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Doubling of Farmer Income Through Growing of Vegetable Crops

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Abstract

Vegetables are called as protective food due to their enhanced vitamins and minerals content thus leading front in the crop cultivation to cop up with the nutritional needs and also play a pivotal role in doubling the farmer's income due to the short duration, higher productivity, and labour-intensive nature. The doubling of farmer income through cultivating vegetable crops is a transformative approach that holds immense potential for improving the livelihoods of small and marginal farmers which India has the most. By means of focusing on market-driven and sustainable agricultural practices, this initiative aims to empower farmers, reduce poverty, and foster rural development while ensuring food security and nutrition for both urban and rural consumers.

Introduction

As India achieved self-sufficiency in food grains production and due to rising income level of urban consumers, make them to concentrate more on the health and nutrition. Vegetables are called as protective food due to their enhanced vitamins and minerals content thus leading front in the crop cultivation to cop up with the nutritional needs and also play a pivotal role in doubling the farmer's income due to their short duration, higher productivity and labor-intensive nature. The protected cultivation of high value vegetables like tomato, cucumber, capsicum etc. provide export opportunities leading to augmented rural prosperity alongside India epitomizes a compelling stride towards elevated socioeconomic development and agrarian advancement.

Ways to double the farmer income through vegetable growing

1. **Protected cultivation of vegetable crops:** As a key factor in preventing a vegetable shortage in a given state during a given season, off-season vegetable farming is increasingly being considered as a viable solution to supply this demand. Additionally, during its off-season, it can regulate the increase in vegetable prices. That means that all social classes

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can readily access and purchase the vegetables referred to as the "protective food" at any time of the year. Because of this, it may be extremely important in reducing dietary deficiencies in humans. Furthermore, during the primary growing season, farmers frequently produce a sizable quantity of vegetable crops, which ultimately causes a significant market glut and a decline in price. Growing vegetables outside of their primary growing season under inexpensive covered structures might therefore guarantee producers a larger profit margin.

Suitable vegetable varieties for year-round cultivation under low-cost poly house (Phookan and Saikia, 2003)

Crops	**Varieties**	**Season**
Tomato	Naveen, Karnataka	May-Aug
French bean	Kentucky Wonder, Contender	Sept-Nov
Cauliflower	White Marble, Indam	Dec-Feb
Coriander	CO-1, Mehak	May-April
Cowpea	Arka Suman	May-June
Okra	Arka Anamika	May- June
Palak	All Green, Pusa Jyoti	June-July

2. **Growing of high yielding varieties and hybrid:** Growing of high yielding vegetable varieties may double farmer profit. Small and marginal farmers harvest good yield in small area. High yielding vegetable varieties have been released and recommended for cultivation throughout India, Vegetable crop varieties Brinjal Pusa Krishna, Pusa Safed Baingan-2, Pusa Hara Baingan-2, Pusa Golden Cherry Tomato-2, Pusa Tomato (Protected)-1, Pusa Cauliflower Hybrid 3, Pusa Cauliflower Hybrid 101, Pusa Red Cabbage Hybrid-1, Pusa Capsicum-1, Carrot Pusa Prateek, bitter gourd Pusa Hybrid-6, and Pusa Hybrid-5 Pusa Prasanskrit tomato, Pusa Cocktail Tomato, Pusa Peet capsicum, Pusa Parthenocarpic Cucumber Hybrid-1, Pusa Sem-6, Pusa Cauliflower Hybrid 102, Pusa Purple Broccoli-1 and Pusa Lal Bhindi-1. These regionally suitable varieties can be grown successfully in different zones.
3. **Good agriculture practices:** The concept of Good Agricultural Practices (GAP) has evolved in recent years in the context of a rapidly changing and globalising food economy

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and as a result of the concerns and commitments of a wide range of stakeholders about food production and security, food safety and quality, and the environmental sustainability of agriculture. GAP includes applying the right amount of fertilizer at the right time. Use organic fertilizers and aged manure. Store fertilizers in a dry, clean, and sheltered place. Growing different crops in the same area in sequence over seasons to preserve the soil's productive capacity. Using an ecosystem-based strategy to prevent pests and disease long term. Using of good quality of seeds for good yield and profitability. It aims to help farm owners maximize yields and optimize business operations while also minimizing production costs and environmental impact.

4. **Adaption of high-tech agriculture practices in vegetable farming**
   - **Mechanization:** This modern way of vegetable farming relies on smart machines to automate planting, growing, and harvesting vegetables, all the way to processing them. It's a game-changer, boosting production, cutting down on labour, and getting more out of each harvest.
   - **Drip irrigation**: It increases the irrigation efficiency as water directly delivered to the rhizosphere, and helps to increase the profit by enhanced input efficiency and yield.
   - **Fertigation:** When the fertilizers applied through drip irrigation reffered to as fertigation. It reduces their leaching and increased uptake by plants.
   - **Mulching:** It is the technique of covering the soil around the plants by natural crop residues or synthetic plastic films. it acts like an insulator, reduces water evaporation and prevents weed growth. Thereby creates congenial conditions for the growth of the plants.
   - **Soil and crop sensors**: A network of sensors track plant and soil health, monitoring the needs of water and nitrogen, which influence maximum yields.
   - **Micropropagation for mass production of disease-free planting materials:** Use of tissue culture derived planting materials reduces the infestation of diseases. For example, Virus free potato.
5. **Integrated nutrient management:** INM offers a variety of benefits, including the ability to safeguard the environment and resource quality in addition to enhancing plant performance and resource efficiency. NM improves grain quality, soil health, and sustainability, while increasing crop yields by 8–150% as compared to conventional

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approaches. It also boosts water-use efficiency and the financial rewards to farmers. INM system is to handle and sustain the agricultural output and improve the farmer's productivity through the cautious and efficient use of chemical fertilizers, organic manures, green manures, and compost including vermicompost, crop residues and bio-fertilizers.

6. **Integrated pest and disease management:-** Integrated Pest and Disease Management is a holistic approach to agricultural practices that seeks to minimize the impact of pests and diseases on crops. IPDM is an ecosystem-based strategy that emphasizes prevention rather than eradication. It advocates for a combination of techniques, including biological, cultural, and physical methods, to maintain a healthy crop ecosystem and reduce reliance on pesticides. IPDM decreases the cost of production and increases the income to farmers.
7. **Post harvest technology of vegetable crops:** In India a loss of 4.87 to 11.61 per cent of total vegetables produced was observed (PIB, 2022) mainly due to glut in the peak season and poor post-harvest infrastructure. There are two approaches for reducing postharvest losses of vegetables. The first approach for loss reduction is to follow scientific postharvest management of vegetables. Another approach is processing them into value added products. Post-harvest technology for vegetable crops envisages the development of appropriate techniques to reduce post-harvest losses to prevent spoilage and help to utilise maximum crops in a nutritious and safe manner. Post harvest technology of vegetable crops adds extra income to farmers.
8. **Precision Farming:** Vegetable crops are becoming more and more in demand. Maintaining this demand calls for the introduction of technologies that enable the effective use of resources to produce output that is higher per unit of inputs used and of exceptional quality. Improving crop performance and setting quality is the goal of precision vegetable growing. It helps farmers by enabling them to carry out much more frequent tillage, modify sowing rates and fertilizer application according to soil conditions, plan even more crop protection programs with greater accuracy, and recognize the area where yield variation occurs. These advantages might actually increase the harvest production's cost-effectiveness, but the grower still has to be ready to adjust his management strategies to make them more effective. Modern techniques such as cloud computing, information technology (IoT), wireless sensor networks (WSN), artificial intelligence (AI), and machine learning (ML) are used in precision vegetable farming to increase crop output. Studies to date have

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generally indicated that PA-based techniques have positive effects on sustainability and production.Precision agriculture has been adopted quickly in the vegetable growing industry, where growers are given high-quality solutions and are able to identify problems with food security and quality. Automation of goods record attributes related to product quality, including colour, size, shape, outward flaws, acidity, sugar content, and other internal features. Furthermore, monitoring field operations such as artificial fertilizers and sprayed chemicals can readily supply comprehensive vegetable and fruit processing techniques (Kaushik et al, 2021).

9. **High Value Horti Commodities Cultivation:** The rising market demand for high-value vegetable commodities is unlocking opportunities for farmers, especially those with smaller landholdings, to broaden their scope by diversifying into commodities that offer substantial potential for higher profits in terms of land, labour, and capital. The implementation of institutional innovations in marketing expands their market penetration, facilitates their acquisition of high-quality resources, advanced technology, crucial information, and essential services. Ultimately, this leads to heightened productivity and decreased costs related to marketing and transactions as well as increase the farmer income. Spinach, lettuce, parsley, cherry tomato has importance in international vegetable market.
10. **Hybrid/OP seed production:** India benefits from a wide range of agro-climatic conditions, which vary from tropical to temperate. This diversity enables the cultivation and seed production of almost all types of vegetables that thrive in different temperature regimes. Thus, farmers in India can took up commercial seed production. As the warm season vegetables can be grown and their seeds produced in the plains of India and the Deccan Plateau. On the other hand, the hilly regions of the Himalayas provide suitable conditions for seed production of winter vegetables such as cabbage, cauliflower, broccoli, beetroot, European carrot, and radish. In the northern plains of India, certain winter vegetables like onion, Asiatic carrot, Asiatic radish, and tropical cauliflower produce seeds during the winter season. In the southern regions of India, Solanaceous vegetables, cucurbits, and legumes have the ability to set seeds throughout the year (Prasad et al, 2009). Therefore, seed production adds profits to farmer income and also generates additional employment to farm labourers.

How does vegetable growing bolster the farmer's income?

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1. **Higher Profit Margins:** One of the primary reasons why vegetable farming has the potential to boost India's GDP is the higher profit margins it offers to farmers. Vegetables produces higher yield per unit area and high-value crops like tomato, bell pepper, and cucumber often yield better returns. Some vegetable crops, despite requiring less space, fetch higher prices in the market. Vegetables, being perishable, can command better prices in the market, ensuring better returns for farmers. Vegetables, being perishable, can command better prices in the market, ensuring better returns to the farmers.
2. **Export opportunities:** The global market for vegetables is vast, and India can tap into this market to further gain its foreign exchange earnings. With the right infrastructure and quality control measures in place, Indian vegetables can find a place on international shelves.
3. **Diversification of Agriculture:** Vegetable farming offers an excellent opportunity to diversify agriculture and reduce vulnerability to these risks. As vegetables are short duration crops, they are highly suited for crop rotation, intercropping, and multiple cropping systems. Thus reduces the pressure on water and land resources and can lead to more sustainable farming practices.
4. **Job Creation:** Vegetable farming is highly labour-intensive, and has the potential to create millions of jobs across the country. This can be a significant boost to India's employment landscape, especially in rural areas where job opportunities are limited. A thriving vegetable farming sector can provide employment not only in cultivation but also in transportation, packaging, as well as marketing opportunities thus creates the stable economy.
5. **Sustainable Farming Practices:** Vegetable farming can encourage the adoption of sustainable farming practices. Many vegetables can be grown using organic and eco-friendly methods, reducing the reliance on chemical fertilizers and pesticides. This move towards sustainable farming aligns with global trends and can enhance India's image as an environmentally conscious nation.

Government initiatives to support vegetable growers

- Organic farming promotion
- Farmer Producer Organisations (FPOs) promotion
- National Beekeeping and Honey Mission (NBHM)

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- Agricultural Mechanization
- Operation Greens: To address price volatility of perishable commodities like Tomato, Onion and Potato (TOP).
- Kerala becomes the first state in India to fix the floor price for 11 vegetables, which will be 20 per cent above the production cost of the vegetable.

Conclusion

The doubling of farmer income through cultivating vegetable crops is a transformative approach that holds immense potential for improving the livelihoods of small and marginal farmers which India has the most. By means of focusing on market-driven and sustainable agricultural practices, this initiative aims to empower farmers, reduce poverty, and foster rural development while ensuring food security and nutrition for both urban and rural consumers.

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