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Multilayer Farming: an Initiative towards Increasing Farmer's Income

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Abstract: *Due to rapid urbanisation, highway building and fertile land degradation, soil erosion, soil salinity and water extraction, our agriculture land is diminishing day by day. Multilayer farming is one of the viable technologies that involve multi species cultivation, both annual and perennial, as an alternative to sustainable growth for small and marginal farmers that can produce higher economic returns per unit area. It is a multiple cropping scheme of dynamic collaborative activities that enhance the use of basic input such as manure, air, water, soil, solar radiation etc. Multilayer cropping system is also beneficial for providing insurance against market glut of single commodity, growing up according to market demand; maintaining an ecological balance and generating high from per unit area, supply food and nutritional security to the farming family.*

Multi-layer farming means growing and cultivating compatible plants of different heights on the same field and at the same time. It is generally practiced in orchards and plantation crops for the utmost use of solar energy.

Keywords: *Multilayer farming, multitier, off-season vegetation, resource conservation, water use optimization*

I. INTRODUCTION

India is a diversified land, having year- round agricultural production with varying agro-climatic conditions. Approximately 70 percent of the population relies on agriculture for their livelihood or as a source of income. Due to rapid urbanization, highway building and fertile land degradation, crop erosion, soil salinity and water extraction our land for agriculture is decreasing. Also the man to land ration is increasing. because of high flood risk, small area of land was inaccessible to agriculture **[1]**. By using advanced technologies using vertical and horizontal land along with sunlight and other natural resources, we can use any area to optimize unit production.

Multilayer farming is one of the advanced technologies that involve multi-species cultivation, both annual and perennial, in the same field, as a new alternative to sustainable growth for small and marginal farmers that can produce higher economic returns per unit area [**2**]. It is multiple cropping schemes of dynamic collaborative activities that enhance the use of basic output such as water, land, manure, air, solar radiation and all the rest. Sustainable goods allow land to make the most of scarce resources. This is quite well known and true among minor and marginal landowners. This is also helpful in defending against competition from weeds. The basic founding principle includes field diversification prospects based on scientific, ethical and economic principles of maximizing the efficiency of the system, usage of higher output resources, heavy use of inputs and long term management of farm land and climate.[**3**] Generally, farmers are seasonally bound and seasonal crop are grown. Earnings are in fact restricted due to aberrant season. Several times, the climate destroys standing crops and exacerbates their poverty. Multilayer farming is also beneficial for providing insurance against market glut of single commodity, growing crop according to market demand; maintaining an ecological balance and generating higher income from per unit area, supply food and nutritional security to the farming family.

Adopting multilayer farming is more competitive than conventional systems. Cultivators can grow 3-4 separate crops under 3- tiered structure at the same time using the same resources. As an intercrop it will grow profitably in different horticultural crops. These vegetables will be rich in Calcium, phosphorous , vitamins and other minerals **[4]**

II. Basic Principle of Multilayer Farming

Basic principles of Multilayer farming system include;
Multilayer farming is an integrated farming model which depends on the principle of total utilization of water, manure, and land and to obtain more production per unit area. This farming technique needs less cost of cultivation whereas provide much more benefit compared to another farming system. In multilayer farming, four or five crops can be cultivated in same amount of fertilizer and water required for one crop, which leads the farmer's income. 4-5 crops can be harvested in a year with same piece of land. Multilayer farming offers:

1. Opportunities for crop diversification on scientific, ecological and economic principles;
2. Maximize system productivity;
3. Utilization of resources with higher efficiency;
4. Intensive input use
5. Sustainability of farm resources and environment on long term perspective. This system mostly comprises an over story of trees or shrubs with an understory of economic or forage crops. Tree-to-tree distance can be wide enough to let sufficient light through to understory crops.

Fig 2. Multilayer farm field [7]

Multilayer farming system is a perspective modern approach for sustainable productivity in horticulture crops in general and plantation crops. The farming system is more adaptable in tall-growing perennials with compatible semi-perennial and annual crops. The practice of Multilayer farming is highly successful in plantation crops especially in Coconut, Areca nut, Coffee, ginger, leafy vegetables and Cashew for enhancing sustainable productivity and realizing higher income per unit area**.[5]**

III. Benefits of Multilayer Farming

Multi-layer farming incentivized farmers to switch to a more sustainable type of farming and simultaneously meet the food and nutrition requirements of the entire household, generating income from cash crop production. Some of the benefits of Multilayer farming can be given below;

1. Effective utilization of soil, water, and other resources.
2. Reduces climate specific damage & enhances soil health
3. Keep ecological balance in the environment.
4. Prevent water loss due to evaporation from the soil.
5. The income per unit area increases substantially with this system and multilayer farming ensures an even distribution of income and employment throughout the year by producing several off-season crops.
6. Minimize risks of crop yield loss and this system enables a steady supply of farm products round the year.
7. Generates jobs and provides better labour use pattern.
8. Reduces the impacts of climate specific hazards such as high-intensity rainfall, soil erosion, and landslides.
9. Well utilizes the soil moisture at different depths of soil and effectively utilises solar energy at different heights.
10. Natural resources are utilized efficiently.
11. Improve the soil characteristics and adds organic matter to the soil.
12. Effective nutrient leaching and helps in effective weed control.
13. It provides partial guaranty against the market glut of the single commodity and the efficient cultivation of a range of products is possible. Crops can be developed according to market preference.
14. Accelerated production cycle, hence better production.
15. Reduces pests and diseases infestation.
16. Provide micro-climate conditions which ensures better productivity of the crops underneath.

IV. Case- Study

Fig 3- Farmers of Mokaro village

In the present case , multilayer farming technique is practiced in the Makrao village. Since, water is drawn from natural spring and stored in cement tanks, there is no scarcity of water for land irrigation even in the summer season. Moreover, farmers (based on a general consensus) have developed a rotational system of land irrigation. In this system, a whole day is allotted to a farmer to irrigate the land using the water stored in the tanks. Through this system, each farmer gets his chance to irrigate the land at regular intervals. To overcome the problem of nutrient competition in the multilayer crop fields, farmers apply a huge quantity of farmyard manure during the month of December (before sowing seeds/seed tubers of colocasia, potato and green leafy vegetables) in each of such crop field. The land cultivated through multilayer technique is generally close to the farmer's household and therefore there is no difficulty in manuring these crop fields. Most importantly, the availability of enough water and farmyard manure has made this multilayer farming system viable in the Makrao village. As three vegetable crops are now being cultivated simultaneously, the new technique has resulted in increased production of vegetables per unit of land in the colacasia fields. The input-output ratio (in terms of money) of this system was computed to 1:8, which is significantly higher than the input output ratio reported for potato (1:2), tomato (1:5), capsicum (1:2) and pea (1:2) cultivation (as sole plantation) in the other villages of the region.

Farmers fetches the profit upto Rs. 70,000 per year from single plot which traditionally will be around Rs.10,000 from single crop. [6]

V. Conclusion

Multi story cropping system is a very effective technique in today's scenario of agriculture where land use under farming s degrading at a faster rate. In most of the times it has been seen that the inter spaces are left unutilized in that case a good amount of returns can be earned through this system of planting where the production will increase at least 2 to 3 times from the existing one along with , maintaining soil health status. This system of farming is indeed a boon to small and marginal farmers of the country.

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