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SUSTAINABLE RIDGE GOURD PRODUCTION THROUGH INTRODUCTION OF HIGH YIELDING VARIETY ARKA PRASAN IN DAKSHINA KANNADA DISTRICT OF KARNATAKA, INDIA

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ABSTRACT

Ridge gourd is an important cucurbitaceous vegetable crop grown for the fresh vegetable market, and it plays a vital role in supplementing the income of small and marginal farmers in the district. One of the significant constraints of traditional ridge gourd farming is low productivity due to the non-adaption of advanced technologies. To address these issues, Front Line Demonstrations (FLDs) on sustainable ridge gourd production through the introduction of high-yielding Arka Prasan variety was carried out by ICAR-KVK, Dakshina Kannada during 2023-24 and 2024-25. The study aimed to bridge technology gap and enhance yield to improve farmers income. The FLDs incorporated improved technologies such as the introduction of high-yielding variety (Arka Prasan), balanced nutrient application, integrated pest and disease management etc. The results indicated significant improvements in productivity and economic returns for the demonstration plots compared to traditional practices. The demonstration plots achieved an average yield of 155.94 q/ha, a substantial increase over the 108.12 q/ha yield from check plots, reflecting an 46.56% and 42.07% yield increase in 2023-24 and 2024-25 respectively. The cost of cultivation was also lower for the demo plots, averaging Rs. 221930/ha, compared to Rs. 230848/ha for the check plots. Consequently, economic returns were higher with average gross returns of Rs. 701730/ha and net returns of Rs. 479800/ha for demo plots, versus Rs. 486517/ha and Rs. 255669/ha for check plots. The benefit-cost ratio for demo plots averaged 2.16 significantly outperforming the 1.10 ratio for check plots. In addition to the high yield of variety Arka Prasan, lower values of technology gap, extension gap, and technology index observed in the present study revealed the effectiveness of technical interventions.

Key words : Arka prasan, Front-line demonstration, Ridge gourd, Technology index, Yield gap.

Introduction

Ridge gourd (*Luffa acutangula* L.) is one of the important cucurbitaceous vegetable crops in India and it is also popular in Southeast Asia and China. The crop originated from India which has a diploid chromosome number (2n = 26). Ridge gourd is a delicious vegetable. The pulp is edible once the skin is removed, and it will be white (Shadrach *et al.*, 2023) its tender fruits can be cooked to prepare various curries, and the outer skin of ridge gourd is used for making chutneys in South India. Ridge gourd is rich in dietary fiber and enriched with all the vital elements including vitamin C, zinc, iron, riboflavin, magnesium, thiamine and traces of other minerals (Swetha and Muthukumar, 2016). It has excellent cooling properties. Ridge gourd contains a gelatinous compound called luffein (Thamburaj and Singh, 2013) contains a good amount of cellulose, and rich in water content that helps to relieve constipation. A few of the health advantages are an excellent blood purifier, possesses laxative properties, cure for jaundice, beneficial for diabetes, aids weight loss, anti-inflammatory and anti-biotic, fortifying the immune system, skincare, and good for the stomach. Ridge gourd is a versatile crop that can be grown in almost all types of soil with little management.

In Karnataka, vegetable growers seek high-yielding and early open-pollinated varieties of ridge gourd. The prevalent practice of intensive input usage among these growers often results in unstable yields and reduced profit margins. Additionally, insufficient information on quality inputs, particularly regarding varieties and improved management practices, contributes to lower yields and income. To address these issues, the ICAR-Indian Institute of Horticultural Research, Bangalore, India, has developed an early open-pollinated variety of ridge gourd named Arka Prasan. This variety is known for its early harvesting which comes to picking 42–45 days after sowing. Arka Prasan variety produces light green long tender fruits which have excellent cooking qualities. It offers an average yield of 26 tons per hectare over a cultivation period of 120 to 135 days. This variety is intended to mitigate the challenges faced by growers by providing a more stable and profitable cultivation option.

Frontline demonstrations serve as an effective extension tool for showcasing improved technologies, particularly high-yielding varieties (HYVs) and integrated crop management practices for farmers. Extension centers such as Krishi Vigyan Kendra's play a pivotal role in this process, operating as field-based organizations focusing on evaluating, refining and disseminating successful technologies across diverse agro-climatic regions. This concerted effort leads to the adoption of improved practices, narrowing the gap between technology development and its implementation, ultimately resulting in enhanced yields for farmers and better returns to the growers. Because of the extension activities required at field levels ICAR- KVK, Dakshina Kannada located in the coastal zone of Karnataka conducted front-line demonstrations at different farmers fields to promote the high-yielding variety of ridge gourd during the years 2023-24 and 2024-25 to reduce the technology as well as the extension gaps to improve the yields and the farmers income.

Materials and Methods

The present study was carried out by ICAR-Krishi Vigyan Kendra, Dakshina Kannada for two consecutive years from 2023–24 and 2024-25 in the Farmers Field of Dakshina Kannada district. A total of 40 farmers actively involved in ridge gourd cultivation were selected consisting of 20 participants from demonstration groups across 5 villages and 20 non-participating farmers (check). The front-line demonstration had begun with a benchmark survey in different villages in the district. Diversified information was collected through structured personnel interviews of practicing ridge gourd growers in the districts. Secondary information was collected from taluk horticultural officers, experienced vegetable growers, vendors and other stakeholders in the ridge gourd value chain (Poshadri *et al*., 2020).

The Variety "Arka Prasan" of ridge gourd was developed by ICAR-IIHR and was used in the FLD programme. Arka Prasan was tested through FLD with

Table 1 : Technological Interventions under FLD and farmers' practice.

S. no.	Components	Demonstration	Farmers practice
1.	Selection of high yielding variety	High yielding Variety Arka Prasana	Local variety/private hybrids
2.	Planting system	Pandal system of planting	Channel method. In the channel seeds were sown @ one seed/hill
3.	Seed rate	01 Kg/acre	2.5 kg/acre
4.	FYM	25 t/ha	7-8 t/ha
5.	Spacing	2.5 x 2 m	3 x 0.6 m
6.	Fertilizer	NPK 20:20:20 Kg/ha	NPK 15:15:15 @ 50Kg/ha
7.	Micronutrients	Arka Vegetable Special 2g/lit @ 15 days interval for 3 times	No micronutrients application
8.	Microbial Consortia	Arka Microbial Consortia @ 5Kg/500 kg of FYM	Not practiced
9.	Plant protection	• Installation of Yellow sticky traps @ 20/acre • Installation of fruit fly traps @ 10/acre and need based application of chemicals • Need based application of chemicals like Neem oil (10000ppm) @0.5 ml/lit	• Without installation of Fruit fly traps • Spraying of non-recommended chemicals

a Foliar spray of Arka Vegetable special (2 g/lit.), Drenching of Arka microbial consortium (20 g/lit), recommended doses of fertilizers, integrated pest and disease management and interventions compared with Local variety grown with farmers practices. The critical inputs required for the study concerning FLD and farmer's practice are given in Table 1. Critical inputs namely Arka Prasan quality seeds, Arka vegetable special (micronutrient mixture), Arka microbial consortium, fruit fly traps for plant protection measures were provided in FLD plots, and non-monetary inputs like timely sowing in lines and timely weeding and irrigation were performed. The FLD farmers were facilitated by the KVK scientists in performing field operations during training and visits. Two off-campus trainings have been organized for the group of beneficiaries Farmers. The farmer's practice of local variety was taken as a control (check). Field days were also conducted in each cluster to show the results of the front-line demonstration to the farmers of the same village and neighbouring villages, print and visual media were also used to disseminate the technology.

The study evaluated yield and yield attributing characters, cultivation costs, and net returns including the benefit-cost ratio to gauge the impact of the FLD on ridge gourd cultivation practices and economic outcomes as previously reported by Raghuveer *et al.* (2020). Gross income was calculated based on local market prices of ridge gourd and net income by subtracting the total cost of cultivation from gross income. The B: C ratio was computed by dividing gross returns by the cost of cultivation.

To estimate the technology gap, extension gap, and technology index, as well as additional costs, returns, and effective gains, the following formulae were used as suggested by Sagar and Chandra (2004), Sunil Kumar *et al.* (2021), Shankar *et al.* (2022), Rashmi *et al.* (2024a) and Rashmi *et al.* (2024b).

$$\textbf{Percent increase in yield} = \frac{\text{Demonstration yield} - \text{Farmers yield}}{\text{Farmers yield}} \times 100$$

Technology Gap = Pi (Potential yield) – Di (Demonstration yield)

Extension Gap = Di (Demonstration yield) – Fi (Farmers yield)

$$\textbf{Technology index} = \frac{\text{Potential yield} - \text{Demonstration yield}}{\text{Potential yield}} \times 100$$

Results and Discussion

The Technological Interventions under FLD and farmer's practice details are given in Tables 2, 3 and 4. The provided data set offers a comparative analysis of the promotion of the Arka Prasan variety through FLD in the coastal zone of Karnataka through demonstration plots (demo) versus check plots (farmers practice) over two consecutive years 2023-24 and 2024-25. The key parameters evaluated include yield attributing characters viz., days taken for first picking, weight of the fruit, number of fruits per vine, fruit length, yield (q/ha), cost of cultivation (Rs. /ha), gross returns (Rs./ha), net returns (Rs. /ha) and the benefit-cost (B: C) ratio. This analysis aims to determine the effectiveness of the demonstration plots in improving productivity and economic returns compared to traditional practices represented by the check plots.

Yield and yield attributing characters

Demonstration plots of high-yielding ridge gourd var. Arka Prasan led to a marked effect on total fruit yield. The yield attributing traits *viz*., days taken for first picking was early in Arka Prasan (43.20 days), weight of the fruit (193.62g), number of fruits per vine (16.16) and fruit length (70.07 cm) were significantly higher in demonstrated plots. Whereas a comparatively lower number of fruits per vine (11.43), fruit length (34.60 cm), and fruit weight (153.62g) were recorded in farmers-practiced plots. Higher values of yield attributing traits observed in the demonstrated plot might be due to the high yielding of a variety of seeds, bio-fertilizers, micronutrients, integrated nutrient management, integrated pest, and disease management.

The demonstration plots reported a yield of 152.52 and 159.36 q/ha significantly higher than the check plots, which produced 104.06 and 112.17 q/ha during 2023-24 and 2024-25. This represents an increase of approximately 44.31% in yield due to the improved variety of Arka Prasan over hybrids/local varieties cultivated by traditional practices. The demonstrated plot recorded higher yield might be due to the higher number of fruits per vine, fruit length, and fruit weight. The ridge gourd genotypes showed significant variation in growth, yield (Krishnamoorthy and Ananthan, 2017), and quality of fruits (Choudhary *et al.*, 2014). Fruit weight is strongly associated with fruit length, fruit weight and total yield as reported by Sunil Kumar *et al.* (2024). Yield is a complex and dependent trait in which one is determined by the fruit weight and number of fruits per plant and their inheritance any change in these would reflect on total yield (Karthick *et al.*, 2017).

Economic parameters

Economic indicators *i.e.*; gross cost of cultivation;

Table 2 : Yield and yield attributing characters of Ridge gourd var. Arka Prasan.

Year	Days taken for first picking		Weight of fruit (g)		Fruit length (cm)		Number of fruits per vine		Yield q/ha		% increase over check
	Demo	Check	Demo	Check	Demo	Check	Demo	Check	Demo	Check	
2023-24	43.68	52.28	192.94	152.94	69.62	34.10	16.36	11.97	152.52	104.06	46.56
2024-25	42.73	53.43	194.30	154.30	70.53	35.10	15.96	10.89	159.36	112.17	42.07
Average	**43.20**	**52.85**	**193.62**	**153.62**	**70.07**	**34.60**	**16.16**	**11.43**	**155.94**	**108.12**	**44.31**

Table 3 : Cost economics on demonstration of Ridge gourd var. Arka Prasan.

Year	Yield q/ha		Gross cost of cultivation (Rs. /ha)		Gross returns (Rs. /ha)		Net returns (Rs. /ha)		Benefit Cost Ratio	
	Demo	Check	Demo	Check	Demo	Check	Demo	Check	Demo	Check
2023-24	152.52	104.06	218800	228734	686340	468270	467540	239536	2.14	1.04
2024-25	159.36	112.17	225060	232962	717120	504765	492060	271803	2.18	1.16
Average	**155.94**	**108.12**	**221930**	**230848**	**701730**	**486517**	**479800**	**255669**	**2.16**	**1.10**

Table 4 : Yield, extension gap, technology gap, and technology index on demonstration of Ridge gourd var. Arka Prasan.

Year	Yield q/ha		Potential Yield q/ha	Extension gap (q/ha)	Technology gap (q/ha)	Technology index (%)
	Demo	Check	Demo			
2023-24	152.52	104.06	**260.0**	48.46	107.48	41.33
2024-25	159.36	112.17		47.19	100.64	38.70
Average	**155.94**	**108.12**		**47.82**	**104.06**	**40.02**

gross returns, net returns and BC ratio of front-line demonstration are presented in Table 3.

The cost of cultivation for the demo plots, using Arka Prasan was Rs. 218800/ha, slightly lower than the Rs. 228734/ ha for the check plots where private hybrids/ local varieties were used as seed material. This suggests that the demo plots not only achieved higher yields but also managed to do so at a reduced cost during the year 2023–24. The cost of cultivation for the demo plots during the year 2024-25 increased to Rs. 225060/ha, while the check plots incurred a cost of Rs. 232962/ha. Although the demo plots experienced a slight increase in costs, they remained lower than the check plots. The average gross cost of cultivation over the two years was Rs. 221930/ha for the demo plots and Rs. 230848/ha for the check plots. The lower cultivation costs in the demo plots indicate more efficient resource use and cost management.

The gross returns during the year 2023–24 for the demo plots were Rs. 686340/ha substantially higher than the Rs. 468270/ha for the check plots. Consequently, the net returns for the demo plots were Rs. 467540/ha compared to Rs. 239536/ha for the check plots, showing a significant advantage for the demo plots. The demo plots again outperformed during 2024-25 with gross returns of Rs. 717120/ ha compared to Rs. 504765/ ha for the check plots. The net returns for the demo plots were Rs. 492060/ha significantly higher than the Rs. 271803/ha for the check plots. Over the two years, the average gross returns were Rs. 701730/ha for the demo plots and Rs. 486517/ha for the check plots. The average net returns were Rs. 479800/ha for the demo plots and Rs. 255669/ha for the check plots (Table 3). These figures highlight the superior economic performance of the demonstration plots.

The Benefit-Cost (B: C) ratio is a critical indicator of economic efficiency, reflecting the return on investment for every unit of currency spent. Economic analysis of the yield performance revealed that the benefit-cost ratio of demonstration plots was observed to be significantly higher than control plots i.e., farmer's practice. The B: C ratio demonstrated were recorded as 2.14 and 2.18 and control plots 1.04 and 1.16 during 2023-24 and 2024-25, respectively. The average B: C ratio over the two years was 2.16:1 for the demo plots and 1.10:1 for the check plots. This indicates that the demo plots generated Rs. 2.16:1 for every rupee spent, compared to Rs. 1.10:1 for the check plots. Similar results were reported in ridge gourd by Sundharaiya *et al.* (2022) in the frontline demonstration. This consistently higher B: C ratio for the

Fig. 1 : Field view of Ridge gourd var Arka Prasan plot.

Fig. 2 : Field day of Ridge gourd var Arka Prasan.

demo plots underscores their superior economic efficiency and profitability.

The data clearly illustrates that the demonstration plots outperformed the check plots across all key metrics, including yield, cost of cultivation, net returns, and B: C ratio. The higher yields in the demo plots suggest that the improved agricultural practices, technologies, or crop management strategies implemented in these plots were effective. The reduction in the cost of cultivation for the demo plots further highlights their efficiency. Lower costs, coupled with higher yields, resulted in significantly higher gross and net returns for the demo plots. The superior B: C ratio achieved by the demo plots they are more economically viable and provide better returns on investment. Several factors could contribute to the enhanced performance of the demo plots. These may include the use of high-yielding crop varieties, better soil fertility management, efficient use of water and fertilizers, effective pest and disease control measures. Additionally, the demonstration plots likely benefited from closer monitoring and support from agricultural extension services, which can play a crucial role in improving farming practices and outcomes.

Extension gap

Extension gaps of 48.46 and 47.19 q/ha were observed during 2023-24 and 2024-25, respectively. On average extension gap under the two-year FLD programme was 47.82q/ha. This emphasized the need to educate the farmers through a scientific approach for the adoption of improved agricultural production practices to reverse this trend of wide extension gap. More and more use of the improved production technologies along with high-yielding variety will subsequently change this alarming trend of galloping extension gap.

Technology gap

The technology gap, the difference between potential yield and yield of demonstration plots was 107.48 and 100.64 q/ha during 2023-24 and 2024-25, respectively (Table 4). On average technology gap under the two-year FLD programme was 104.06 q/ha. This may be due to the soil fertility, managerial skills of individual farmers and climatic conditions of the selected area. Hence, need-based location-specific recommendations are necessary to bridge these gaps (Sundharaiya *et al*., 2022 and Sunil Kumar *et al*., 2024).

Technology Index

The technology index showed the feasibility of demonstrated technology at the farmer's field. The technology index varied from 38.70 to 41.33 (Table 4). An average technology index of 40.02 percent was observed during the two years of FLD programme, which shows the effectiveness of technical interventions. This accelerates the adoption of demonstrated technical interventions to increase the yield performance of the ridge gourd variety Arka Prasan.

Conclusion

The promotion of the ridge gourd variety Arka Prasan through frontline demonstrations (FLDs) in the coastal zone of Karnataka has demonstrated significant improvements in agricultural productivity and economic returns compared to traditional farming practices. The data from the years 2023-24 and 2024-25 clearly illustrate that the demonstration plots outperformed the check plots across all key metrics, including yield, cost of cultivation, net returns, and B:C were substantially higher than the check plots, emphasizing their superior economic efficiency and profitability. In addition to the high yield of variety Arka Prasan, lower values of technology gap, extension gap, and technology index observed in the present study revealed the effectiveness of technical interventions. The present study concludes that the introduction of high-yielding varieties including integrated crop management practices, improved production technologies, and location-specific techniques must be popularized through various extension tools to increase the yield, income, and livelihood of the farming community. Further, it will certainly decrease the extension gap and technology index.

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