Green Solutions with Sustainable Textiles in Horticulture

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Abstract **- With technical advancements in textiles and many sustainable alternatives used for horticulture, the present research was undertaken to investigate and find out what options are available and being adopted for sustenance and consistency in utilizing these products within the current scenario in Nashik and around. There are many ways through which green and natural fibres are being utilized in growing of vegetables, fruits, medicinal and ornamental plants. The study was undertaken to identify the implementation of eco-friendly and sustainable textile solutions for horticulture. For the study seven plant nurseries were randomly selected with purposive convenience sampling to study their green horticulture practices and methods of application for different vegetables and fruits plants, medicinal plant, and ornamental plants. An interview was conducted in seven nurseries with no. of respondents obtaining qualitative data. Need for sustainable textile options were ascertained and novelty in consumption of sustainable solutions was identified. There is a need for popularising sustainable textile options for enhanced horticulture with proper marketing strategies. It was observed that cocopeat is the only sustainable material which is being used by three nurseries. The case studies indicate that five out of the seven horticulturists have started implementing green ways of production and the remaining are still in the phase of implementation. Support from textile experts, aggrotech technologists and government support schemes need to be integrated for healthy horticulture.**

Index Terms **- Horticulture, Eco-friendly, Sustainability, Textiles.**

INTRODUCTION

India is still known for its agriculture throughout the world. Also, from time-to-time India has also undertaken various eco-friendly solutions to the ever-increasing soil, water, and air pollution in the country. Sustainable solutions are followed in every field and textile is not an exception to it. Many fruits and vegetables are grown and exported to various parts of the world. Fruits like mango, apple, coconut, banana, sapota, grapes, pomegranate, watermelon, papaya, citrus fruits, onion, etc. Similarly, vegetables like bottle gourd, tomato, chili, potato, sweet potato, etc. Diverse climatic conditions in India ensure the production of all these fruits, vegetables, and medicinal plants throughout the country1. India is a second largest producer of fruits and vegetables globally. It ranks first in the productivity of grapes, banana, papaya, peas, etc8.

Horticulture is a science that deals with the production, utilisation, and improvements of horticulture crops, then be it fruits, vegetables, spices and condiments, ornamental, medicinal and aromatic plants. Horticulture falls between domestic gardening and field agriculture. Textiles in horticulture are growing fast. Net, non-woven mats, movable screens for green house, non-woven sheets, mixed bed for mushrooms, cordage and strings are used in horticulture. Some of the agrotextiles used frequently for horticulture are-hail protection, mulch mat, rain protection fabrics, wind control and harvesting nets.9

Fabrics such as polyester, polyethylene and polypropylenes are commonly used. But due to their environmental and health hazard these are being replaced by natural, sustainable, and biodegradable fibers like coir, jute, wool, etc. much of the literature has the evidence of utilizing these sustainable fibers for soil protection as well as for plant cultivation. But the main obstacle is that their sustainable solution is the cost as its raw material is natural and so is its implementation cost.

Nashik District is situated in Northwestern part of Maharashtra. Nashik District has 18 towns and 1931 villages. Godavari and Gima are the main rivers flowing through the district. The climate is agreeable for all crops like pulses, sugarcane, oilseeds, and food

grains. Nashik is specifically known for grapes in India. Other than this pomegranate, guava, spinach, Amaranthus, cucumber, tomato, coriander, onion, etc. are also produced on a large scale. Also, department of Agriculture and horticulture of Maharashtra state is helping farmers of Nashik. Fruits contribute 6% GCA (gross cropped area) under which grape contribute more than 2 % and pomegranate another 1.3%. 10 Of farmers in Nashik, 73% are small or marginal and operate 40% of land. Most recently, Agricultural Marketing Reforms have been carried out under which the state has issued licenses for direct purchase from farmers and private wholesalers.

Due to continuous efforts of Governmental and Non-governmental organizations for eco-friendly agricultural practices a study was conducted to document the actual findings of the horticultural practices implemented in Nashik by the plant nurseries and vegetable farmers. Therefore, plant nurseries were selected, and owners were personally interviewed, the findings were documented and assessment was done for green horticulture practices which the plant nurseries followed.

OBJECTIVE

1. To identify the horticulturalists practicing green horticulture in and around Nashik city.
2. To document the findings made through selected plant nurseries.
3. To assess the popularization of the green solutions followed by the plant nurseries.

METHODOLOGY

The present study is based on the primary data collected from the field visits and interviewing horticulturalists, experts, scientists with an understanding of data obtained from various horticultural practicing personnel. To obtain relevant literature the investigator visited several websites, journals and reviewed related articles. A sample of every horticultural field was selected, and field visits were conducted in Nashik District. Purposive convenience sampling technique was used to select the nurseries. Profiles of these plant nurseries were studied. Success and failure parameters were noted down.

Case studies of seven plant horticulturalists were taken for qualitative analysis. Care was taken while choosing the plant nurseries so that each and every aspect of horticulture is covered like vegetable nursery, fruit nursery, ornamental plant nursery and medicinal plant nursery. Therefore, plant nurseries selected were as follows-

1. Bohora Nursery
2. Alpha Nursery
3. Gangajal Nursery
4. Amrai Nursery
5. Papaya Nursery
6. Shrinivas Hi-tech Nursery
7. Kaveri Seeds

Study of Profiles of Horticulturalists

A profile study was made under the following headings-

1. Introduction and general information
2. Sustainable fibers used
3. Products of sustainable fibers
4. Product availability

Individual Case Studies-

An unstructured case study schedule was implemented covering the following parameters for better understanding of the personnel of horticulture. With regard to individual horticulturalists, case studies were made depicting the education, knowledge of the field, sustainable practices available and implemented, method of implementation and continuation of eco-friendly solutions in their fields.

Description of the tool used-

Field studies were the main source of primary data. Unstructured interview schedules were followed and closed, and open-ended questions were used appropriately in order to obtain correct information from the subjects.

Qualitative Data-

Scheduled information from individuals, professionals and horticulturalists obtained was presented through case studies.

RESULTS AND DISCUSSION

The results of the present research study were organized into the following sections-

Section-1 Qualitative data-

This helped to understand the present scenario of the sustainable fibers or green fibers solutions in horticulture field. Profiles of horticulturalists were present under following headings-

Profile 1- Bohora nursery-

Introduction-

This plant nursery is 28 years old covering 8.5 acres of land. The nursery deals with outdoor plants, landscaping, flowering plants and some indoor plants. Rain water harvesting is done for watering the plants in summers. The bags used for plantation are of 51 micron. The procurement of various plant varieties is done from different parts of the country like Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu.

Product

The textile products available and used were plastic bags of 51 micron. Other than this, compost manure was also used and sold. Usage of dry leaves was done for shade nets at various places in the nursery.

Usability of sustainable fibers or green products-

Compost manure was used majorly for the pre-preparation of the soil which was used for plantation of outdoor plants, flowering plants and some indoor plants.

Awareness and Procurement of green solutions and marketability-

The owners of the plant nurseries were aware of the green solutions used for plantation and were in the process of application in their plant nursery. The owners had ordered for the cocopeat.

Profile 2- Alpha Nursery-

Introduction-

The owner of this plant nursery is a landscape designer and has an experience of 18 years in the field of landscaping and 5 years of experience in the plant nursery. The owner is also the secretary of Nursery Association, Nasik and also works as a lecturer in Yashwantrao Chavhan Open University, Nashik. The specialty of this nursery is the ornamental and aromatic plants and also the only nursery with 12 varieties of Tulsi. These varieties are the flavored ones with different flavors and aroma. The procurement of variety of plants is from all over the world due to the owners' frequent visits.

Production-

The production of the variety of plants was done in his nursery itself. The nursery produces all varieties of plants and supplies as per the demand of the consumer whenever required. Being a landscape designer himself, a variety of new plants, which are not readily seen in Nashik city was produced too.

Usability of sustainable products-

Cocopeat is used for some varieties of plants only. Cocopeat is made of coir and was used for plantation of saplings. Left over or dry flowers and leaves were also used for compost manure for his farm.

Awareness and procurement of sustainable products and Marketability-

The owner was aware about the various green solutions for horticulture and the procurement is too under process. The owner was not very sure about its positive impact on production rate of the plants.

Profile 3- Gangajal Nursery-

Introduction-

It is one of the oldest plant nurseries of Nashik city. Having an experience of 34 years the nursery has all forms of plants and varieties in abundance. The nursery covers up to 3.5 acres of land in total.

Production-

All varieties of fruits and vegetables are grown in their nursery. Fruits such as banana, mango, chikoo and variegated pineapple variety are available.

Usability of sustainable products-

This plant nursery used cotton bags for saplings but was unsatisfied. They use cocopeat and compost manure for their plants. The owner was more of the opinion that sustainable and natural solutions are key to success as it will not affect the soil and so the plant.

Awareness and procurement of sustainable products and Marketability-

The owners are aware about the sustainable products and its procurement from various parts of India, but they were of the opinion as to improvise the

marketability of these products for its usability on a larger scale.

Profile 4- Amrai Nursery-
Introduction-
This nursery has a land of 1.5 acres under horticulture out of its 11-acre land. The plants are not grown here in the nursery but are procured from various nurseries of Nashik city, Telangana and Rayalseema and Konkan. The peculiarity of this horticulture nursery is the ornamental flowers and plants, indoor and outdoor plants especially anthuriums and orchid plants are mostly available. The nursery was started five years back.

Production-
The plants are not produced here, and the quantity is also 20-30 of every variety. Another peculiarity of this nursery is the decorative and attractive mugs which have magnets or are without magnets vases. Customised decoration and mugs are also made available here.

Usability of sustainable products-
Here cocopeat is used as manure and jute bags are stitched and used to cover the earthen pots for enhancing its appearance. The cocopeat is procured from Tamil Nadu. Also manure of cocopeat in the form of baskets was available from 2 inches to 12 inches thickness. There was usage of discarded green mats rather than moss stick for cost effectiveness.

Awareness and procurement of sustainable products and Marketability-
The owner is aware of the sustainable product and was satisfied by the marketability of these products too.

Profile 5- Papaya Nursery-
Introduction-
This nursery is 15years old and has made its mark in every plant variety in Nashik city. This nursery produces plants on their own and also have tissue culture research and development unit in their nursery. They are also known for their vertical garden concept and eco-friendly method of growing plants. The nursery is covered with weed mat from start to the end. This is to protect the plant from weed formation and damage to the plants. It is made of polypropylene fibers. If the weed mats are damaged due to severe weed conditions, extra layer of weed mat is covered on the already existing weed mat.

Production-
All varieties of indoor and outdoor plants, ornamental plants, aromatic plants, fruits, and vegetables are grown here and are available in abundance too. These plants are also supplied for landscape designers. Also, plants are grown through tissue culture method in which controlled atmosphere is created through white poly houses.

Usability of sustainable products-
Here too, cocopeat of coir fiber is procured in the form of jiffy plug, which is a bag of cocopeat in which saplings are grown. The thickness of this bag varies from 30 to 50 mm. the cost of each bag is 2.2. Rupees and is available in a box in 560 pieces. Also tissue culturing is done for papaya, banana, and drumstick vegetable plants and all the flowering plants. Other than these bags they procure coir fiber for cocopeat preparation. The cocopeat is procured from Karnataka, Bengaluru.

Awareness and procurement of sustainable products and Marketability-
The owner of the nursery was very much aware of the various eco-friendly products available in the market and is satisfied by its marketability too. As research and development takes place in its nursery it is quite easy for the owner to produce new varieties or modify the original varieties for more consumer acceptance.

Profile 6- Shrinivas Hi-Tech Nursery-
Introduction-
This nursery deals with vegetable more rather than ornamental and medicinal plant and fruit variety. The area covered under horticulture is 1 acre. The nursery works from farmer's demand of growing vegetables and supplying it to them as per their demand. The owner of this nursery also owns an eco-friendly pesticide shop in their nursery itself. They have procured a seed insertion machine in the sapling; the speed of the machine is 104 sapling bags are ready with seeds in one minute.

Production-
Vegetables like, cabbage, cauliflower, brinjal (all colors and varieties), capsicum, chili (both varieties)

are produced. Fruits like mango, chikoo, coconut, jackfruits are also grown here. The saplings are grown in trays which are made of rubber and there is minimum 104 saplings which are grown in each tray.

Usability of sustainable products-
The use of cocopeat made from coir fiber is used for plantation of saplings of vegetables and fruits. The seeds are procured from Syngenta Company for hybrid varieties of the same. White color poly houses are made for every plantation and variety. Inside these poly houses black poly shade net is put so as to control the heat of the sun. Line stone is sprayed on the poly houses during warm temperatures as it helps to maintain the temperature required by the plant.

Awareness and procurement of sustainable products and Marketability-
The owner was very much aware of the recent trends in horticulture and was satisfied by its marketability.

Profile 7- Kaveri Seeds-
Introduction-
It is a research and development center of Kaveri Seeds Company of India. The resource person was a doctorate in genetics and plant breeding, Principal Breeder of Okra crop with an experience of 12 years. This company has its branch all over India to study various plants under different climatic conditions and accordingly creating an acceptable variety of the plants. Also, to study the effect of fungicides on the hybrid variety created. It is the only agro industry dealing with seeds in India.

Production-
Today this company is dealing with Okra, tomato, chili, bottle gourd, bitter gourd, ridge gourd and sponge gourd. The company seals with the development of hybrid varieties of plants. Kaveri seeds is one of the leading companies of India and other than cotton seeds; they have created avenues for various fruits and vegetables such as rice, maize, wheat, millet, castor oil and okra. The researcher was involved in creating genetically modified hybrid okra.

CONCLUSION

It can thus be concluded that five out of seven plan nurseries use cocopeat as natural manure for plantation, while the remaining two are aware of the products available in the market but have not implemented as yet. Also, the marketability and awareness of the sustainable products is there among the horticulturists. The case studies undertaken were of different fields of agriculture and methods of application of the new sustainable products. Efforts should be taken as to manufacture green and sustainable products like shade nets, sapling bags, mulch mats, packaging material for fruits and vegetables, organic ripeness, etc. Also shade nets were commonly seen in all the nurseries of white, green, and black color depending upon its requirement to each and every plant nursery. Awareness about the green horticulture solutions is to be made available at affordable cost to the farmers. Thus, this study will definitely help to give an overlook of the usability and marketability of green products for eco-friendly tomorrow.

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