertilizer on growth of greens in grow bags” comprised of the following procedure:

Phase I: Household Survey

Phase II: Experimental Study

Phase III: Awareness Programme

Diagrammatic representation of the study is shown in Figure 1.

Phase I: Household Survey

A household survey is the process of collecting and analyzing experiences from the sample households which are representative of all households in the study area. Tools used for collecting data include an interview schedule conquered of a series of questions (<http://wws.unescobkk.org>). It will help in the selection of sample for the study. Hence the household survey was found essential to investigate the required information among selected residences. It includes the following:

1. Selection of study area
2. Selection of sample
3. Selection of method and tool
4. Collection and consolidation of data

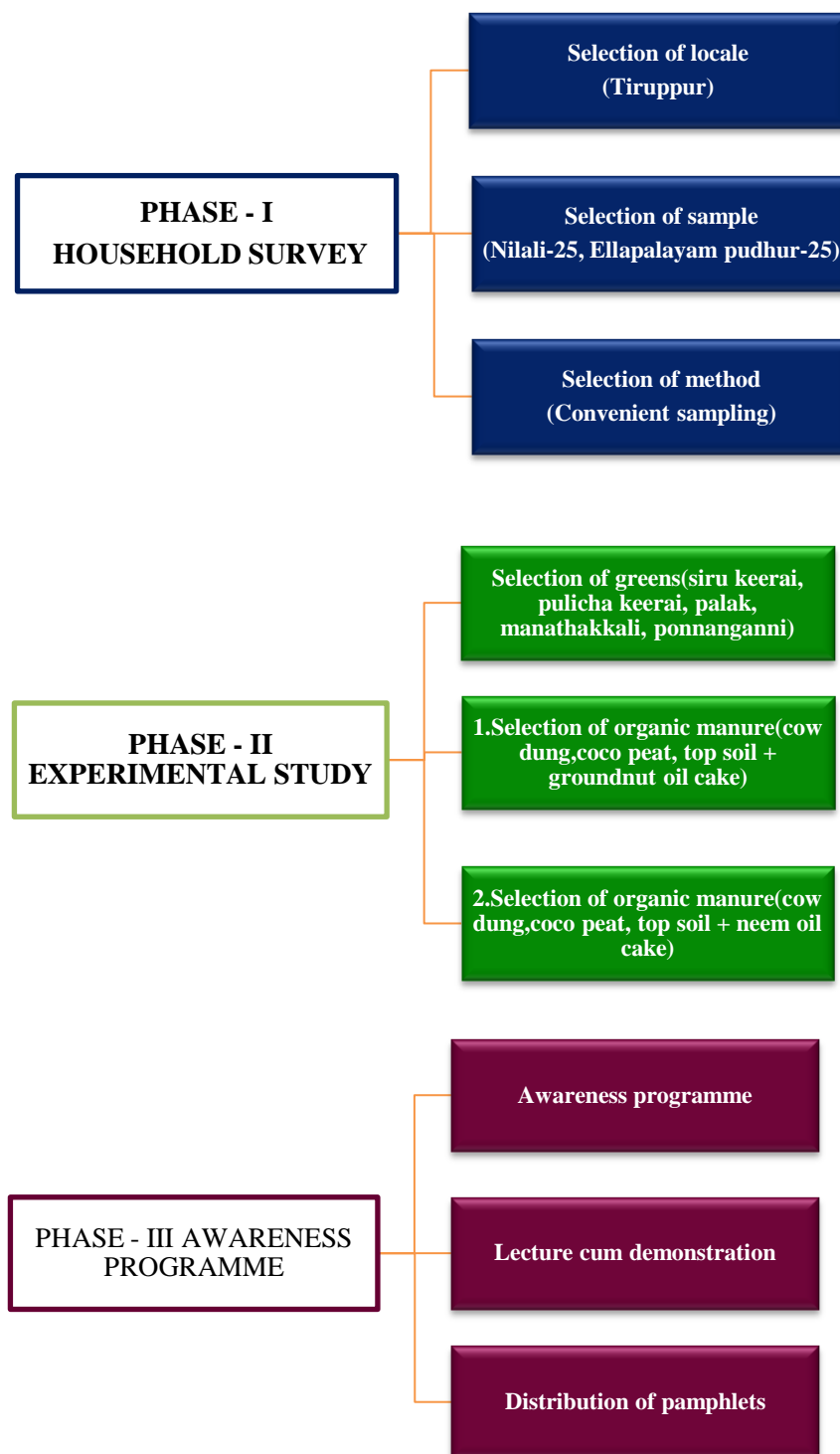


Figure 1: Research design

1. Selection of the locale

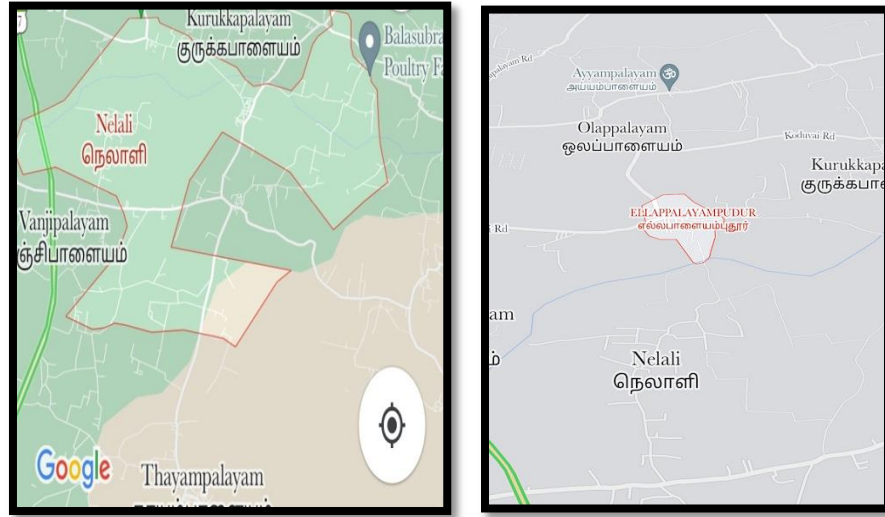


Figure 2: Selection of the Locale

Ellappalayam pudhur and nelali which is selected as a locale for the study is a taluk and municipality in the Tiruppur district (Figure – 2). It is located in western part of tamilnadu. Located on the banks of Noyyal River. The vegetable farmers are primarily the cultivators of the vegetables in transactions at the Tiruppur market and the vegetable traders are the wholesalers and retailers and mandi owners of the market town. (Shodhaganga. inflibnet.ac.in). Tiruppur selected for the study is nearer to Coimbatore (58 kilometers). Eventhough the green leafy vegetables were available in selected shops, the investigator find it necessary to motivate the selected women to cultivate greens organically in their households so as to increase the consumption of greens frequently, especially the pesticide free and fresh greens.

2. Selection of sample

Convenience sampling is used to obtain information quickly and inexpensively. The only criterion for selecting sampling units in this research is the convenience of the researcher or the investigator. Convenience sampling is defined as a method adopted by researchers where they collect research data from a conveniently available pool of respondents. This sampling design is often used in the pre-test phase of a research study such as the pre-test of a questionnaire (Chawla and Sondhi, 2018)

Based on convenient sampling method, 50 households from two different areas in Tiruppur was selected for the survey (Nilali - 25 houses and Ellappalayam

pudhur - 25 houses). This sampling is a type of nonprobability sampling in which people are sampled simply because they are “convenient” sources of data for researchers. In probability sampling, each element in the population has a known non zero chance of being selected through the use of a random selection procedure.

3. Selection of method and tool

Face to face direct interview using interview schedule is the tool used for the study. The interview is an important data gathering technique involving verbal communication between the researcher and the subject. Interviews are commonly used in survey designs and in exploratory and descriptive studies. There are a range of approaches to interview, from completely unstructured in which the subject is made to talk freely about whatever they wish to get the highly structured in which the subject responses are limited to answering direct questions Mathern et al. (2002). The interview method of collecting data involves presentation of oral verbal responses. Direct personal investigation is followed in this study through which interviewer can collect the information personally from the sources. Face to face direct interview using interview schedule is the tool used for the study (Plate 4 and Appendix I).



Plate 1: Collecting Information from the Home Makers

4. Collection and consolidation of data

Data collection is part of preliminary planning and continues throughout the competitive sourcing process – from planning to evaluating performance. (fws.gov//PPIDhb.pdf). Survey was taken from the 50 houses. Questions were asked to the respondents which will help the investigator to know the relevant information.

Collected data required for this study, is tabulated , consolidated and given in results and discussions.

Phase II: Experimental Study

Experimental research is any research conducted with a scientific approach, where a set of variables are kept constant while the other set of variables are being measured as the subject of experiment. When enough data is not available, in such situation one need to carry out experiments to discover the facts. Experimental research can gather a lot of data that can help to make better decision (question pro.com). Experimenting method was selected to observe the growth of plants in two organic manures. Observing the growth of the plants will help to know each and every change in the plants during the study. The experimental study was conducted as mentioned below.

1. Selection of greens
2. Selection of organic fertilizer
3. Biometric parameters of plants

1. Selection of greens

Particulars	Siru keerai	Pulicha keerai	Palak	Manathakkali	Ponnanganni
Botanical name	Amaranthus tricolor	Hibiscus sabdariffa	Spinacia oleracea	Solanum nigrum	Alternanthera sessilis
Common name	Tropical amaranthus	Gongura	Spinach	Black night shade	Sessile joy weed
Nutritional value	Ca - 397Mg P ₄ - 50 Mg Fe - 27 Mg H ₂ O- 90% Fat – 0.3% Protein-2.8 Sugar-4.8%	Ca -130Mg P ₄ - 20 Mg Fe -1.7Mg Fat - 0.2 g Protein 0.6 Mg -123mg	Ca240Mg Kcal - 23 H ₂ O 91% Sugar0.4g Fibre 2.2g Fat – 0.4g Protein2.9	Ca - 410Mg P ₄ - 70 Mg Fe - 20Mg Protein 6% Fat – 1%	Ca - 390 Mg Fe - 24 Mg Sugar – 11g Fibre – 2g Protein -4g
Other benefits	1) It has iron and calcium in abundant quantity. 2) It increases memory power. 3) It excretes the unwanted materials and protects the body form dangerous diseases. 4) It cures poisonous insect bites.	1) Protects liver and increase blood quality and quantity. 2) Prevents hypertension 3) Reduces Breast Milk Flow 4) Prevents Inflammation and Microbial Activity	1) Good source of iron 2) Great source of insoluble fibre. 3) Good for eyes 4) Aids in weight loss 5) Helps body to produce new red blood cells.	1) Used as a medicine for liver and pancreas infections. 2) Juice can be taken for piles and urinary problem. 3) Best medicine for all the types of skin infections and allergies. 4) Leaf paste is used to treat joint pain problems.	1) It cures asthma and headache. 2) It helps to improve breast milk. 3) Ponnanganni keerai are one of the best sources for treatment of eye related problems
Season	It is planted in July but grows well in any seasons.	Mainly in late September to early October	All seasons	June to September	All seasons
Soil type	Red soil	Silty soil	Loamy soil	Red soil	Red soil

Source: <https://www.herbsnpuja.com/>; <https://megworld.in/>

During survey it was realized that the selected households have cultivated only selected varieties ,but they expressed their interest to grow new variety of greens due

to their nutritional benefits and non – availability of fresh greens, especially the organically grown method of cultivation.

2. Selection of organic fertilizer

A organic fertilizer is to grow plants, herbs, vegetables and greens in a grow bag or durable container. Common ingredients used in this medium are coco peat, cow dung and top soil. Along with these, neem oil cake and groundnut oil cake was added. This is an effort by the researcher to formulate two organic fertilizers for the experimental study on five different greens. This formulated manure is expected to meet all the basic plant requirements, such as good drainage, adequate air circulation and storage of water and nutrients. Mineral based soils are not recommended especially for container plants because they physically do not hold up well under repeated watering and will rapidly become very compacted. The packaged potting mediums (organic fertilizers) have been formulated specifically to fulfill the needs of containerized plants was formulated to be used for greens cultivation. The ingredients used to grow the selected greens is shown in Plate -5.



Plate 2: Ingredients for the Preparation of Organic Fertilizer

Cost incurred for the purchase of materials

The materials used for the experimentation were coco peat, groundnut oil cake, neem oil cake, cow dung, seeds of greens, topsoil and the base called grow bags. The details of the sources from which these materials were procured and the total cost incurred is detailed below:




Materials	Quantity	Cost	Source of purchase
Groundnut oil cake	3 Kg	90	Vedcare organic products
Neem oil cake	3 Kg	90	Vedcare organic products
Cow dung	3 Kg	Free of cost (If purchased 225)	Received from gardener
Coco peat	1.5 Kg	350	Manually made by self
Top soil	9 Kg	Free of cost(If purchased 900)	Received from gardener
Grow bags	10	800	Yuva green, Coimbatore
Arai keerai seed	15 g	100	Syed garden, Tiruppur
Pulicha keerai seed	20 g	85	Syed garden, Tiruppur
Palak seed	15 g	60	Trust basket
Manathakkali seed	10 g	45	Trust basket
Ponnanganni seed	15 g	50	All that grows
TOTAL COST: 2895			


Though cow dung and top soil was received from gardeners at free of cost for the purpose of calculating the total cost its current rate if purchased is indicated in above table.

Procedure for growing greens

After the purchase of these materials two different organic fertilizers were prepared . They were mixed in the proportion of Red soil + Coir pith +Cow dung (1:0.5:1) along with 2 kgs of neem oil cake are considered as organic fertilizer – T2. In the same way the proportion of Red soil + Coir pith +Cow dung (1:0.5:1) along with 2 kgs of groundnut oil cake are considered as organic fertilizer – T1 . After sowing the bags were placed in a home garden. The detailed procedure is given below:

Preparation of manure

Manure	Steps to prepare	Nitrogen content	Finished product
Groundnut oil cake	<ol style="list-style-type: none"> 1) Take 2 kg of peanut and extract the oil .From the remaining we will get 1.8 kg of groundnut cake. 2) Then take 1kg of groundnut oil cake with 5 litre of water and soak it. 3) Keep the same for 5 to 7 days. 4) After completing 7th day mix with the proportion of 1:5 (Pulp +water)and apply to the greens. 	<p>Nitrogen content percentage % ratio for this manure is N:P:K = 7.3 : 3 : 2.2.</p>	
Coco peat	<ol style="list-style-type: none"> 1) Collected coconut husk and stored in a clean place 2) After pulling out the fibre chop them into small pieces 3) Grind them in a mixer to fine powder the(coconut husk fibre is powdered using a mix 4) The peat is soaked in water for an hour. 5) Squeeze out excess water with hands. 6) Dry it in direct sunlight for a day. 7) Now coco peat is ready. 	<p>Carbon/Nitrogen: Ratio of between 90:1 and 110:1.</p> <p>This, combined with coir's lignin content, makes it a good long-term growing medium.</p>	
Neem oil cake	<ol style="list-style-type: none"> 1) Take 2 kg of neem seed and extract the oil. From the remaining we will get 1.8 kg of neem cake. 2) Then take 1kg of neem oil cake with 5 litre of water and soak it. 3) Keep the same for 5 to 7 days. 4) After completing 7th days mix with the proportion of 1:5 (Pulp + water) and apply to the greens 	<p>Nitrogen content percentage % ratio for this manure is N:P:K = 6.3 : 3 : 2.2.</p>	

<p>Cow dung</p>	<p>1) Spread it out in full sun for 2 to 3 days.</p> <p>2) Next take a big container with lid and keep broken down manure pieces and fill it with water.</p> <p>3) Now we will get manure like consistency</p>	<p>The ratio of 3:1, it mainly consists of lignin, cellulose and hemicelluloses.</p> <p>It also contains 24 different minerals like nitrogen, potassium, along with trace amount of Sulphur, iron, magnesium, copper, cobalt and manganese from cow dung.</p>	
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Steps to growing greens in grow bags

- 1) Grow bags filled with organic fertilizers
- 2) Sowing the seeds in grow bags

1) Grow bags filled with organic fertilizer



Plate 3: Grow Bags Filled With Organic Fertilizer

The grow bags were filled with selected organic fertilizer which are cow dung, red soil, coir pith along with neem oil cake and groundnut oil cake.

2) Sowing the seeds in grow bags



Plate 4: Sowing the Seeds in Grow Bags

Totally ten grow bags were selected with the dimension of 20 cm X 85 cm for the study, each two for Siru keerai, Pulicha keerai, Palak, Ponnanganni and Manathakkali.. They were made of plastic. In each bag one seedling was planted and their growth was monitored.

3. Study the biometric parameters of plants

To analyse the growth of greens, two criterion were taken into consideration. One is biometric parameters which shows the-shoot length and number of leaves grown and the other one is find out the yield of greens. These were observed and noted down for every ten days of experimentation (Plate 5).



Plate 5: Study the Biometric Parameters of Plants

Phase III: Awareness on Growing Greens using Organic Fertilizer in Home Garden

Home gardening is important for reducing human carbon and eco footprints, food production, increasing property value, and providing somewhat of a lifeline for plants and animals that are becoming victims of human development. With the human population exploding, native habitats being encroached on, wildlife and their food sources dwindling, and food security problems cropping up across the globe; it is evident that home gardening can play a role in providing a lifeline to birds, insects, and wildlife that would otherwise vanish. (<https://www.activif.com/>)

Home garden is a great investment plants help us to breathe, eat and drink. Health experts recommend that we eat lots of fresh fruits and vegetables. The home garden provides the best source for these organic foods. Furthermore, garden activities such as watering, trellising, weeding, mulching, pruning and harvesting are some offer great ways to augment your daily exercise regimen. In the current world where science seems to be taking over our families, having a home garden is the surest way to teach your children about nature and healthy living. Children will love to eat what they see growing out of their gardens and they will be excited to watch the seedlings grow into mature vegetables or fruits. (Bandra,2010).

Environmental education has an effective role in creating awareness and preparing environment for the development and maintenance of human minds. This prepares the individual to become able to balance between his vital needs and the natural environment that provides spiritual, aesthetical and ethical sources for many communities. It includes both formal and informal education and training that increase human capacity and capability to participate in environmental management and in solving environmental crisis and challenges. This could be achieved by increasing awareness and effectively changing the individual outlook on the environment. We need awareness in our behavior; ethical values for protecting and conserving the environment and improving the quality of human life (Mohammed, 2006).

The need to spread environmental awareness towards organic manure and its application for the growth of greens is enormous in the context of successfully addressing environmental problems. Provision of environmental education among the

individuals and communities promote motivation to follow the technique. Greater environmental awareness will increase the scope of environmental education – as a discipline as well as inclusion of aspects of it within the scope of other disciplines (<http://www.your article library.com>).

Awareness was created to motivate the selected residents on organic manure and their effectiveness on the growth of selected greens with the following:

1. Selection of sample
2. Selection of method
3. Conduct of the programme

1. Selection of sample

Convenience sampling is a type of sampling where the first available primary data source will be used for the research without additional requirements. In other words, this sampling method involves getting participants where you can find them and typically wherever is convenient. In convenience sampling no inclusion criteria identified prior to the selection of subjects (research _methodology.net). Among the 60 houses surveyed, only 25 houses were selected.

2. Selection of method

Directly approaching the interested 25 households and explaining in detail about the result of the study on the importance of consuming greens were thought to be more effective for the proper result. Pamphlets and leaflets which explain about the importance and advantages of using organic fertilizer in home garden were prepared for distributing among these households.

3. Conduct of the programme

The training program was organized for three days during the convenient time of the selected homemakers at Ellapalayam pudhur for 25 homemakers. The course content included:

I. Pot media

- Ratio followed in mixing the ingredients of Pot media to provide the necessary aeration, drainage and water holding properties required for plant growth in a container.
- Significance of using organic fertilizer in home garden.
- How to get more yields within a limited area

II. Organic fertilizer

- Significance of organically made fertilizer
- Collection of materials and method of preparation
- Advantages as an organic fertilizer.

III. Benefits of home garden:

- Safe, pesticide-free, healthy when grown the greens organically
- Conducive to a routine of physical exercise, clean air and being close to nature
- Possibility of getting fresh greens in the home garden
- Reduce pollution
- To save the money by cultivating ones own vegetables and greens.
- Educating how the food is free of poison because of its cultivation method.

A flyer providing information about a politician's beliefs or a leaflet advertising a new vacuum cleaner are examples of a pamphlet. A small booklet of printed informational matter, often unbound, having only a paper. (www.yourdictionary.com/pamphlet). Pamphlet prepared show the step by step process of advantages of organic fertilizer, importance home garden and need for home garden. The advantages of maintaining home gardens in every home were given to the participants. They were told to distribute the pamphlets in their neighbourhood and their acquaintances and eventually create awareness among the public.

IV RESULTS AND DISCUSSION

A study was conducted to find out the “**Efficacy of Organic Fertilizer on Growth of Greens in Grow Bags**”, to cultivate five varieties of greens in the home garden and creating awareness among the selected women. The findings of the study are analyzed and presented under the following headings:

A. Household Survey

B. Experimental Study

C. Awareness Programme

A. Household Survey

The information collected from the households is discussed under the following headings:

- 1) Background Information of the family
- 2) Details on existing home garden

1) Background Information of the family

The background information of the family includes age, education, occupation, income, family size, type of family, nature of house and the materials used for the house is presented in Table 1 and Figure 3.

Table 1: Background Information of the Family

Background information	Variables	Percentage of families N = 50		Average
		Ellapalayam pudhur N= 25	Nelali N = 25	
Age (years)	20 – 30	20	20	20
	31 – 40	28	24	26
	41- 50	36	32	34
	51 – 60	16	24	20
Education	Elementary school	28	24	26
	High school	24	32	28
	Graduate	28	20	24
	Illiterate	20	24	22
Occupation	House wife	40	52	46
	Working	48	32	40
	Business	12	16	14
Family Income / month (₹)	10,000 – 20,000	16	24	20
	21,001 – 30,000	44	40	42
	31,001 – 40,000	28	20	24
	41,001 – 50,000	12	16	14
Family size	(1-3) members	32	24	28
	(4-6) members	48	60	54
	7 members	20	16	18
Type of family	Joint	32	40	36
	Nuclear	68	60	64
Nature of house	Owned	48	40	44
	Rented	52	60	56
Type of house	Individual	52	40	46
	Apartment	48	60	54

Age of people

Around 20 per cent from both the selected areas were aged between 20 – 30 years. . Nearly 26 per cent on an average was in the age group of 31-40 years found to be more prevalent than other age groups. The age group of 51-60 years were found among 20 per cent in both the areas respectively.

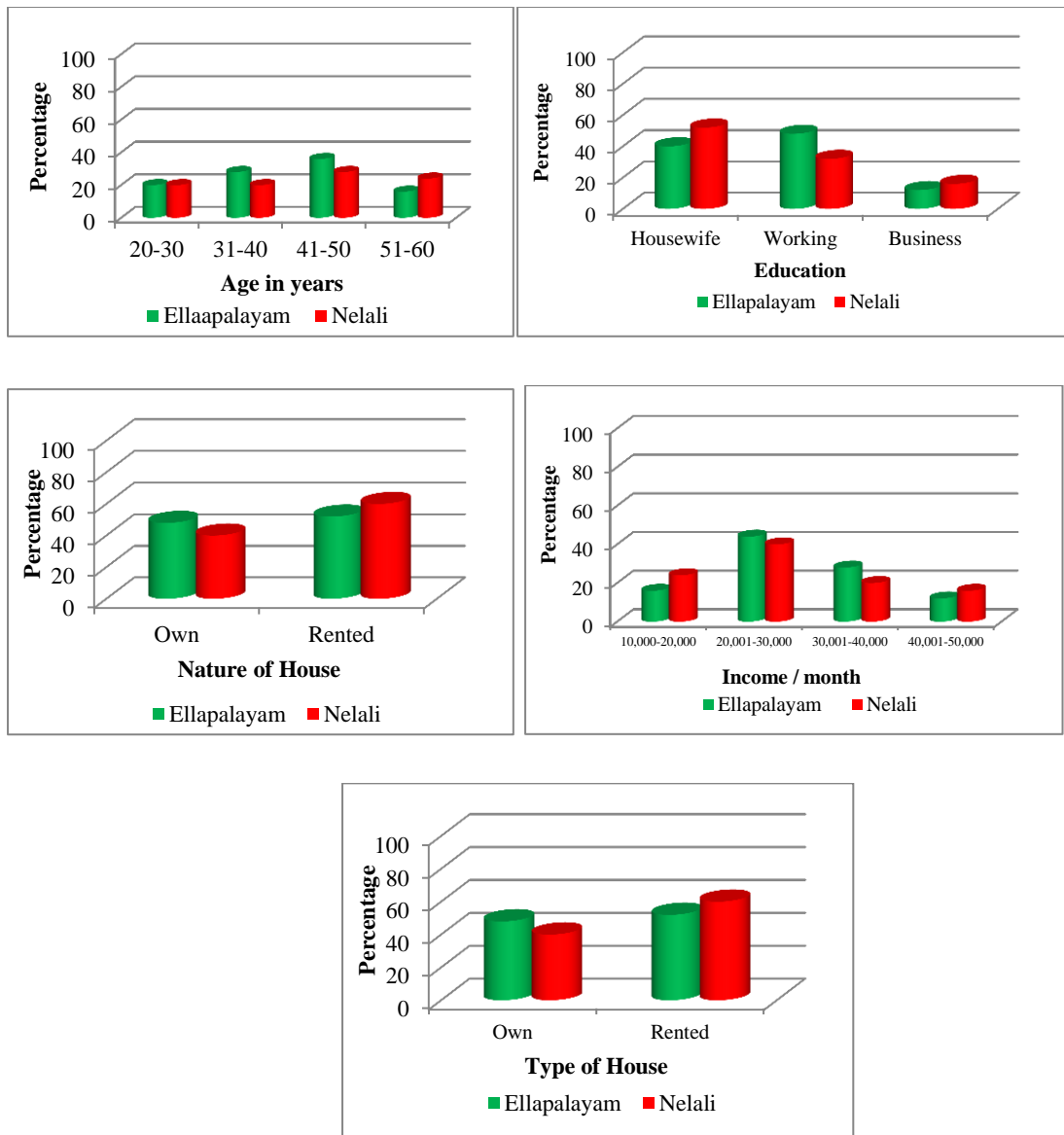


Figure 3: Background Information of the Family

Education of family members

The education of homemakers from an average was majorly elementary and higher secondary school level by 26 per cent. When 24 per cent and were graduates in both the areas, on an average 22 per cent were illiterates in these two places.

Occupation

In Ellapalayam, 48 per cent and 32 Per cent of Nelali women were working in both government and private sectors, whereas 40 Per cent and 52 Per cent were homemakers in the surveyed two areas. Only 12 per cent and 16 per cent were private workers at Ellapalayam and Nelali in maligai, departmental stores, entrepreneurs and

also owned their own tailoring shops. As majority of women were homemakers they showed interest and find time to cultivate greens. Hence they were motivated to attend the awareness programme.

Income of family

On an average 42 per cent of women from both the selected areas were earning 21,000 – 30,000 per month. They were much enthusiastic to undergo the awareness programme for the cultivation of greens using the fertilizer which comprised of neem oil cake and groundnut oil cake. An amount of 31,000 -40,000 was the monthly income for 28 per cent and 20 per cent of the members from these two areas.

Family size

On an average 54 per cent of the families were coming under medium size which constitutes 4 – 6 members. In large families the sharing of responsibilities will encourage to cultivate greens in their own households to meet their family requirements. Only 18 per cent from both the surveyed areas were living as large family with more than 7 members . Small families (1-3) were found to be only 28 per cent on an average.

Type of family

It is inferred that in Ellapalayam and Nelali, 32 per cent and 40 per cent were living in joint families while 68 per cent and 60 per cent followed nuclear family system. The concept of individual happiness and financial stability are the major reasons for increase in nuclear family norms.

Nature of house

Nature of house plays a vital role in gardening. In rented houses, the tenants may not be allowed to have their garden but in own houses they have the freedom to implement garden as per their requirements. Among the surveyed houses in Ellapalayam, 52 per cent were living in rented house and 48 per cent in own house. Whereas in Nelali, 60 per cent were residing in rented house and only 40 per cent in their own houses. Regarding the nature of house on an average 50 per cent were living in rented and another 50 per cent in their own houses.

Type of house

From the table it is clear that in Ellapalayam, 52 per cent were living in individual houses whereas 48 Per cent in the apartments. But in case of Nelali, 40 per cent are living in individual homes when compared to 60 Per cent in the apartments. In individual houses if have more space it is possible to plan the growing of vegetables and greens.

2) Details on existing home garden

A household survey was conducted among 50 houses in Ellapalayam and Nelali related to the location of the garden, type of garden, time spent for gardening, family members involvement in gardening were asked and the information provided by the households are given below.

Table 2 depicts the location of the garden.

Table 2: Location of the Garden

Location of garden	Percentage (N = 32)		Average
	Ellapalayam N = 14	Nelali N = 18	
Front of the house	33	31	32
Back yard	35	23	29
Left side of house	15	21	18
Right side of house	17	25	21

Out of 50 houses surveyed each in Ellapalayam and Nelali, 14 and 18 houses respectively had garden. Totally 32 out of 50 houses established their own garden but the remaining 18 per cent do not have any type of garden. Hence the percentage is calculated for only 32 households. Among them location of garden in front and backyard of the house was most common in 68 per cent and 32 per cent of these two selected areas. Only 15 per cent and 17 per cent in the left and right side of the house in Ellapalayam whereas among 46 per cent of Nelali people the garden was situated in left and right side of their houses. Most of the garden in the selected area is located

either in front or in backside of the houses to enhance the beauty of the surrounding and to have privacy.

Table 3 and Figure 4 represents the type of garden.

Table 3: Type of Home Garden

Type of Home garden	Percentage (N = 32)		Average
	Ellapalayam N = 14	Nelali N = 18	
Kitchen garden	40	48	44
Herbal garden	28	20	24
Terrace garden	20	16	18
Balcony garden	12	16	14

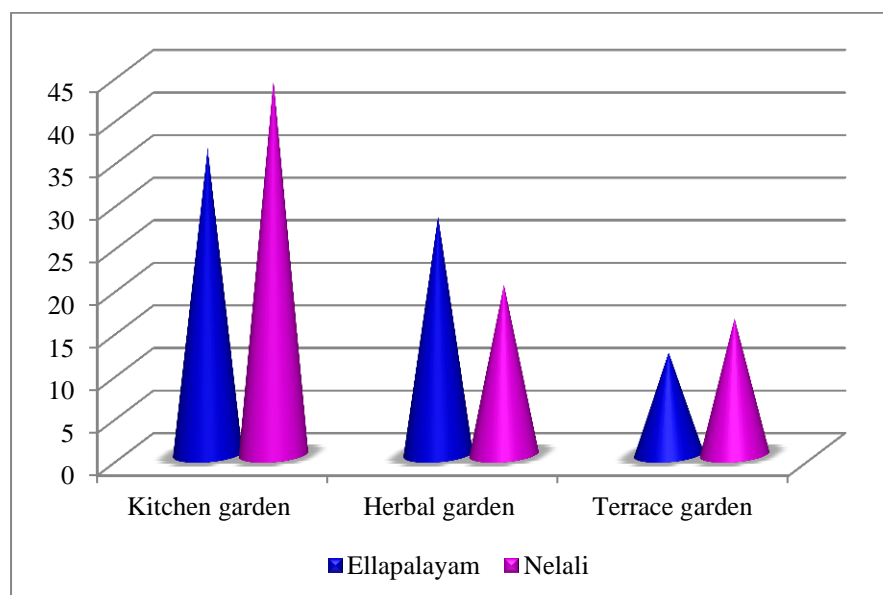


Figure 4: Type of Home Garden

A majority of (44 per cent) established kitchen garden but 24 per cent of them had herbal garden in their household they were grown greens and vegetables without using any fertilizers or growth promoters. Very meagre per cent of (nearly 18) of these families had terrace garden . In addition to these fourteen per cent of them had balcony garden in their household.

Table 4: Types of Home Garden and Vegetables and Greens Cultivated

Types of home garden	Vegetables and greens cultivated	Percentage (N=32)
Kitchen garden	Vegetables: Ladies finger, brinjal, bitter guard, green chilly, long beans. Greens; Manathakali, Drumstick, Ponnanganni	44
Herbal garden	Vegetables: Ridge guard Greens: thandu keerai, palak	24
Terrace garden	Vegetables: Tomato, radish Greens : siru keerai, coriander	18
Balcony garden	Vegetables: Capsicum, cucumber Greens: Agathi keerai, paruppu keerai	14

In kitchen garden ladies finger, brinjal, bitter guard, green chilly, long beans are the vegetables and in greens manathakali, drumstick, ponnanganni were grown by 44 per cent of people in both selected areas. And 24 per cent of them grow ridge guard, thandu keerai and palak. In terrace garden the vegetables are tomato and radish then in greens siru keerai and coriander were grown by 18 per cent. Fourteen per cent were harvested capsicum, cucumber, agathi keerai and paruppu keerai in balcony garden.

Table 5: Time Spent for Garden Activities

Time spent for garden activities	Percentage (N = 32)		Average
	Ellapalayam N = 14	Nelali N = 18	
Below 30 minutes	21	35	28
31-60 minutes	37	20	29
61 – 90 minutes	16	20	18
91 – 120 minutes	16	10	13
Above 120 minutes	10	17	12

The major garden activities include purchase of seeds, preparing the manure, watering and the like. For these activities nearly 30 -60 minutes were spent by 29 per cent of the families whereas 18 per cent were able to spare 61- 90 minutes. Above 120 minutes for the gardening operations like weeding, watering, manuring and harvesting was utilized only by 12 per cent.

Table 6: Period of Maintaining the Garden

Period of maintaining the garden	Percentage (N = 32)		Average
	Ellapalayam N = 14	Nelali N = 18	
0-1 year	47	25	36
2-3 years	21	35	28
4-5 years	16	15	16
Above 5 years	16	25	20

Majority of them (36 per cent) had garden to grow greens, vegetables and herbal plants for the past one year. Almost 28 per cent were having their garden for 2-3 years and above five years by 20 per cent.

Table 7: Family Members Involvement in Garden Activities

Involvement of family members	Variables	Percentage (N = 32)		Average
		Ellapalayam N = 14	Nelali N = 18	
Purchase of seeds and seedlings	House wife	16	20	18
	Head	42	30	36
	Children	26	25	25
	Others	16	25	21
Watering	House wife	37	40	38.5
	Head	16	15	15.5
	Children	31	25	28
	Others	16	20	18
Weeding	House wife	26	25	25.5
	Head	37	30	33.5
	Children	21	20	20.5
	Others	16	25	20.5
Preparation of manure	House wife	34	40	37
	Head	26	15	20.5
	Children	25	20	22.5
	Others	15	25	20
Purchase of manure and other materials	House wife	16	10	13
	Head	42	35	38.5
	Children	21	30	25.5
	Others	21	25	23
Others (picking the litters, planting, sowing seeds)	House wife	26	30	28
	Head	16	20	18
	Children	37	25	31
	Others	21	25	23

i. Purchasing and watering

For purchase of seeds and seedlings majorly 36 per cent of head and 42 per cent and 26 per cent of children were involved eighteen per cent each of homemakers and other members such as grandfather and grand mother (21 per cent) on an average are involved for the same. Regarding watering nearly 39 per cent of

housewives were involved. Next to that children at an average of 28 per cent did watering of plants. Whereas 18 per cent and 16 per cent of watering was carried out by elderly persons and children.

ii. Weeding

On an average, nearly 34 Per cent of head, 26 Per cent of home makers, 20 per cent of children, and another 20 Per cent of others were involved in weeding.

iii. Preparation of manure

From the table 7, it is obvious that in Ellapalayam, 37 Per cent of housewife, 26 Per cent of head per cent of others such as grandfather and grandmother are taking part in preparation of manure. In 25 Per cent and 40 per cent of home makers and grandfather as well as grandmother, 20 Per cent of children and 15 Per cent of head are taking part in preparation of manure.

iv. Purchase of manure

For the purchase of required materials majority of 39 per cent was by the head of the family followed by 26 per cent of their children .When 23 per cent of other members (grand father) showed interest towards the purchase of other materials. Only 13 per cent of home makers were involved in such activities

v. Other activities

At the average of 31 Per cent of children, 28 Per cent of housewife and 21 Per cent of others (gardener) and 18 Per cent of head of family were involved in other garden activities like picking the litters, sowing seeds, plantation of saplings etc.

Establishment of home garden

This particular aspect includes space availability, usage of organic fertilizer, source of purchase and training attended.

Table 8: Availability of Space for Home Garden

Availability of space in home (Sq.ft.)	Percentage N = 32		Average
	Ellapalayam N = 14	Nelali N = 18	
<500	26	30	28
501 – 800	21	20	21
801 – 1100	21	20	20
1101-1400	21	10	16
>1400	10	20	15

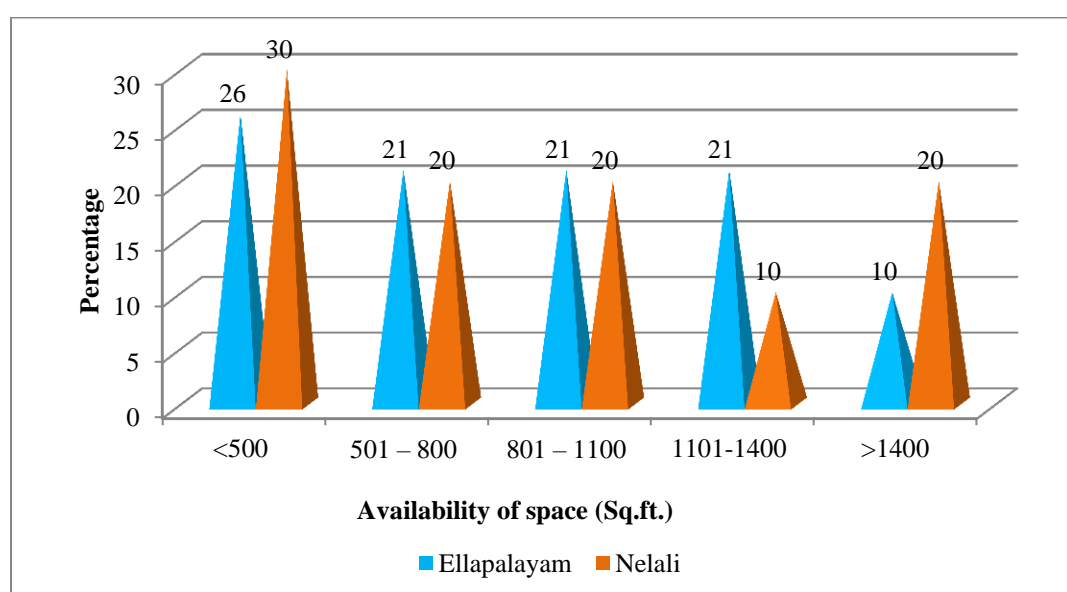


Figure 5: Availability of Space for Home garden

Among surveyed families, most of them 28 Per cent on an average had within 500 square feet only. Whereas 21 and 20 per cent utilized the area between 500-800 sq.ft for cultivation of vegetables, greens other fruits and herbal plants. In this five per cent of the households only more than 1400 sq.ft area is available.

Organic fertilizer

During survey it was understood that only 4 houses (10 per cent) applied organic fertilizer. Majority of them preferred kitchen waste as an organic fertilizer as it can be easily utilized for plants because it is available free of cost . Also they had the feeling that it is an environment friendly method . Very meager (7 per cent) in both the selected areas used vermicompost as manure.

Source of purchase

The compost for the cultivation of vegetables and greens was purchased from the shops because it is readily available in the shops. In addition to that they are also not aware of the method of preparation. They came to know that if prepared by themselves that it is time consuming also. The major source to purchase organic fertilizer by 36 per cent was from nursery, followed by 33 per cent from organic shops, and 13 per cent used online as the source for purchase, whereas 15 per cent from other sources such as directly from farmers and organic fertilizer shops.

Training attended

Among 50 surveyed households , only two of them (4 per cent) have attended training related to organic cultivation of vegetables and greens. Nearly 22 per cent were much aware of organic method of cultivation for which the knowledge was gained from friends and relatives, neighbours, you tube, newspapers and magazines. The remaining 36 per cent were not aware of any natural method especially groundnut and neem oil cake. Based on this, for these group of women awareness on preparation of manure and utilization of the same for plant growth was found to be essential.

3) Opinion on consumption of greens

Under this heading frequency of consuming greens is dealt in detailed in the following Table 9 it indicates how often the members of the family consume greens.

Table 9: Consumption of Greens

Consumption of greens (time period)	Percentage N = 50		Average
	Ellapalayam N = 25	Nelali N = 25	
Weekly once	28	24	26
Weekly twice	20	28	24
Once in 15 days	12	20	16
Once in a month	12	16	14
Others (without any time period)	8	12	10

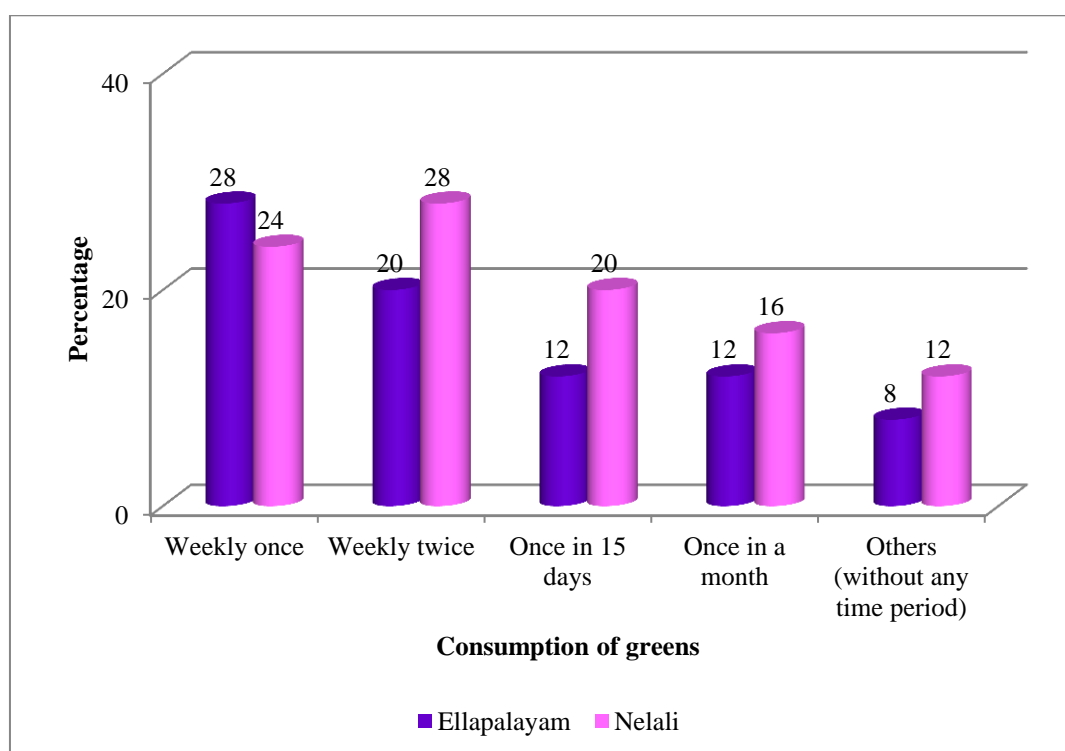


Figure 6: Consumption of Greens

From the above mentioned table it is clear that 26 per cent and 24 per cent of them consumed greens only once and twice in a week. Intake of greens 14 per cent once in a month and 16 per cent once in 15 days among the surveyed families were noted. As they are not aware of importance of greens they should be motivated to include in their diet atleast weekly thrice because it would help to prevent anaemia and thereby promote good health as they are not aware of importance of greens. Once if an attempt is made to educate them by creating awareness as well as if they

cultivate variety of greens definitely these groups can be made to consume greens frequently.

At the time of collecting information the respondents expressed the reasons for the consumption of greens in their diet which is depicted in Table 10.

Table 10: Reasons to Consume Greens

Reasons to Consume green	Percentage N = 50		Average
	Ellapalayam N = 25	Nelali N = 25	
Iron rich	20	16	18
High Fiber content and vitamins	10	8	9
Available at reasonable cost	28	18	23
Easy to grow	14	24	19
Rich in calcium, Beta carotene and vitamin c	8	10	9
Available in their home garden and farm	20	24	22

Availability of greens at reasonable cost among 23 per cent and its easy growing methods as well as short duration of harvest by 19 per cent were the major reasons expressed by the home makers for consumption of greens in their diet. Among the 22 per cent who nurture kitchen garden and also have agricultural land expressed that they could use the greens from their own garden. Eighteen per cent were of the opinion that the greens are rich in iron and hence they should be consumed in different forms. Each 9 per cent realized the fact that greens have high fiber content and vitamins as well as rich in Beta carotene, calcium and vitamin C.

Source of purchasing greens

Table 11 and Figure 8 projects the source from which the selected home makers purchase greens.

Table 11: Source of Purchase of Greens

Source of purchase	Percentage N = 50		Average
	Ellapalayam N = 25	Nelali N = 25	
Organic shop	16	-	8
Market	48	52	50
Street vendors	12	20	16
Ulavarsanthai	24	28	26

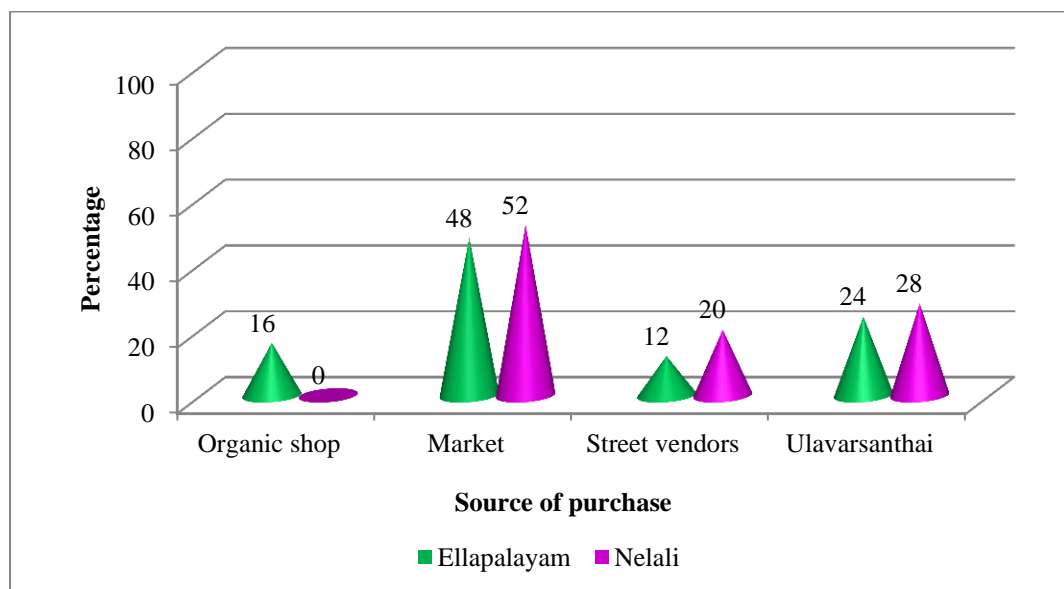


Figure 7: Source of Purchase of Greens

On an average 50 per cent of the selected people from both the areas purchased from the market due to its reasonable cost and nearness to their residence. Ulavarsanthai was the next source of purchase for 26 per cent. Few families also purchased from organic shops (8 per cent) since they are aware of the importance of consuming organic vegetables was consider as other reason for purchase of these

vegetables and greens by limited number of people. Only 16 per cent purchased from the street vendors if fresh greens are not available from other sources and also due to time constraint.

Table 12: Types of Greens used in Diet

Types of greens used in diet	Percentage N = 50		Average
	Ellapalayam N = 25	Nelali N = 25	
Siru keerai	20	28	24
Pulicha keerai	16	16	16
Ponnanganni	12	4	8
Drumstick	32	36	34
Palak	12	8	10
Manathakali	28	8	18

* Multiple responses

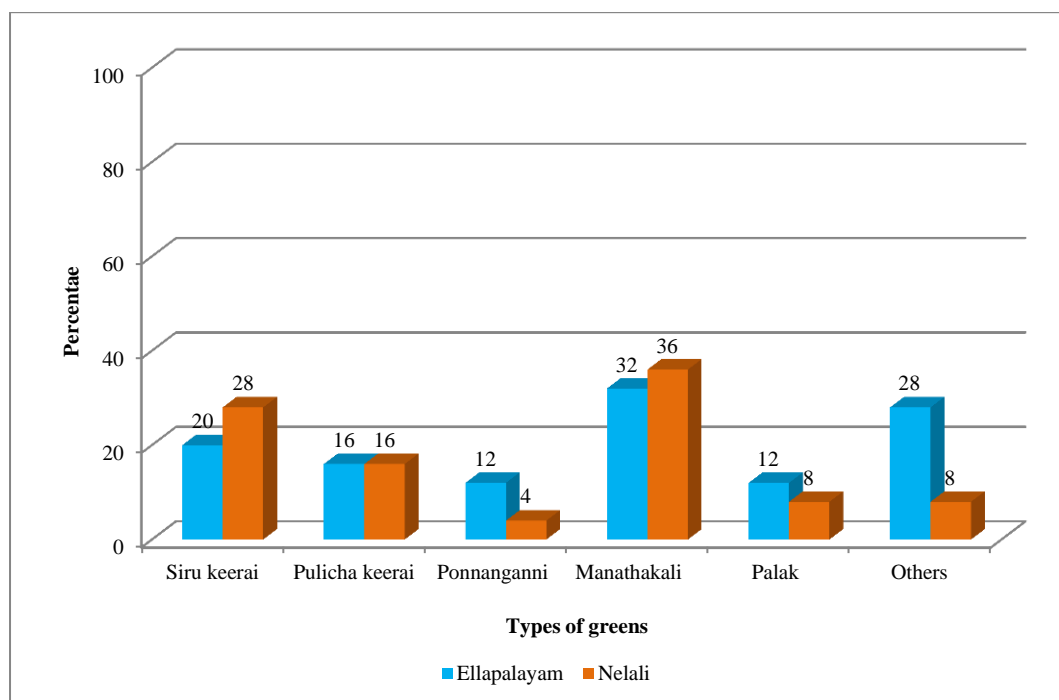


Figure 8: Types of Greens used in Diet

The greens such as drumstick (34 per cent) and siru keerai (24 per cent) was consumed at higher percentage by selected families as they could prepare more recipes in their diet and also it is available in these areas. And these people realized

much of the medicinal values of manathakali (curing Ulcer) eighteen percent have consumed. Sixteen per cent consumed pulicha keerai. Other variety of greens like red spinach, agathi, mola keerai, fenugreek leaves was consumed by majority of them. Only 10 per cent and 8 per cent added palak and ponnanganni in their food pattern.

B. Experimental Study

During household survey it was understood that the selected women were interested to cultivate greens in their home to meet the partial requirement of their family members. Hence the researcher carried out the experiment to determine the effectiveness of growing greens in an organic fertilizer.

In order to assess the growth of greens, the parameters used for the experiment is given below:

1. Number of leaves and shoot length
2. Yield of greens

1. Number of leaves and shoot length

The influence of two different organic fertilizers was studied to analyze the growth of Siru keerai, Pulicha keerai, Palak, Manathakkali and Ponnanganni keerai selected for the experiment. The shoot length and number of leaves from each greens was examined for every 10 days until it reached its maximum growth.

Parameters of siru keerai

Table 13 indicates the shoot length and number of leaves produced by siru keerai.

Table 13: The Parameters of Siru Keerai

Organic Fertilizer	Growth analysis of siru keerai(inches) /10 days							
	0 – 10		11-20		21- 30		31-40	
	Shoot length	No of leaves	Shoot length	No of leaves	Shoot length	No of leaves	Shoot length	No of leaves
T1	10	8	13	12	18	18	35	26
T2	10	11	16	23	20	31	40	33

*T1 - Groundnut oil cake+ coco peat + cow dung + soil

**T2 - Neem oil cake+ coco peat + cow dung + soil

The data on shoot length of siru keerai on 10th day was found to be 10 cm in both the mediums. On 20th day and 30th day an increased in shoot length of 3 inches and 2 inches was observed in groundnut oil cake medium (T1).The same enhanced shoot length of 5 inches in T2 on 40th day proved its effectiveness. When number of leaves are taken into consideration there was gradual increase from 8 to 11 leaves on 10th day followed by sudden increase of 12 to 23 leaves on 20th day in (T2) which consisted of neem oil cake.It was observed that the number of leaves with same manure increased from 18 to 31 and 26 to 33 on the 30th and 40th day. Hence it could be concluded that neem oil cake gives better result in both shoot length and number of leaves for siru keerai compared to groundnut oil cake. Even though shoot length remains the same on 10th day in both the manures, 20th to 40th day showed an increase in shoot length of 2 to 5 inches for the siru keerai grown in neem oil cake. Even incase of number of leaves compared to T1 , T2 showed better result. Gradually the number of leaves increased to 3 and 11 on 10th and 20th day to 13 leaves on 30th and 40th day respectively.

Table 14: The Parameters of Pulicha Keerai

Organic fertilizer	Growth analysis of pulicha keerai(inches) / 10 days							
	0 – 10		11-20		21- 30		31-40	
	Shoot length	No of leaves	Shoot length	No of leaves	Shoot length	No of leaves	Shoot length	No of leaves
*T1	10	6	11	13	16	18	33	30
**T2	10	9	12	18	24	26	38	36

The shoot length of pulicha keerai on 10th day remains the same. But it gradually increased on every 10 days which was found to be 12, 24 and 38 inches respectively in T2 manure when compared to T1 was 11,16 and 33 inches. When compared with to other days only on 30th day a difference of 8 inches was noticed in T2. Whereas only 1 inch and 5 inches variation was seen on 20th and 40th day.

Regarding the number of leaves also there was progressive increase on every 10 days among the two organic fertilizers. Increase in number of leaves on 10th and 20th day in T2 was (6-9) and (13-18) in T2 followed by 18-26 and 30-36 on 30th and 40th day. On the whole there was a decrease in number of leaves in T1 than that of T2 .Among the two treated fertilizers, the one with neem oil cake showed an increased shoot length and number of leaves than that of groundnut oil cake in pulicha keerai. The increased difference in shoot length was 1inch,8inches and 5inches on 20th,30th and 40th day duration, whereas among the number of leaves it showed 3,5,8 and 6 leaves respectively on 10th,20th,30th and 40th day in T2.

Table 15: The Parameters of Palak

Organic fertilizer	Growth analysis of palak(inches) /10 days							
	0 – 10		11-20		21- 30		31-40	
	Shoot length	No of leaves	Shoot length	No of leaves	Shoot length	No of leaves	Shoot length	No of leaves
T1	7	4	9	12	15	16	31	28
T2	8	6	10	16	22	25	37	34

The shoot length of palak in T1 (groundnut oil cake) on day 10th was 7 inches showing an increase of 8 inches on T2. The same increased shoot length was seen in above table (6 inches) and (7 inches) during 20th to 40th day. In T2 both shoot lengths gradually increased on day 21 and 30 its length is 15 and 22. And on 31 to 40 days by using neem oil cake it is slightly increased in neem oil cake. On 10th to 20th day in palak only one inch increase in shoot length and on 30th and 40th day 6 and 7 inches was noted in neem oil cake as medium than that of groundnut oil cake.

When number of leaves are taken into consideration, there was gradual increase from 4 to 6 on 10th day and 12 to 16 on 20th day was seen between T1 and T2. On 30 and 40th day the same increase was noted as (16 -25) and (28 -34). Even in palak the performance of neem oil cake showed an increase shoot length and number of leaves than that of groundnut oil cake. To prove this it is concluded that an increase in shoot length of 1 inch to 4 inches in T2 between 0-20 days and 9 inch on 21 to 30 days as well as 6 inch on 31 to 40 days was noted. With regard to number of leaves also in T2 an increase of 6,16,25,34 was noted when compared to T1 was 4,12,16 and 28 showing a difference of 2,4,9 and 6 leaves.

Table 16: The Parameters of Manathakali

Organic fertilizer	Growth analysis of manathakali(inches)/ 10 days							
	0 – 10		11-20		21- 30		31-40	
	Shoot length	No of leaves	Shoot length	No of leaves	Shoot length	No of leaves	Shoot length	No of leaves
T1	10	6	11	10	15	18	31	34
T2	10	4	9	8	13	15	25	28

The data on shoot length of manathakali on 10th day was found to be the same (10inches) in both the treatments but for the each 10 consecutive days, the increase in shoot length was noticed in groundnut oil cake 2 inches each on 20th and 30th day. But on 40th day it was 6 inches. Compare to neem oil cake,only in manathakali the groundnut oil cake will give better result.

When number of leaves are taken into consideration,treated with groundnut oil cake was found to be effective showing there was a gradual increase of 2,2,3 showed on 10th,20th and 30th day but on 40th day an increase of 6 leaves was noted in T1 treated with groundnut oil cake. So it could be inferred that manathakali will bring about better result in groundnut oil cake than that of neem oil cake.

Table 17: The Parameters of Ponnanganni

Organic fertilizer	Growth analysis of ponnanganni(inches) /10 days							
	0 – 10		11-20		21- 30		31-40	
	Shoot length	No of leaves	Shoot length	No of leaves	Shoot length	No of leaves	Shoot length	No of leaves
T1	10	6	11	13	16	18	33	30
T2	10	9	12	18	24	26	38	36

Shoot length of ponnanganni remains the same on 10th day in both the fertilizers. This has gradually increased on 20th day with 1 inch and 40th day was 5 inches in T2. But a vast difference of 8 inches was noticed on 30th day in which consist of neem oil cake. Compared with the neem oil cake, shoot length was increased to certain extent of (1 -5 inches) on 20th and 40th day 5 inches difference was noticed 30th day.

Incase of number of leaves also there was a difference of (6-9inches),(13-18 inches) on 10th and 20th day respectively in T2. On 30th and 40th day an increase in number of leaves were between 18 -26 and 30 -36 respectively in these two fertilizers. When compared with groundnut oil cake with that of neem oil cake the difference was 3-5 leaves during their growth period of 20-30 days but after 30 days the number of leaves were found to be nearly 20.

Table 18: Average Shoot Length of Selected Greens

Name of the greens	Shoot length		Number of leaves	
	T1	T2	T1	T2
Siru keerai	19	21.5	18	24.5
Pulicha keerai	17.5	21	19	22
Palak	15.5	19.25	15	20
Manathakali	16.75	14.25	17	14
Ponnanganni	17.5	21	19	22

It is evident from above table that when noted the shoot length and number of leaves were noted among the five selected greens T2 treated organic manure which consisted of neem oil cake was more potent than that of T1 manure with groundnut oil cake. Except manathakali in T2 than T1, rest of the greens showed increase among these two parameters for the manure treated with neem oil cake.

Among the five selected greens siru keerai had shown increased growth both on shoot length (21.5 and number of leaves (24.5) in T2. Next to this pulicha keerai and ponnanganni showed the same shoot length (21 inches) whereas number of leaves was noticed as 22 in treated with neem oil cake .

Yield of greens

Yield from greens selected for the experiment was measured for every 15 days and it is shown in the Table 19.

Table 19: Yield of Greens

Variables	Yield of greens					
	T1			T2		
	0-15 days	16-30 days	31-45 days	0-15 days	16-30 days	31-45 days
Siru keerai	70g	120g	250g	130g	220g	340g
Pulicha keerai	40g	100g	230g	150g	210g	400g
Palak	80g	140g	230g	170g	330g	415g
Manathakali	150g	120g	250g	80g	140g	230g
Ponnanganni	90g	150g	285g	130g	250g	320g

When the greens cultivated during experiment was calculated for every 15 days, the total yield on 45th day was between 370-525 grams in T1 which consist of groundnut oil cake. Whereas in T2 an increase in difference was between 450 – 700 grams. There was a difference of 80 -170 grams between these two organic fertilizers. Hence it could be conclude that yield was found to be more in neem oil cake medium than groundnut oil cake.

C. Awareness Programme

After the experiment being carried out, 30 women were educated and created awareness to practice this concept in their home garden. The outcomes of the awareness programme is presented under the following Table 20.

**Table 20: Knowledge Gained by the Sample Before and After
Awareness Programme**

S.No.	Variables	Response of the sample (%)	
		Before	After
1	Lower the carbon footprints	45	98
2	Develop skill in preparation of organic fertilizer	10	90
3	Reduces the cost of the greens	40	98
4	Improve the health when fresh greens are consumed	30	92
5	Availability of greens in all period	25	94
6	Reduce gas emission on land fills	35	97
7	Reduces the need for chemical fertilizers	10	92
8	Enrich soil and retain moisture	15	97
9	Organically growing our own greens is sustainable	43	96
10	Organic growth promoters are easily biodegradable	20	95

After the awareness programme, it was came to know that women gained knowledge on the effective use of organic fertilizer for the home garden. Majority (98%) agreed that it will reduce the cost of the greens and easily available . It was found that 45 % of the women knew that using basic pot culture containing red soil, cow dung, coir pith, along with organic manure of groundnut oil cake and neem oil cake will help to increase the greens growth. Nearly 30 per cent and 43 per cent knew that fresh greens will improve health and sustainability. Consuming organic fresh greens will be beneficial to health was agreed by 97 per cent.

The selected group had 10 - 45 per cent of knowledge on the above mentioned topic before the awareness programme. But their knowledge was enhanced to the level of 90 - 98 per cent after the awareness being created.

V SUMMARY AND CONCLUSION

In those days many of them especially those who are living in rural areas had an opportunity to grow greens and vegetables in their own farm . Even they supply these to their neighbors . At present many of them are aware of the nutritional significance of greens. But in cities and main towns due to scarcity of land, unable to cultivate the greens . Hence they have to purchase from market or street vendors which were grown in unhygienic environment that leads to some health problem.They can grow healthy greens for their family using organic fertilizer which comprised of groundnut and neem oil cake,coco peat, cow dung, which is the formulated organic fertilizer for this research. As an alternative to this problem, one can grow their own preferred greens in their households using available containers, pots, bags, bucket etc. To enhance growth from the health and environment point of view it is the need of an hour to develop home gardening which is more sustainable.The aim of this study is to investigate the “**Efficacy of Organic Fertilizers for Growth of Greens in Grow bags**” with the following objectives: To

- Perform household survey to identify the type of greens cultivated
- Carry out trial experiment on selected greens in grow bags
- Find out the growth parameters of greens
- Conduct training programs for the selected home makers.

The findings of the study are analyzed and presented under the following headings:

A. Household Survey

B. Experimental Study

C. Awareness Programme

A. Household Survey

The information collected from the households is discussed under the following headings:

- 1) Background Information of the family
- 2) Details on existing home garden

Around 20 per cent from both the selected areas were aged between 20 – 30 years. . Nearly 36 per cent residing at Ellapalayam and 28 per cent at Nelali was in the age group of 31-40 years found to be more prevalent than other age groups.

The education of homemakers from Ellapalayam and Nelali was majorly elementary and higher secondary school level by 52 per cent and 56 per cent. When 28 per cent and 20 per cent were graduates in Ellapalayam and Nelali, 20 and 24 per cent were illiterates in these two places.

In Ellapalayam, 48 per cent and 32 Per cent of Nelali women were working in both government and private sectors, whereas 40 Per cent and 52 Per cent were homemakers in the surveyed two areas. As majority of women were homemakers they showed interest and find time to cultivate greens. Hence they were motivated to attend the awareness programme.

On an average 42 per cent of women from both the selected areas were earning 21,000 – 30,000 per month. They were much enthusiastic to undergo the awareness programme for the cultivation of greens using the fertilizer which comprised of neem oil cake and groundnut oil cake.

On an average 54 per cent of the families were coming under medium size which constitutes 4 – 6 members. . Only 18 per cent from both the surveyed areas were living as large family with more than 7 members . Small families (1-3) were found to be only 28 per cent on an average.

It is inferred that in Ellapalayam and Nelali, 32 per cent and 40 per cent were living in joint families while 68 per cent and 60 per cent followed nuclear family system. The concept of individual happiness and financial stability are the major reasons for increase in nuclear family norms.

Nature of house plays a vital role in gardening. In rented houses, the tenants may not be allowed to have their garden but in own houses they have the freedom to implement garden as per their requirements. Regarding the nature of house on an average 50 per cent were living in rented and another 50 per cent in their own houses.

2) Details on existing home garden

A household survey was conducted among 50 houses in Ellapalayam and Nelali related to the location of the garden, type of garden, time spent for gardening, family members involvement in gardening were asked.

At the average of 31 Per cent of children, 28 Per cent of housewife and 21 Per cent of others (gardener) and 18 Per cent of head of family were involved in other garden activities like picking the litters, sowing seeds, plantation of saplings etc.

Out of 50 houses surveyed each in Ellapalayam and Nelali, 14 and 18 houses respectively had garden. Totally 32 out of 50 houses established their own garden but the remaining 18 per cent do not have any type of garden. Hence the percentage is calculated for only 32 households. Among them location of garden in front and backyard of the house was most common in 68 per cent and 32 per cent of these two selected areas.

Regarding the type of garden a majority of (44 per cent) established kitchen garden but 24 per cent of them had herbal garden in their household they were grown greens and vegetables without using any fertilizers or growth promoters. Very meagre per cent of (nearly 18) of these families had terrace garden .

The major garden activities include purchase of seeds, preparing the manure, watering and the like. For these activities nearly 30 -60 minutes were spent by 29 per cent of the families. Above 120 minutes for the gardening operations like weeding, watering, manuring and harvesting was utilized only by 12 per cent.

Majority of them (36 per cent) had garden to grow greens, vegetables and herbal plants for the past one year. Almost 28 per cent were having their garden for 2-3 years and above five years by 20 per cent.

For purchase of seeds and seedlings majorly 36 per cent of head and 42 per cent and 26 per cent of children were involved. Eighteen per cent each of homemakers and other members such as grandfather and grand mother (21 per cent) on an average are involved for the same. Whereas 18 per cent and 16 per cent of watering was carried out by elderly persons and children. On an average, nearly 34 Per cent of head, 26 Per cent of home makers, 20 per cent of children, and another 20 Per cent of others were involved in weeding.

It is obvious that in Ellapalayam, 37 Per cent of housewife, 26 Per cent of head per cent of others such as grandfather and grandmother are taking part in preparation of manure. In 25 Per cent and 40 per cent of home makers and grandfather as well as grandmother, 20 Per cent of children and 15 Per cent of head are taking part in preparation of manure.

For the purchase of required materials majority of 39 per cent was by the head of the family followed by 26 per cent of their children. Only 13 per cent of home makers were involved in such activities.

At the average of 31 Per cent of children, 28 Per cent of housewife and 21 Per cent of others (gardener) and 18 Per cent of head of family were involved in other garden activities like picking the litters, sowing seeds, plantation of saplings etc.

Establishment of home garden

This particular aspect includes space availability, usage of organic fertilizer, source of purchase and training attended.

Among surveyed families, most of them 28 Per cent on an average had land area within 500 square feet only. Whereas 21 and 20 per cent utilized the area between 500-800 sq.ft for cultivation of vegetables, greens other fruits and herbal plants. For 5 per cent of the households only more than 1400 sq.ft area is available.

During survey it was understood that only 4 houses (10 per cent) applied organic fertilizer. Majority of them preferred kitchen waste as an organic fertilizer as it can be easily utilized for plants because it is available free of cost. Very meager (7 per cent) in both the selected areas used vermicompost as manure.

The major source to purchase organic fertilizer by 36 per cent was from nursery, followed by 33 per cent from organic shops, and 13 per cent used online as the source for purchase, whereas 15 per cent other sources such as directly from farmers and organic fertilizer shops.

Among 50 surveyed households, only two of them (4 per cent) have attended training related to organic cultivation of vegetables and greens. Nearly 22 per cent were much aware of organic method of cultivation for which the knowledge was gained from friends and relatives, neighbours, you tube, newspapers and magazines.

The remaining 36 per cent were not aware of any natural method especially groundnut and neem oil cake.

Twenty six per cent and twenty four per cent of them consumed greens only once and twice in a week. Intake of greens by 14 per cent once in a month and 16 per cent once in 15 days among the surveyed families were noted.

The major reasons expressed by the home makers for consumption of greens in their diet availability of greens at reasonable cost among 23 per cent and its easy growing methods as well as short duration of harvest by 19 per cent. Each 9 per cent realized the fact that greens have high fiber content and vitamins as well as rich in Beta carotene, calcium and vitamin c.

On an average 50 per cent of the selected people from both the areas purchased from the market due to its reasonable cost and nearness to their residence. Ulavarsanthai was the next source of purchase for 26 per cent. Only 16 per cent purchased from the street vendors if fresh greens are not available from other sources and also due to time constraint.

The greens such as drumstick (34 per cent) and siru keerai (24 per cent) was consumed at higher percentage by selected families as they could prepare more receipies in their diet and also it is available in these areas. Only 10 per cent and 8 per cent added palak and ponnanganni in their food pattern.

B. Experimental Study

During household survey it was understood that the selected women were interested to cultivate greens in their home to meet the partial requirement of their family members. Hence the researcher carried out the experiment to determine the effectiveness of growing greens in two different organic fertilizers.

In order to assess the growth of greens, the parameters used for the experiment is given below:

1. Number of leaves and shoot length
2. Yield of greens

1. Number of leaves and shoot length

The influence of two different organic fertilizers (groundnut oil cake and neem oil cake) was studied to analyze the growth of Siru keerai, Pulicha keerai, Palak, Manathakkali and Ponnanganni keerai selected for the experiment. The shoot length and number of leaves from each greens was examined for every 10 days until it reached its maximum growth.

Siru keerai

It could be concluded that neem oil cake gives better result in both shoot length and number of leaves for siru keerai compared to groundnut oil cake. Even though shoot length remains the same on 10th day in both the manures, 20th to 40th day showed an increase in shoot length of 2 to 5 inches for the siru keerai grown in neem oil cake. Even incase of number of leaves compared to T1 , T2 showed better result. Gradually the number of leaves increased to 3 and 11 on 10th and 20th day to 13 leaves on 30th and 40th day respectively.

Pulicha keerai

Among the two treated fertilizers, the one with neem oil cake showed an increased shoot length and number of leaves than that of groundnut oil cake in pulicha keerai. The increased difference in shoot length was 1inch,8inches and 5inches on 20th,30th and 40th day duration, whereas among the number of leaves it showed 3,5,8 and 6 leaves respectively on 10th,20th,30th and 40th day in T2.

Palak

On 10th to 20th day in palak only one inch increase in shoot length and on 30th and 40th day 6 and 7 inches was noted in neem oil cake as medium than that of groundnut oil cake. To prove this it is concluded that an increase in shoot length of 1inch to 4inches in T2 between 0-20 days and 9inch on 21 to 30 days as well as 6inch on 31 to 40 days was noted. With regard to number of leaves also in T2 an increase of 6,16,25,34 was noted when compared to T1 was 4,12,16 and 28 showing a difference of 2,4,9 and 6 leaves.

Manathakali

The data on shoot length of manathakali on 10th day was found to be the same (10inches) in both the treatments but for the each 10 consecutive days, the increase

in shoot length was noticed in groundnut oil cake 2 inches each on 20th and 30th day. But on 40th day it was 6 inches. When number of leaves are taken into consideration, treated with groundnut oil cake was found to be effective showing there was a gradual increase of 2,2,3 showed on 10th,20th and 30th day but on 40th day an increase of 6 leaves was noted in T1 treated with groundnut oil cake.

Ponnanganni

Shoot length of ponnanganni remains the same on 10th day in both the fertilizers. Compared with the neem oil cake, shoot length was increased to certain extent of (1 -5 inches) on 20th and 40th day 5 inches difference was noticed 30th day. When compared with groundnut oil cake with that of neem oil cake the difference was 3-5 leaves during their growth period of 20-30 days but after 30 days a vast difference in the number of leaves were found to be nearly 20.

Only in manathakali the groundnut oil cake was effective than neem oil cake on shoot length and number of leaves rest of the greens showed enhanced growth among these two parameters in neem oil cake.

Average of five greens

It is evident from above table that when noted the shoot length and number of leaves among the five selected greens T2 treated organic manure which consisted of neem oil cake was more potent than that of T1 manure with groundnut oil cake. Among the five selected greens siru keerai had shown increased growth both on shoot length (21.5 and number of leaves (24.5) in T2. Next to this pulicha keerai and ponnanganni showed the same shoot length (21 inches) whereas number of leaves was noticed as 22 in treated with neem oil cake .

During experiment yield of greens was calculated for every 15 days until it reach 45 days. The total yield on 45th day was between 370-525 grams in T1 which consist of groundnut oil cake. Whereas in T2 an increase in difference was between 450 – 700 grams. There was a difference of 80 -170 grams between these two organic fertilizers. Hence it could be conclude that yield was found to be more in neem oil cake medium than groundnut oil cake.

Awareness programme

After the awareness programme, it was came to know that women gained knowledge on the effective use of organic fertilizer for the home garden. Majority (98%) agreed that it will reduce the cost of the greens and easily available . It was found that 45 % of the women knew that using basic pot culture containing red soil, cow dung, coir pith, along with organic manure of groundnut oil cake and neem oil cake will help to increase the greens growth. Nearly 30 per cent and 43 per cent knew that fresh greens will improve health and sustainability. Consuming organic fresh greens will be beneficial to health was agreed by 97 per cent.

The selected group had 10 - 45 per cent of knowledge on the above mentioned topic before the awareness programme. But their knowledge was enhanced to the level of 90 - 98 per cent after the awareness being created.

Conclusion

Cultivation of greens must be encouraged among selected homemakers so that they will be available throughout the year. To achieve this kitchen garden, roof, herbal garden and balcony gardens are needed for growing using organic fertilizers. If many home makers are motivated to grow vegetables and greens on their own it has greater health benefits and also saves money as well as creates sustainable environment.

Majority of people are consuming green less than the daily recommended allowance eventhough they are available readily and fresh. Further poor knowledge of the nutritional benefits and the growing methods also made them to intake of greens to be in lesser amount. Hence the awareness given by the researcher and experts in this field can motivate women to cultivate more greens on their own.

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APPENDIX I

An Interview Schedule on Efficacy of Organic Fertilizer on Growth of Greens in Grow Bag

Background Information:

- 1) Name of the interviewer :
- 2) Name of the interviewee :
- 3) Address :
- 4) Sex :
- 5) Type of family : a) Nuclear b) Joint
- 6) Educational qualification of the respondents:
- 7) Occupation of the respondent :
- 6) Family income :
- 7) Phone number :
- 8) Email ID :

Details of the house

- 9) Type of the house
 - a) Own
 - b) Rented
 - c) Individual apartment.
 - d) Others
- 10) If apartment where is your house located ?
 - a) ground
 - b) First floor
 - c) Second floor
 - d) Others
- 11) If your house you grow greens ?
 - a) yes.
 - b) No
- 12) If yes mention the type of greens? _____

13)

Name of the greens	No. Of. Potting you have in each greens	Placement			
		Terrace	Front of the house	Sides of the house	Others

14) In which container do you grow greens?

- a) Grow bags
- b) Wooden barrels
- c) Plastic bags.
- d) Ceramic pots
- e) Plastic pots.
- f) Others

15) If you grow greens in grow bags?

- a) Yes
- b) No

16) If yes size of the grow bags do you prefer?

- a) 16×16×30 cm.
- b) 20×20×35cm
- c) 24×24×40 cm.
- d) Others

17) If you get best results while you grow greens in grow bags?

- a) Yes
- b) No

18) If yes your opinion about growing greens in grow bag?

19) Can you use any potting media for growing greens?

- a) Yes
- b) No

20) If yes what kind of pot media are you using?

- a) vermicompost.
- b) Coir compost
- c) Kitchen waste
- d) Oil cakes

- e) Wood ash f) Others

21) Are you preparing the compost yourself or purchasing from the shop?

- a) Preparing the compost yourself
b) Purchasing from the shop

A) If preparing mention the type of compost?

- a) Vermicompost. b) Kitchen waste compost
c) Leaf mold compost. d) Coir compost e) Others

B) If purchasing mention the source?

- a) Organic shops. b) Nursery
c) Krishi bhavan d) Other shops

22) The amount spent for the purchase of compost per month?

- a) Below 100 b) between 100 and 300
c) Above 300. d) Above 500

Maintenance

23) How often do you water the greens?

	During summer		During winter	
	Morning	Evening	Morning	Evening
Frequently				
Daily twice				
Daily once				
Weekly				

24) How often do you apply manure?

- a) Once a month. b) Once in two months
c) Once in three months. d) Others

25) Do any greens need special care?

- a) Yes b) No

If yes mention the greens and caring methods?

Name of greens.	Caring methods.

26) How will you manage the greens if you are away from the house?

- a) Give responsibility to other family members
- b) Take help of neighbors
- c) Water dripping methods (bottle with holes)
- d) Artificial glow lights
- e) Others

27) Is there any plans to increase greens?

- a) Yes
- b) No

28) If yes what greens do you prefer? Why?

Name of the greens	Reason for choosing

29) If you have knowledge about oil cakes ?

- a) Yes
- b) No

30) If yes in what way ?

- a) Over radio
- b) Over tv
- c) In public meeting
- d) In school
- e) Others _____

31) what type of oil cakes do you prefer for growing greens?

- a) Groundnut oil cake
- b) Neem oil cake
- c) Sesame oil cake
- d) Soya cake
- e) Others

32) If you prepare the oil cakes on your own?

- a) Yes
- b) No

33) If yes. Tell about the process.

34) You notice any advantage while using oil cakes.

If yes. Write some points.

- a)
- b)
- c)
- d)

35) Can you suggest any other organic ways to grow greens?_____

Signature of the Interviewer with date:

Signature of the Witness with name:

APPENDIX II

Pamphlet to Convey Information about the Advantages of Organic fertilizer and Home Garden

AWARENESS ABOUT GROWING GREENS ORGANICALLY

BY
S.PREETHI
REG NO: 20PIR008

UNDER THE GUIDENCE OF
DR.B.LOGANAYAKI
ASSISTANT PROFESSOR
DEPARTMENT OF RESOURCE MANAGEMENT



AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN
Coimbatore-641043, Tamil Nadu, India.

HOME GARDEN:

Gardening is one of the earliest hobbies, which is absorbing as well as stimulating for the joy of creation. Secondly through it one gets immense pleasure and make a sizeable profit, but for that one must be conversant with the art of horticulture science. It comprises the culture of flowers, fruits and vegetables. The amateur growers will take up mainly for pleasure and to utilize the cultivated produce for own use. On the other hand, the market growers use more land and invest much money for making profits. Both the classes of growers need to know the technology involved gardening. Gardening to be successful the plants need a growing medium which is soil. Therefore the soil factors should be favourable for the growth of the plant. The use of other planting materials like vermi compost, farmyard manure is the key to success. Globally, home gardens have been documented as an important livelihoods contributing to food and nutritional security. 'Food production on small plots adjacent to human settlements is the oldest and most enduring form of cultivation'. For centuries, home gardens have been an integral component of family farming and local food systems. It is an ancient and widespread practice all over the world. In the literature, home gardens are classified as mixed, kitchen, backyard, farmyard, compound or homestead garden. These gardens take on many forms, from a few plants in containers to large garden plots in the backyard. Beyond the reward of homegrown produce, the benefits of gardening as a hobby include health, environmental and enjoyment for the gardener.



Organic fertilizer:

Organic fertilizers are natural products used for the plants growth. They are farmyard manure, green manures, compost prepared from crop residues and other farm wastes, vermicomposting, oil cakes, biological wastes, biogas slurry, agricultural wastes, bio fertilizers, slaughter house refuse and amount of urine concentrated with the manure and so on.

Manure is an excellent fertilizer containing nitrogen, phosphorous, potassium and other micro nutrients. It acts as a source of crop nutrients and soil amendment. Soil organic matter is considered as nature's signature of a productive soil. Organic carbon from manure provides the energy sources and make those nutrients available to crops. It also adds organic matter to the soil which may improve soil structure, aeration, soil moisture-holding capacity and water infiltration. To determine how much manure is needed for a specific application, the nutrient content of fresh manure varies with the type of animal feed ratio, amount of litter, bedding or soil included.



ADVANTAGES OF ORGANIC FERTILIZER:

Organic fertilizers are carbon-based compounds that increase the productivity and growth quality of plants. They have various benefits over chemical fertilizers, which include the following:

Non-toxic Food: Use of these organic fertilizers ensures that the food items produced are free of harmful chemicals. As a result, the end consumers who eat these organic products are less prone to diseases such as cancer, strokes, and skin disorders, as compared to those who consume food items produced using chemical fertilizers.

On-Farm Production: The majority of organic fertilizers can be prepared locally or on the farm itself. Hence, the cost of these fertilizers is much lower than the cost of chemical fertilizers.

Low Capital Investment: In addition to the on-farm production possibilities of organic fertilizers, organic fertilizers help in maintaining the soil structure and increasing its nutrient-holding capacity. Therefore, a farmer who has practiced organic farming for many years will require far less fertilizer, because his soil is already rich in essential nutrients.

Low Capital Investment: In addition to the on-farm production possibilities of organic fertilizers, organic fertilizers help in maintaining the soil structure and increasing its nutrient-holding capacity. Therefore, a farmer who has practiced organic farming for many years will require far less fertilizer, because his soil is already rich in essential nutrients.

Fertility of Soil: Organic fertilizers ensure that the farms remain fertile for hundreds of years. Land located at the site of ancient civilizations, such as India and China, are still fertile, even though agriculture has been practiced there for thousands of years. The fertility is maintained because organic fertilizers were always used in the past. However, with the increased use of chemical fertilizers today, land is rapidly becoming infertile, forcing many farmers to further increase their use of chemical fertilizers or even leave the farming industry entirely.



APPENDIX III

Feedback Form to Check The Knowledge Gained by the Sample Before and After Awareness Programme

S.NO	Variables	Response of the samples in percentage (%)	
		Before	After
1	Lower the carbon footprints	45	98
2	Develop skill in preparation of pot culture	10	90
3	Reduces the cost of the greens	40	98
4	Improve the health when fresh greens are consumed	30	92
5	Availability of greens in COVID – 19 situation	25	94
6	Reduce methane emission on land fills	35	97
7	Reduces the need for chemical fertilizers	10	92
8	Enrich soil and retain moisture	15	97
9	Organically growing our own greens is sustainable	43	96
10	Organic growth promoters are easily biodegradable	20	95

APPENDIX IV

Ethical Committee Clearance Certificate

INSTITUTIONAL HUMAN ETHICS COMMITTEE

Avinashilingam
Institute for Home Science and Higher Education for Women
(Deemed to be University under Category 'A' by MHRD, Estd. u/s 3
of UGC Act 1956) Re-accredited with 'A++' Grade by
NAAC. Recognised by UGC Under Section 12 B
Coimbatore-641 043, Tamil Nadu, India

26th February 2022

Chairman
Dr. Sadha Ramalingam
Director-Research & Innovation,
Professor-Community Medicine,
PSG Institute of Medical Sciences
& Research, Coimbatore

Member Secretary
Dr. S. Uma Mageshwari
Professor and Head,
Department of Food Service
Management & Dietetics

Members
Mr. K. Arumoli (Legal Expert)
Dr. Subhashini K. Sripathi
Dr. A. Saranwathy (Medical Officer)
Ms. D. Kavitha
Dr. A. R. Sridharani Ramasamy
Dr. G. Victoria Naomi
Dr. Judith Justin
Dr. Anitha Subash

To
Ms. Preethi S
Department of Resource Management
Avinashilingam Institute for Home Science and
Higher Education for Women
Coimbatore - 641 043

Dear Preethi S,
Ref: Your proposal No. IHEC/21-22/RM-05 entitled
"Efficacy of Organic Fertilizer on Growth of Greens in Grow Bags"
submitted for approval of IHEC on 23.11.2021.

The Institutional Human Ethics Committee of our University
hereby grants approval to your research proposal No. IHEC/21-22/
RM-05 entitled "Efficacy of Organic Fertilizer on Growth of Greens
in Grow Bags" submitted by you. The Approval number for the
same is AUW/IHEC/RM-21-22/XM1-05.

We wish you all the best in your research endeavours.

Regards,
S. Uma Mageshwari
Dr. S. Uma Mageshwari
Member Secretary

