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Off-season trellis-based vegetable cultivation can provide better source of income for small and marginal farmers

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Abstract

This research is conducted on the effects of bottle gourd cultivation during the off-season by small and marginal farmers in the Deeh block of Raebareli district, Uttar Pradesh. In agriculture, trellis farming has become revolutionary, especially for creepers like Bottle gourd, Ridge gourd, Bitter gourd, etc. A total of 20 farmers were selected from five villages for the study in the FRDP (Focused Rural Development Programme) project area during the year 2022-2023. Each farmer cultivated bottle gourd on 0.5-acre area, with 10 farmers sowing seeds in the first week of February 2023 and the remaining 10 in the first week of May 2023.

This study shows bottle gourd farming using trellis during the off-season and on-season, focusing on input costs, yield, harvesting dates, Gross Return (Rs), Price per qt (Rs), Net Return (Rs) and B:C Ratio. On-season (February) bottle gourd cultivation performed better in terms of production and harvesting days than off-season cultivation, with negligible cost of cultivation differences. Off-season bottle gourd cultivation production is less (68.213) on 0.5 acres than on-season bottle gourd cultivation (79.130), and also on-season bottle gourd cultivation had higher harvesting days (87.03) and also significantly higher than off-season bottle gourd cultivation (70.00).

Economic features show notable variations that support off-season farming. Remarkably, for 0.5 acres, off-season cultivation yielded more net return (Rs 72700.80) with Rs. 2004.34 per qt. On the other hand, the net return from on-season cultivation was Rs 35944.60 with Rs.1231.65 per qt. These findings highlight the off-season bottle gourd cultivation's economic feasibility in trellis-based systems. However, May sowing fetches the best market price as the highest B:C ratio (2.11) was recorded for May sowing.

Keywords: Off-season, trellis, better income source, small and marginal farmers

Introduction

Trellis, the structure used to support climbing plants, has become a game-changer in modern agriculture. Among the various crops benefitting from trellis farming, bottle gourd (scientifically known as *Lagenaria siceraria*) shines as a versatile and highly sought-after vegetable. Originating in tropical climates, particularly India, bottle gourd is cherished for its culinary, medicinal, and utilitarian purposes. Fresh bottle gourd fruit juice is used as medicine to cure various diseases (Ghule *et al.*, 2007) ^[1]. Its seeds are the potential source of protein, lipid, macro and micronutrients (Anjula *et al.*, 2019) ^[2] and high genetic diversity for fruit traits resulted in a variety of uses in daily human life.

The agricultural sector, especially in countries like India, heavily relies on small and marginal farmers, who make up around 85% of the farming community. With challenges like land degradation, climate change, and rapid urbanization posing threats to cultivable land, innovative agricultural practices are crucial for enhancing productivity per unit area (Sultan *et al.*, 2020) ^[3]. The shift towards off-season trellis-based vegetable production presents a sustainable and efficient solution to these pressing issues.

More than 95% of land holdings will be under small and marginal farmers in India by 2050 as per the Projection. In this situation, it is essential to improve the crop productivity per unit area by using both vertical and horizontal available land along with sunlight and other natural

resources. To address this problem, an offseason trellis-based vegetable production system will be a potential and efficient solution to provide food, nutrition, and income and also an option of livelihood source for the small and marginal farmers of India.

By building elevated structures out of wood or other materials, trellis farming creates the ideal environment for the growth of vegetable crops that are climber kinds. By using this method, the crops are guaranteed to get more sunlight, better aeration, and little contact with pests and illnesses. A more sustainable future for small and marginal farmers is being made possible by trellis-based agriculture, which lowers production costs, improves food quality, and supports organic farming methods.

Research studies conducted by experts like Meena *et al.*, 2022^[4]; Sultana *et al.*, 2020^[3]; Mali *et al.*, 2019^[5]; Singh and Negi, 2013^[6] have consistently shown that multilayer trellis farming outperforms traditional crop farming in terms of net returns. Farmers who have embraced trellis-based vegetable production have witnessed a significant improvement in both the quantity and quality of their crops, leading to increased profitability. Compared to on-season trellis systems, off-season trellis farming has demonstrated superior profitability, showcasing its potential to transform the livelihoods of farmers and revolutionize the agricultural landscape.

Materials and Methods

The present study was conducted in the Deeh block of Raebareli district in the state of Uttar Pradesh. The Deeh block is a desert and a corresponding community development block in the Salon tehsil of Raebareli district. It is situated 22 km from Raebareli, the district headquarters, near the intersection of the road to Parshadepur and the road leading from Jais to the Gukana Ghat. Geographically, the study area is located at 26.14° North latitude and 81.39° East longitude, with an average altitude.

A total of 20 farmers were selected from five villages for the study in the FRDP project area during the years 2022-2023. Each farmer cultivated on 0.5-acre plots, with 10 farmers sowing seeds in the first week of February and the remaining 10 in the first week of May 2023. Data on various parameters such as established cost, land preparation, insect pest control, irrigation, production, labour cost, transportation, and income were collected by our technical expert from the farmers.

The research design employed a two-sample T-test design, and the benefit-cost ratio was calculated based on the cost of cultivation and net return for both treatments. The data on various parameters were statistically analysed using the ICAR Web software.

Results and Discussion

Table 1: Effect of on-season trellis Bottle Gourd cultivation on yield attributes

Off-season trellis-based bottle guard cultivation	Cost of cultivation (Rs)		Production (Qt)		No of days harvesting	
	Off Season Cultivation	On Season Cultivation	Off Season Cultivation	On Season Cultivation	Off Season Cultivation	On Season Cultivation
Mean	63856.900	61603.100	68.213	79.130	70.00	87.30
Number of Observations	10	10	10	0	10	10
P(T<=t) two- tail	NS	NS	-3.99	-3.99	-5.93	-5.93

The results of off-season trellis-based cultivation regarding input cost, production, and the number of days harvesting are presented in Table-1. It is revealed from Table 1 that no significant differences were observed in the cost of cultivation between both treatments. In the case of production and the number of days harvesting, on-season bottle gourd cultivation (T₂) showed a significant difference compared to treatment one (T₁), as observed in Table 1. However, off-season (T₁) bottle gourd cultivation recorded a numerically higher cost of Rs 63856.900 for 0.5 acres compared to on-season bottle gourd cultivation (T₂), which is Rs 61603.100. The numerically

maximum production and number of days harvesting for 0.5 acres were observed in on-season bottle gourd cultivation (T₂) at 79.13 qt/ha and 87.30, respectively, compared to off-season vegetable cultivation (T₁) at 68.23 qt/ha and 70 days of harvesting, respectively.

Similar results were obtained by Sindhu and Chatterjee in 2020^[7], Dickerson in 2014^[8], and Chowdhury *et al.* in 2002^[9]. Manabendra *et al.* in 2019^[10] also reported that on-season vegetable production was higher and showed a significant difference due to the minimum attack of insects and pests, along with an increased number of days of harvesting.

Table 2: Effect of on-season trellised Bottle Gourd cultivation on economic parameter.

Off-season trellis-based bottle guard cultivation	Gross Return (Rs)		Price per qt (Rs)		Net Return (Rs)		B:C Ratio	
	Off Season Cultivation	On Season Cultivation	Off Season Cultivation	On Season Cultivation	Off Season Cultivation	On Season Cultivation	Off Season Cultivation	On Season Cultivation
Mean	136557.70	97547.70	2004.34	1231.65	72700.80	35944.60	2.11	1.58
Number of Observations	10	10	10	10	10	10	10	10
P(T<=t) two- tail	6.58	6.58	13.42	13.42	7.88	7.88	9.67	9.67

The income, price, and net return of off-season bottle gourd cultivation, along with the benefit-cost ratio, are presented in Table-2. It is indicated from the table that a significant difference was observed in income, price per quantal, net monetary return, and benefit-cost ratio due to off-season bottle gourd cultivation on trellis-based systems. However, the maximum income of Rs 136557.7, price per quart of Rs 2004.34, and net monetary return of Rs 72700.80 were recorded by off-season bottle gourd cultivation and also significantly higher compared to on season trellis based bottle gourd cultivation from 0.5 acres of land.

Manabendra *et al.* in 2018^[13] reported that off-season bottle gourd cultivation leads to higher gross returns, maximum net monetary return due to the higher price of vegetables, and also a higher cost-benefit ratio. Similar results were observed by Khan *et al.* in 2001^[11] in tinda vegetable crops, supporting the opinion given by Aderibigbe and A.T. Benjamin in 2016^[12].

Conclusion

Studies concluded that off-season bottle gourd cultivation has the potential to provide higher gross returns, net returns, and a higher cost-benefit ratio per unit area. It was found that a change

in cultivation time helps in reducing irrigation costs to a considerable extent in the given soil condition. Sowing during the normal time in February and March month requires frequent irrigation and adds to production costs. Off-season sowing of summer bottle gourd proved to be successful, as late sowing in May helps fetch a good market price due to a substantial demand and supply of vegetables during the rainy season. In this context, it is concluded that the May month sowing of bottle gourd is more appropriate in terms of net return compared to the February crop.

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