



EXPLORING ECONOMICAL & ENVIRONMENTAL BENEFITS OF VERTICAL FARMING USING MULTI STORY PANELS

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Abstract- India is the largest Agricultural country in the world. Where 70% of the total population depends on farming and it also affects the development of country as well as economy of the country. It has been observed that this research paper totally belongs from Agricultural and Irrigation field. Because as it is observed due to sudden increment in urbanization and high growth in infrastructure. Results, food scarcity occurs in many regions. Use for farming land decreases, forest and grassland also decreases as infrastructure taking place. Due to that the biggest adverse effects effect on climate change. Uneven rainfall, uneven temperature, Decreases ground water table etc. like situation occurs. So the villagers start moving towards town and city at where they can get some money to survive. It results that, land for the farming decreases. As mentioned above day by day population increases and demand for food is also increasing. It is essential to invent new technology to prevent from this situation. Vertical farming is the concept which is not well known in India and not taking it in practice. But it is very useful techniques for farming now a days. As it gives high productivity as compare to horizontal conventional farming practice. So finally say that this research concern with agricultural field, land use planning, soil engineering and irrigation engineering for efficient water management.

Keywords- Vertical Farming, Multi Story Panels, Irrigation System, Land Use Planning, Farmers.

I. INTRODUCTION

Considering the recently industrial revolution carbon dioxide gases is highly increased in very high manner, resulting in climate change and global warming effects in agricultural production. As growth in population increases rapidly and area of agricultural land decreases brought about the world's food security issue. Food sustainability improved by urban agriculture for a country and urban area's formation affected through its effect on planning, design and construction. All though adoption of concept of vertical farming with the growth of urban agriculture is not a straight forward process. There are numbers of factor to consider, for example, cultivation quantity and quality, design and supporting technology, in order to successfully implement vertical farming in the city. The cultivation of rainy crops in semi-arid areas large variation incurred in response to the variation in seasonal rainfall. There are different farm-level resolutions such as the selection of crop-pattern, whether to invest in fertilizers etc., the choice of the planting period, plant population density etc. for which the appropriate choice (concerned with maximum productivity) depends upon the rainfall variability.

II. OBJECTIVES

This concept can be used to explore the utilization of vertical spaces for horticultural crop production in urban areas. Increase in production of food by such technique can be used for conservation and recycling of natural resources. Sustainable urban growth can be achieved through ecofriendly vertical farming. Use of organic crop can reduce the Food borne diseases and illness.

III. LETRETAURE REVIEW

Vertical Farming is also defined as the faming which grows vertically. Vertical farming is increases growing area of cultivation. Very less area required for farming. There number crop can be cultivated in this concept. Effect of flood in horizontal farming is high as compare to vertical farming. Due to heavy rain possibility of water logging is more in case of horizontal conventional farming but it can be reduce by applying concept of Vertical farming. One biggest problem in Horizontal farming is erosion of soil of farm as time goes. But in case of vertical farming erosion of soil can be optimize.

Following points are very important to know whyvertical farming is needed:

A. Reliable Harvests

As space is used is less wastage of seed would be neglected. And so it will be reliable to farmer and common public to do Vertical farming at their places. After investing initial money, maintenance is not coming more so it will one time investment plan.

B. Minimum Overheads

Vertical farms need small space for cultivation. Once money invested than after cultivation it will back in terms of 3 to 4 times as structure is built up to number of story. So finally what revenue get is more than the investment. So minimum overhead is reduces in the case of vertical farming.

C. Increased Growing Area

In very small area vertical farming is possible and it will increases growing area. If land having 50 m² area is cultivated for twomonths of crop period, more yield can be expected if six panels each containing three cultivation floor of 5 m² area individually, with cultivation area of 90m².

D. Wide Range of Crop

Any kind of crop is possible in vertical farming. As preventing crop from rain shed will possible to construct on the structure so summer crop is also possible in rainy season as a vertical farming.

IV. DESIGN AND PROCEDURE

The work is initiated with reconnaissance survey for economical and environmental benefits of vertical farming using multi story panels. Different types of crops has been used to understand environment of the study area. The people were interacted were observed to obtain activities as well as to identifying prevailing problems. Users as Farmers, Villagers, and Professionals were been interacted. Even people were interviewed to recognize current Farming practice.

A. Design Specimen

For the Vertical farming concept a Multi-story panel's structure is essential. Which may be constructed from fabrication work or if it for large area than may it of concrete structure. But in case of concrete structure the initial investment will be high as compare to fabricated steel structure.

Here used fabricated steel structure having 3 stories in vertical directions. The total height of the structure is 2.51m. Distance between 2 panels is minimum 0.91 m.

B. Details for Specimen

Fabricated steel structure is used for constructing Multi story panels with i.e. three story each of 0.38m^2 as shown in Figure1. Total height of the structure is 2.51 m including depth of each container.



Fig.1 Innovative Vertical Panel for Farming

C. Soil & Crop Description

Soil:

For Farming, Soil is taken from the Gujarat State Fertilizer Company along with proper addition of fertilizer. Fertilizer is important component for developing crop at desire stages.

Crop:

“Sponge Gourd” is selected for vertical farming as it is growing vertically.”Also requirement of the water is more for this crop, so that it also classified as rainy crop. Generally except rain water, no additional water required for crop. Maturity duration of crop is 55 to 60 days from seeding.

V.METHODOLOGY

Sponge Gourd, a rainy crop is selected for testing the concept. Seeds, provided by Gujarat State Fertilizer Company were been seeded in September, 2016. Additional water supplied as and when required. Growth was observed regularly. Fig. 2 shows various stages of growth of crop.

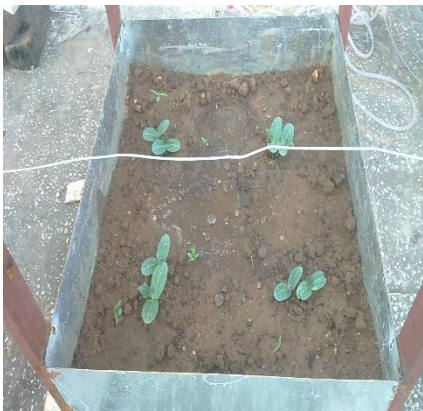




Fig. 2 Growth of Sponge Gourd at different stage

VI.ANALYSIS

Analysis can be done by showing comparison between what actually invest for research purpose and what will get back after completion of research. It include all kind of money invested from 1st day to last day throughout the crop period. Table 1 represents the information for investment to the gain. For horizontal farming of **1.11 m²**, with concept of vertical farming, the use of space will be only **0.38m²** i.e. Area per each panel / container. So, finally specimen gives output of **1.11 sq.m²** cultivation in only **0.38m²** area in same crop period.

Table 1

Item	Investment	Gain
1.Multi story panel	Rs. 2700	Output of Sponge Gourd is around 12 kg. Rate of per kg of Sponge Gourd is Rs. 20 (Say). Total revenue generated will be Rs. 240 / 2 months .(Crop Period) Annual income will be Rs. 1440 . (ApproxRs. 480 for Each Panel)
2.Cost of Transportation	Rs. 300	
3.Cost of Fertilized Soil (Including Seeds)	Rs. 600	
Total Investment	Rs. 3600 /-	
Per Panel Cost	Rs. 1200 /-	

VII.CONCLUSION

In the country where more than 70% of the total population are dependent on farming, it is very essential to explore adaption of new techniques and application of new innovative ideas to increase food resources with increasing urbanization.

Horizontal farming is carried out for any crop in India. If this concept is adopted for farming of Sponge Guard, three times more productivity and 3 times more income can be achieved than conventional practice. Adoption of this technique for various crops in various season can be considered further scope of research.

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