



# HORTICULTURAL FIELD IS EXPLORING WITH ITS VARIOUS UTILIZATION

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Article DOI: <https://doi.org/10.36713/epra16613>

DOI No: 10.36713/epra16613

## ABSTRACT

Horticulture farming also aims to enhance the quality of life, as well as the beauty, sustainability, and recovery of our ecosystem and the human condition. These days, a crucial concerning issue is arising globally to ensure nutrition security for huge population that leads to focus on production increase, quality improvement, food safety assurance, and processing strategies. Consequently, a large amount of waste generates in the processing industries, household kitchen, and supply chain of horticultural commodities that has led to a significant nutrition and economic loss, consequently creating environment pollution with extensive burden of landfills. However, these wastes showed magnificent potentiality of re-utilization in several industries owing to as rich source of different bioactive compounds and phytochemicals. Therefore, sustainable extraction methods and utilization strategies deserve the extensive investigations.

## INTRODUCTION

According to the Horticulture definition "The science and art of growing, producing, marketing, and utilizing high-value, intensively grown food, and ornamental plants in a sustainable manner is known as Horticulture". Annual and perennial plants, fruits and vegetables, decorative indoor plants, and landscape plants are all examples of horticulture crops. Horticulture farming also aims to enhance the quality of life, as well as the beauty, sustainability, and recovery of our ecosystem and the human condition. Plants, crops, and green spaces help to sustain and enrich our lives by providing healthy food, beautifying our homes and communities, and lowering our carbon footprint.

Horticulture an art of production, utilisation and improvement of horticultural crops, such as fruits and vegetables, spices and condiments, ornamental, plantation, medicinal and aromatic plants. Horticulture plays a major role in the economy by generating employment, providing raw material to various food processing industries, and higher farm profitability due to higher production and export earnings from foreign exchange.

Nowadays, the horticultural field is exploring with its various utilization. An ever-demanding market is going on with its various options. Vast cultivation in field level with fabulous export potential makes the horticultural product market more outstanding. The global horticultural market value about 20.77 billion USD was estimated in 2021 and targeted to 40.24 billion USD till 2026 [1]. From the kitchen to processing industry, the uses of horticultural product are remarkable today. With its flexibility of uses, problems also arise with various means. The by-products or wastes in horticultural point of view is getting worst day by day for lack of proper utilization not taken. Both

developing and developed countries such as Bangladesh, Cambodia, India, Indonesia, Malaysia, Philippines, Thailand, and Vietnam are suffering from various environmental pollutions in concern with water, soil, and air pollution. The increasing trend of population is found to be the major cause of waste generation [2]. Increased population make wastes more usual in homestead generally produced by unnecessarily.

## Introduction to Horticulture

- Horticulture is based on agriculture, and its name comes from the Latin terms Hortus and culture, which mean "garden" and "cultivation," respectively.
- Horticulture does not involve large-scale crop production or animal husbandry, unlike agriculture.
- Horticulture does not involve large-scale crop production or animal husbandry, unlike agriculture. Horticulture, on the other hand, emphasizes the use of small plots with a diverse mix of mixed crops, while agriculture focuses on a single large primary crop at a time.
- Horticulture has been studied and practiced for thousands of years, and it is thought to have played a role in the transition from nomadic human cultures to sedentary, or semi-sedentary, horticultural communities.
- Horticulture is classified into many types, each of which focuses on the production and processing of various plants and foods for particular purposes.
- Multiple organizations around the world teach, encourage, and support the advancement of horticulture in order to preserve science.
- Plant propagation and cultivation are used in horticulture to increase plant growth, yields, quality, nutritional

value, and resistance to insects, diseases, and environmental stresses.

- Luca Ghini, Luther Burbank, and Tony Avent are well-known horticulturists.

From the production of horticultural foods, various factors involve for the hazardous environmental appearance. Uncontrolled uses of pesticide and residual effects of various chemicals initiate the primary threats to nature by creating bad impact on the wildlife, soil, human, and animal communities [3]. Sometimes these chemicals (about 5–15%) that introduced in the global market for field management are counterfeit in nature [4]. The food wastes evolved in kitchen is noteworthy in many countries such as China, containing solid food wastes between 88% and 94% [5]. Processing industries greatly influence the environment pollution as so many by-products discarded to the environment from this sector while these by-products contain some high quantities of phytochemicals that can be reusable enough for the better disposal [6]. Massive climate issues arise from the undisposed waste available in the environment [7]. Greenhouse gases increases are also introduced in nature by the inappropriate waste disposal method. So, proper and alternative process of waste disposal is compulsory for economic viability and environmental stability.

Increasing the recycling and developing various disposal methods can ensure the proper mitigation of environmental pollution. The industrial and various sources of horticultural wastes are getting importance for its valuable compositions. Recycling can develop the new opportunities with commercial benefits. Biofuels, enzymes, vitamins, antioxidants, and various important chemicals are manufactured from the industrial wastes today. Waste to wealth can be the modern thought of waste disposal. The management of these wastes can be

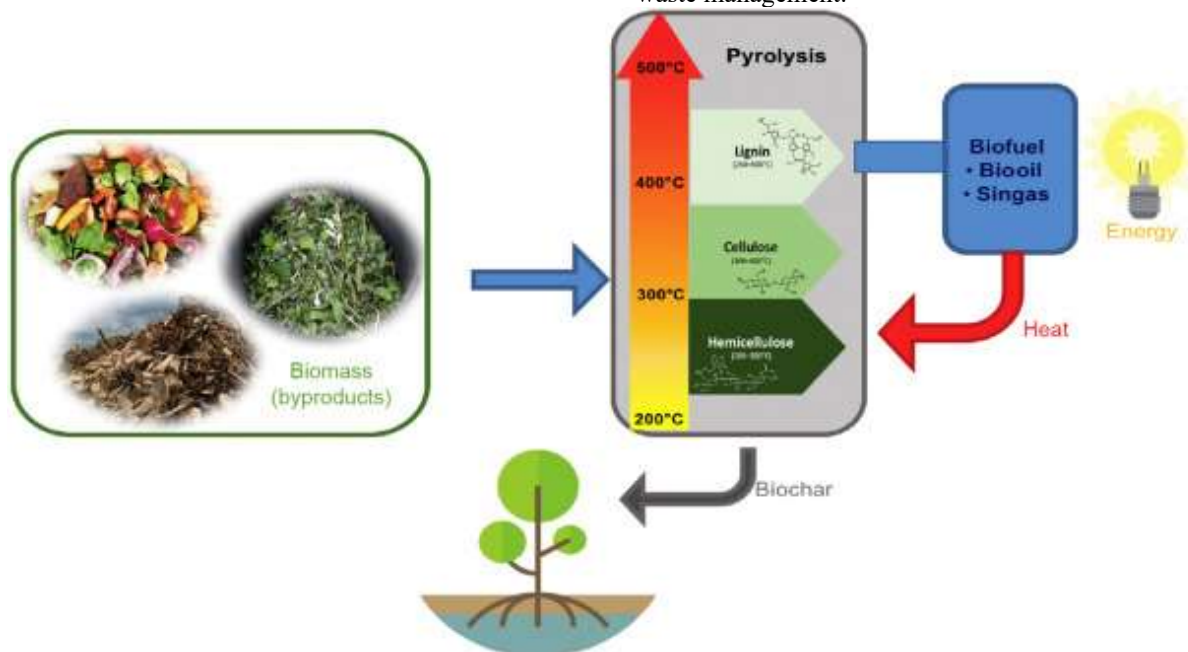
supervised by the government with its regular monitoring, because the waste disposal with its economic benefits can bring the sustainability for both environment and industrial concern [8].

### Scope of Horticulture

- Horticulture crops produce a higher yield per hectare than field crops.
- Horticulture crops are extremely valuable because of their high nutritional value. Fruits and vegetables, in particular, provide us with a lot of vitamins and minerals.
- Horticulture is very important because it improves the beauty of the environment.
- Small and marginal farmers can benefit from horticulture crops.
- Crop varieties with a wide variety of applications are available in the Horticulture section.
- Horticultural crops benefit the environment by minimizing waste, conserving soil and water, and enhancing the farmer's socioeconomic status.

### Nature and generation of horticultural waste

The affluence of horticulture in industrial and environmental perspective is greatly significant today. Whereas there are some phenomena arising day by day with management and utilization of horticultural wastes. The nature of wastes in horticultural end is multidisciplinary. Some create chemical hazard; some are alarming for their biological and thermal point of view also. Postharvest handling and storage occur about 54% of wastes that is upstream, while 46% happens “downstream,” at the processing, distribution, and consumption stages [9]. These wastes disposal is our major concern in case of sustainable waste management.



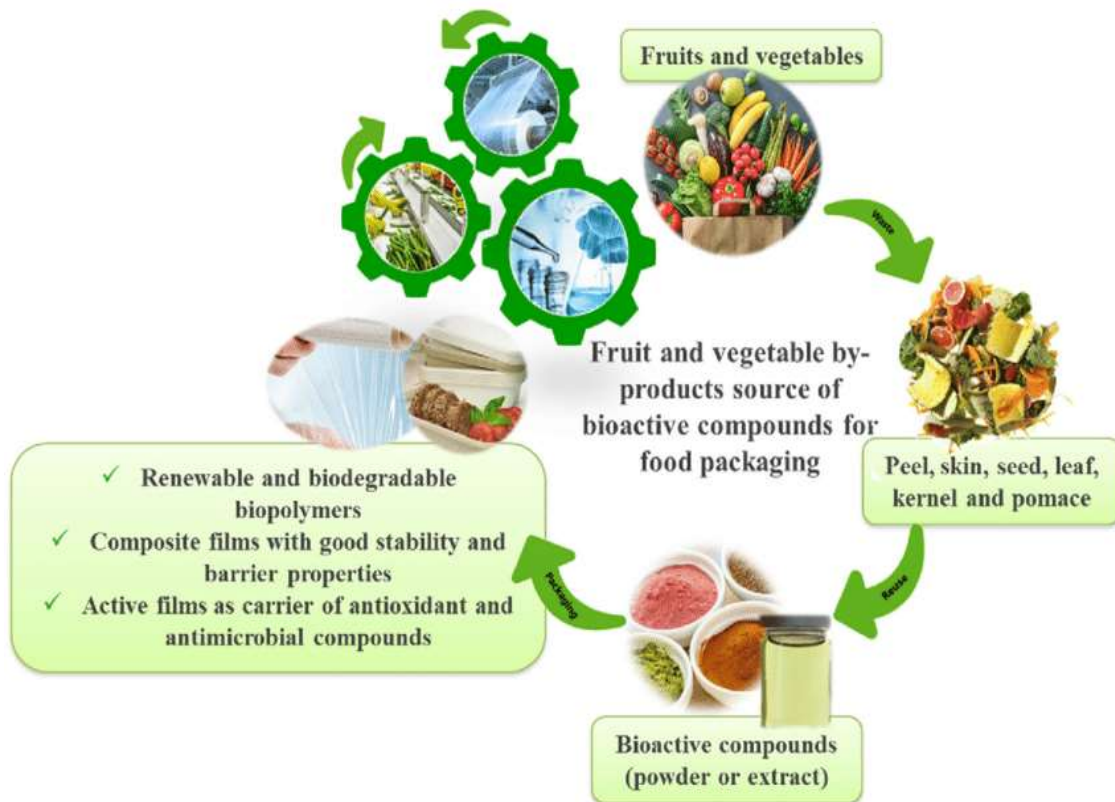
### Wastes evolving during horticultural production chain

The pragmatic scenario of waste evolving is associated with the increasing of population. With higher population, increasing rate demands the higher agricultural produce. In other words,

more food demand may arise with the population increasing rate.

Agricultural production nowadays is more than three times than the last five decades [10]. With technological advancement, the productivity may increase in horticultural sectors also. On the

contrary with the increasing productivity, it generates the higher quantities of wastes also. Some of them are green wastes, and some are recyclable solid wastes.



### Chemical wastes during cultivation

These wastes are generated from the continuous use of pesticides, insecticides, and herbicides during the cultivation. These are mainly solid wastes such as pesticides containers, bottles. The activities of using these types of chemicals in developing countries are mostly handled by the rural uneducated farmers. So, the disposal of these types of solid wastes usually gets ignorance by the farmers or the users. Such

types of ignorance result in the degraded mode of the environmental balance. About 2% of pesticides usually remain unused in the containers, and then the disposal of these hazardous material is done by the throwing these into the nearest ponds or on the open field condition; the ultimate environmental issues may arise by this as food poisoning, water pollution, air pollution, etc., by this type of ignorance [11].

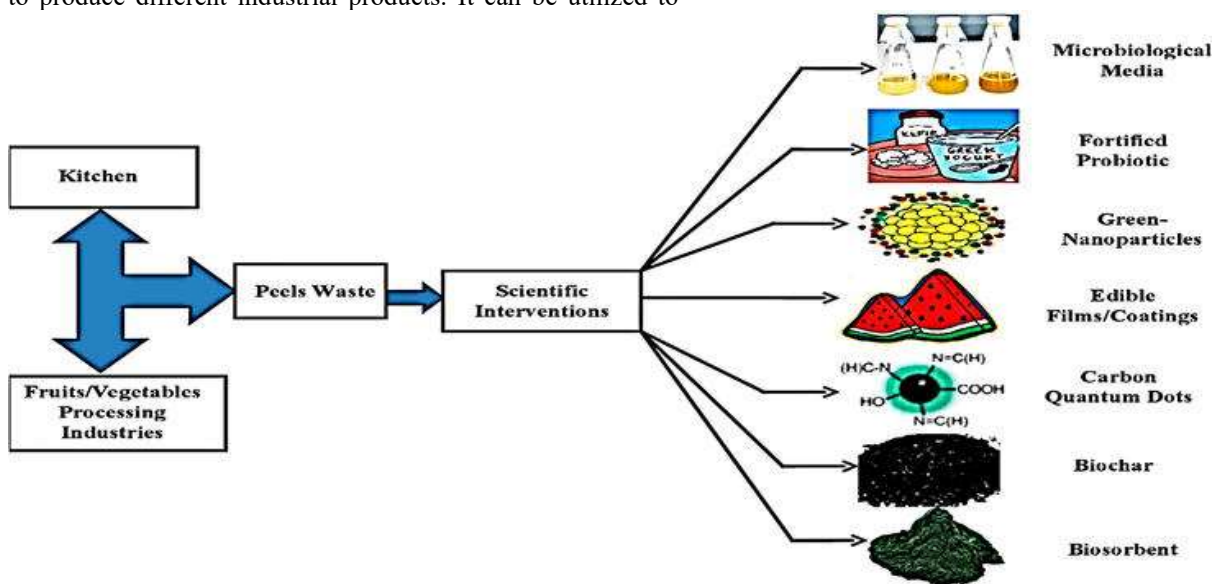




**Technique of horticultural waste management**

Horticultural waste such as the peels, seeds, and other constituents of vegetables and fruits that contain high amount of phytochemical compounds and essential nutrients are used to produce different industrial products. It can be utilized to

extract as well as obtain bioactive compounds that can be used in food, textile, and pharmaceutical industries as shown in Figure

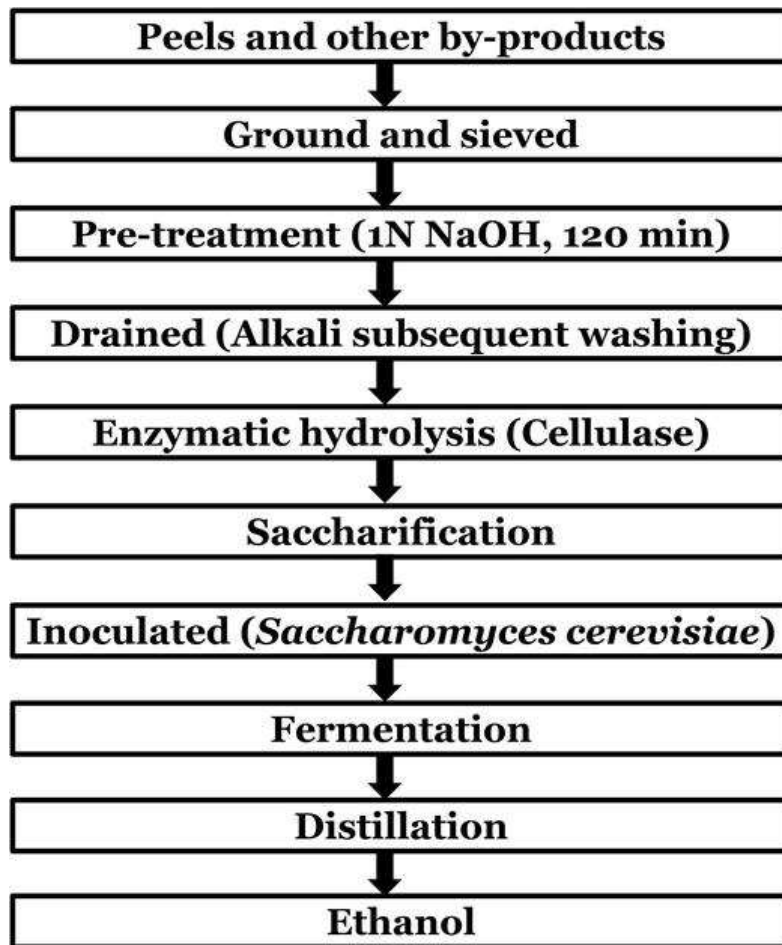


**Utilization of fruits and vegetable peel-based waste into novel industrial products Biofuels (bioethanol, biogas)**

Waste can be disposed through converting the wastes and by-products into biofuels. Bioethanol and biogas production nowadays appears as the most sustainable waste management program, which has some significant economic values.

Bioethanol can be processed through horticultural by-products such as carrot peels, banana peels, and other crops parts, which

previously can be dried in the sun. The product can be ground and sieved for further processing. After that, the products can be pretreated with 1 N NaOH for 2 hours. Then draining or in other words alkali subsequent washing can be done. Enzymatic hydrolysis by cellulase enzyme leads to saccharification. Then the inoculation of *Saccharomyces cerevisiae* is required. Then the fermentation and distillation are done for bioethanol production.



Flow chart for bioethanol production by cellulase enzyme.

The other way for wastes disposal as the biofuel source is biogas production. Nowadays we can see the rapid adaptation of this disposal system in our rural areas also.



### By-Products of Fruits

Orange, lemon, lime and mandarin are the four principal citrus fruits that are widely grown throughout the world. The industry produces by-products such as peels, interior tissue and seeds. In the course of processing, over 50% of the fruit is converted to by-products and 15 million tonnes of peel waste are produced annually. Bagasse from grapes is another waste product created during the manufacturing of wine, which accounts for around 80% of all grape output. It is made up of the peels, seeds and stems of the fruit. The manufacturing of juices, jellies and raisins may also produce by-products, though in smaller amounts. Apple (*Malus domestica*) pomace, a by-product of the

fruit juice sector, is made up of apple peels, seeds, stems and pulp. Mango (*Mangifera indica* L.), mostly produces peels and seeds as by-products. The biggest manufacturers of wastes are the alcoholic beverage and sugar industries, which also utilize sugarcane extensively. Other residues are produced as well, including cane trash, molasses and press mud, even though wastes is the principal By-products of Vegetables.

- The primary by-products of the tomato (*Lycopersicon esculentum* L.), which is the second-most significant vegetable crop in the world, are peels, seeds and pulp.

• Peel is the most valuable by-product of the potato (*Solanum tuberosum* L.). The main outcomes of processing potatoes are chips and fries .

• Broccoli and cauliflower (*Brassica oleracea* var. *italica*) both create the by-products leaf and stem. According to a production estimate for broccoli and cauliflower, 50% of the leftovers might be used as animal feed and the other 50% for bioconversion into new products.

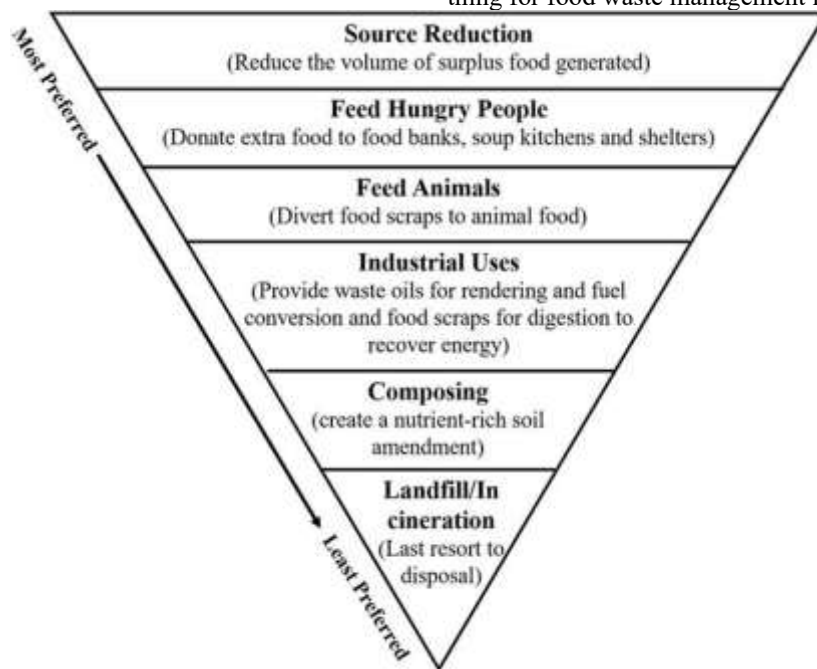
• The pod of the pea (*Pisum sativum* L.), is one of the principal by-product that is typically rejected and burned despite having a high protein content .

• The by-products of the carrot (*Daucus carota* L.), which is a rich source of carotene, are largely pomace and peels.

Prospects of horticultural waste management

It is obvious that waste disposal is not an easy task as it requires bigger margin of resources and right methods to minimize its after-effects. All the techniques or methods of reaping wastes are not efficient enough always. Food recovery hierarchy

published by US EPA showed that there are different methods or approaches are proficient at different level. Landfilling and incineration (combustion of the waste materials) are the last resort of wastes disposal, because sometimes it is harmful for our environment. Soil pollution and abundance of toxic gases are visible by this kind of disposal system. Then the composting creates a nutrient-rich soil amendment. It requires specialized area away from the home, and it requires more time for disposal. Industrial uses of wastes are just above from the composting in that pyramid as it provides waste oils for rendering and fuel conversion and food scraps for digestion to recover energy. Lots of commercial industries are developing today with the new hope with horticultural by-product establishing. Although some wastes also are considered developing the industries but commercial exposure may be spread rapidly. Main effective approach will be the source reduction and sometimes we waste food more than we consume so that extra food can be donated to food banks, shelters can reduce the possibility food wasting. Public awareness is the big thing for food waste management in horticultural sectors also.



### Food Recovery or Management Hierarchy.

## CONCLUSION

Various environmental concerns and some economic benefits demand the appropriate disposal of horticultural wastes. Minimizing of wastes can maximize the environmental stability. However, people are not so aware about the impact of horticultural wastes. So, the proper awareness with the effective implementation of wastes is a crying need for today. Meanwhile, sustainability can be brought through adapting the modern disposal methods with longer effects and economic flexibility. In addition, the growth of the wastes disposal industries also gives the new dimension for the sustainable waste management. Finally, it can be enunciated that waste management provides green ecology, which can serve environmental stability with industrial prosperity.

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