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An analysis of technological gap in fig cultivation in Ballari district of Karnataka

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Abstract

The present study was conducted in Ballari district during 2023-24 to analyze the technological gap in fig cultivation among growers of the Ballari district of Karnataka. The Ballari is purposively selected for having maximum production and productivity with highest area under fig in Karnataka. Using the 'Ex-post facto' research design by employing a simple random sampling technique, 120 respondents were selected and data were collected through a well-structured interview schedule. Results revealed that nearly half (45.00%) of the fig growers belonged to the low technological gap category, followed by high (29.17%) and medium (25.83%) technological gap categories. This is due to more than two-fifths of the respondents had low extension orientation, nearly half of the respondents had medium risk orientation, more than two-fifths of the respondents had medium innovative proneness and scientific orientation and nearly half of the respondents having medium management orientation. Cent per cent of fig growers had fully adopted the selection of varieties, drip irrigation and pruning while, 75.00 and 52.50 per cent of respondents adopted recommended training of fig tree and spacing, respectively. These results indicated that enhancing extension services and providing targeted management and risk training is key to bridging technological gaps and improving fig cultivation productivity.

Keywords: Technological gap, fig growers, ballari

1. Introduction

Fig (*Ficus carica* L.,) plant of the mulberry family (Moraceae) is indigenous to an area extending from Asiatic Turkey to northern India, but natural seedlings grow in most Mediterranean countries; it is cultivated in warm climates. In the Mediterranean region, the fig is so widely used, both fresh and dried, that it is called "the poor man's food" as the fruit contains significant amounts of calcium, potassium, phosphorus and iron. (Anon. 2024) [2].

In India, fig cultivation is mainly grown in the western regions of Maharashtra, Gujarat, Uttar Pradesh, Karnataka and Tamil Nadu. Maharashtra is the leading fig producer in the country, followed by Karnataka and Uttar Pradesh. India ranks twelfth globally, producing approximately 14, 695.56 tonnes of figs annually. Karnataka is notable for its fig cultivation, with Ballari district having the highest area under fig cultivation in the state. Karnataka has an area of 1,355 hectares out of which 1, 100 hectares is in Ballari and the production is about 19, 313 metric tons with a yield of 15.56 metric tons/hectare. The fig industry generates significant economic benefits, with an annual income of 32 million rupees and 0.8 million man-days of employment at the national level. In Karnataka, the income is 8.6 million rupees, and the employment generated is approximately 0.1 million man-days. (Anon, 2023) 1[1]

The Technological gap represents the disparity between recommended agricultural technologies and those adopted by farmers in the field. This gap often arises due to factors such as limited awareness or understanding of new technologies, financial constraints that prevent investment in advanced tools, inadequate infrastructure or resources, resistance to change due to traditional practices or cultural beliefs and perceived risks or uncertainties about the effectiveness of innovations. Additionally, the effectiveness of agricultural extension services, which are crucial for disseminating information and providing support, plays a significant role. Addressing these barriers is essential for bridging the gap and ensuring that farmers can effectively utilize recommended technologies.

2. Methodology

The study was carried out in the Ballari district of Karnataka. The Ballari district comprises five taluks, out of which two taluks namely Kurugodu and Siruguppa taluks were selected for the study as these talukas have the highest area under fig cultivation in Ballari district. The village-wise information relating to the area under fig cultivation was obtained from the office of the Joint Director of Horticulture, Ballari district and KVK, Hagari. The top five villages having the highest area under fig cultivation in Kurugodu taluk and the top five villages having the highest area under fig cultivation in Siruguppa taluk were selected from the district for the study. From each village, twelve fig growers were selected. Thus, from each selected taluk, sixty fig growers were selected by using a simple random sampling method. The total sample constituted from two taluks was 120. Data was collected by using a pre-tested interview schedule. The responses were scored, quantified, categorized and tabulated using statistical tools like percentage, mean, standard deviation and frequencies.

3. Results and Discussion

3.1 Overall technological gap of the fig growers in fig cultivation

The data presented in Table 1, the overall technological gap in fig cultivation, the findings revealed that a significant portion of fig growers 45.00 per cent fall into the low technological gap category, indicating that nearly half of the fig growers are relatively up-to-date with current recommended technologies. The mean technological gap score is 70.67, with a standard deviation of 06.07, reflecting moderate variability in the adoption of technologies among fig growers. Additionally, 29.17 per cent of the fig growers are in the medium technological gap category, indicating that one-third of the fig growers' moderate level of technology adoption. The remaining 25.83 per cent fall into the high category, indicating that fig growers are facing substantial challenges in adopting and implementing recommended technologies. The high percentage of fig growers in the low technological gap category may be attributed to better access to recommended technologies, effective training or knowledge about recommended practices and adequate financial resources. Conversely, the presence of a significant portion in the high technological gap category points to challenges such as limited access to technologies, insufficient training or knowledge, financial constraints or resistance to change. This variation underscores the need for targeted interventions to support those in the high and medium technological gap categories while continuing to encourage those in the low technological gap category to maintain their progress. The results are in line with Rathod and Vishal (2016) [8].

Table 1: Overall technological gap of the fig growers in fig cultivation N=120

Sl. No.	Category	Frequency	Per cent
1.	Low (<67.62)	54	45.00
2.	Medium (67.63-73.70)	35	29.17
3.	High (>73.70)	31	25.83
		Mean= 70.67	SD= 06.07

3.2 Practice-wise technological gap of the fig growers in fig cultivation

The data in Table 2. Reveals that, the adoption levels among fig growers. More than half (52.50%) of the fig growers fully adopted the recommended spacing of 5m × 3m (15 × 9 ft), underscoring the practice's direct impact on yield and plant health. Notably, Cent per cent of the fig growers adopted the 'Ballari fig' variety, valued for its high yield, nutritional benefits and economic potential, particularly given its versatility in processing and the growing demand for fig-based products. Drip irrigation was adopted by Cent per cent of fig growers because it delivers water directly to the roots in a controlled manner, reducing the risk of over-watering and fulfilling the need of regular water requirements for fig trees. Additionally, Cent per cent of the fig growers practiced pruning and 75.00 per cent practiced training, with training focused on maintaining a low height with 6 to 8 branches for better management, increased fruit production and easier maintenance. Pruning was recognized as essential for enhancing fruit yield and tree health by removing dead or diseased wood, improving sunlight penetration and enhancing air circulation. In pest and disease management, adoption rates were 64.67 per cent for spider mite control, 58.33 per cent for leaf-eating caterpillar control and 63.33 and 64.17 per cent for rust disease and leaf spot control, respectively. These adoption rates highlight the fig growers' awareness of the importance of these practices in preventing foliage damage, minimizing crop losses and ensuring a productive orchard.

More than half (55.83%) of the fig growers were in the 'partial adoption' category for the recommended plant population of 266 plants per acre, the reason might be some growers planting up to 300 plants per acre. This overcrowding can lead to competition for resources such as nutrients, water and sunlight, potentially compromising plant health and yield quality, although fig growers may expect higher yields from a higher plant population. The majority (58.33%) of the fig growers adopted the recommended pit size (2 ft length × 2 ft breadth × 2 ft depth) due to its significant benefits for tree establishment and growth. This pit size ensures adequate space for root expansion, promotes better soil aeration and facilitates effective drainage. More than 61.67 per cent of the respondents sourced their planting material from nurseries, which provide certified and healthy plants, ensuring better survival rates and early tree establishment. Nurseries also offer seedlings or cuttings at affordable prices, which is particularly beneficial for growers with smaller operations or limited resources. Cent per cent of fig growers were harvesting more than twice a year followed by pruning.

More than (56.67%) of the fig growers have not adopted the recommended pit treatment, due to limited awareness or neglect. Additionally, none of the fig growers adopted the ring method of irrigation, intercropping or bahar treatment practices. The reason for this non-adoption is that fig trees, for their deep root systems, benefit more from drip irrigation than the ring method. Intercropping is impractical because the fig tree's dense canopy and bahar treatment may be unnecessary where figs naturally undergo dormancy. Consequently, growers focus on practices that directly enhance fig tree health and productivity.

The data in Table 2 shows that high adoption rates are observed in essential production practices such as the selection of varieties (100.00%), followed by the use of cuttings from 3-year-old wood (90.55%), proper spacing (84.17%) and maintaining the recommended plant population (81.38%). For instance, the adoption rate for nematode control measures is (66.38%), while managing stem borer is adopted by 53.88 per cent of the fig growers and biofertilizer application at the planting stage is notably low at 34.44 per cent and none of the growers use the ring method of irrigation, intercropping and Bahar treatment.

Additionally, there are moderate to significant gaps in the adoption of integrated nutrient management and pest control practices. These gaps highlight the need for targeted extension efforts and support in specific areas. Low adoption rates in the use of biofertilizers, intercultural practices and specific pest and disease management techniques. The reason might be that, a lack of adequate knowledge, resources, or incentives to implement these technologies. Addressing these gaps through improved access to information, training and financial support can lead to better yields, enhanced pest and disease control and more efficient resource use, ultimately improving productivity and sustainability in fig farming. The results are in line with Lekhnath, (2016) [6].

Table 2: Distribution of respondents according to their practice-wise technological gap of the fig growers in fig cultivation N=120

Sl. No.	Recommended Technologies	Fig growers: Full adoption F	Full adoption %	Partial adoption F	Partial adoption %	No adoption F	No adoption %	Adoption quotient
I	**Production practices**							
1.	Spacing (5m × 3m/ 15 ×9 ft)	63	52.50	57	47.50	00	00.00	84.17
2.	Plant population (266 plant/acre)	53	44.17	67	55.83	00	00.00	81.38
3. a.	**Pit preparation** Size of pit (2ft length ×2ft breadth ×2ft depth)	50	41.67	70	58.33	00	00.00	80.55
b.	Pit treatment (Pits are treated with endosulfan at 100gm per pit)	10	8.33	42	35.00	68	56.67	50.55
c.	Filling of pit (Top soil mixed with 25kg FYM treated with Trichoderma)	86	71.67	34	28.33	00	00.00	90.55
d.	Application of biofertilizers (20gm each of Azospirillum and Mycorrhizae per plant in pits at planting)	20	16.66	04	36.67	56	46.67	34.44
II	**Planting**							
4. a.	Selection of varieties (Ballari fig, Dayan, Poona and Ganjam fig)	120	100.00	00	00.00	00	00.00	100.00
b.	Age of planting material (Cuttings from 3 years old wood)	86	71.67	34	28.33	00	00.00	90.55
c.	Source of planting (From nursery)	46	38.33	74	61.67	00	00.00	79.44
5.	Season of planting (June to July)	85	70.83	35	29.17	00	00.00	90.27
6. a.	Irrigation: Drip irrigation	120	100.00	00	00.00	00	00.00	100.00
b.	Ring method irrigation	00	00.00	00	00.00	120	100.00	00.00
III	**Integrated Nutrient Management**							
7.	FYM application (35 kg/tree/year)	88	73.33	32	26.67	00	00.00	91.11
8.	Neem cake application (2 kg/tree/year)	20	16.67	42	35.00	58	48.33	56.11
9.	NPK Application (N:P:K = 300:200:200 g/tree/year)	73	60.83	47	39.17	00	00.00	86.94
IV	**Intercropping**							
10.	Intercropping (Leguminous plants and vegetables grown as intercrops during initial 5 years)	00	00.00	00	00.00	120	100.00	00.00
V	**Mulching and Earthing up**							
11.	Mulching (Straw or plastic mulch)	10	08.33	45	37.50	65	54.17	51.38
12.	Earthing up (Before or after the onset of monsoon)	73	60.83	47	39.17	00	00.00	86.94
VI	**Training and Pruning**							
13.	Training (Train the trees to a low height of 3 to 4 feet with 6 to 8 branches)	90	75.00	30	25.00	00	00.00	91.66
14.	Pruning	120	100.00	00	00.00	00	00.00	100.00
VII	**Integrated Pest and Disease Management**							
15. a.	**Pest management**: Stem borer (On the point of boring inject 1.0 ml. DDVP 76 EC)	20	16.67	34	28.33	66	55.00	53.88
b.	Spider mite (Spray 2.5 ml. Dicofol 18.5 EC. In a lit. water)	77	64.17	43	35.83	00	00.00	88.05
c.	Leaf-eating caterpillar (Spray 2.0 ml. Quinolphos 25 EC. In a lit. water)	70	58.33	50	41.67	00	00.00	86.11
d.	Gall fly (Spray 0.5 ml. Lambdacyhalothrin 5 EC. In a lit. water)	30	25.00	90	75.00	00	00.00	75.00
16. a.	**Disease management**: Rust disease (Spray 2.0 g. Mancozeb 75 WP)	76	63.33	44	36.67	00	00.00	87.77
b.	Nematodes (Incorporate 10 g. Carbofuron 3G. to the base of the plant)	29	24.17	61	50.83	30	25.00	66.38
c.	Powdery mildew (Spray 1.0 g. Carbendazim 50 WP. in a lit. water)	81	67.50	39	32.50	00	00.00	89.16
d.	Leaf spot (Spray Mancozeb 70 WP. @ 2.0 g./ lit. water)	77	64.17	43	35.83	00	00.00	88.05
VIII	**Flowering and Fruiting stage**							
17.	Bahar treatment	00	00.00	00	00.00	120	100.00	00.00
18.	Micro-nutrients (Apply $ZnSO_4$ (0.5%) and H_2BO_3(0.1%) as foliar spray.)	70	58.33	50	41.67	00	00.00	86.11
IX	**Harvesting stage**							
19.	Time of harvest (April to May and August to September)	00	00.00	120	100.00	00	00.00	66.66

F: Frequency,%: Percentage

3.3 Relationship between selected independent variables with technological gap of the fig growers

The data from Table 3 shows the association between independent variables and the technological gap in fig cultivation. Here's an overall analysis with specific reasons for significant and non-significant variables at the 1% or 5% level, along with negative and positive correlations.

Significant variables at the 5% level show a strong relationship with the technological gap among fig growers. Higher education levels (r=0.361, p=0.034) are linked to a smaller technological gap, indicating that growers with better education tend to adopt modern agricultural practices more effectively. Growers with higher extension orientation scores (r=0.380, p=0.023) are more likely to bridge the technological gap, as they are more open to new information and innovations provided by agricultural extension services. Moreover, mass media utilization (r=0.201, p=0.027) contributes to reducing the technological gap, implying that access to information through media channels aids in technology adoption among fig growers.

Significant variables at the 1% level reveal important insights into the technological gap among fig growers. Higher annual income (r=0.631, p=0.000) correlates with a smaller technological gap, indicating that financial resources play a significant role in adopting recommended technologies. Achievement motivation (r=-0.618, p=0.000) shows a negative correlation, indicating that growers with higher motivation tend to have a smaller technological gap because motivated individuals actively seek out and adopt new technologies to improve productivity and achieve their goals. Conversely, risk orientation (r=0.305, p=0.001) positively correlates with a larger technological gap, indicating that more risk-averse growers may hesitate to adopt new technologies, due to perceived risks or uncertainties associated with change. These findings highlight the psychological factors influencing technology adoption among fig growers, with motivation driving adoption and risk perception influencing reluctance to adopt new practices.

Non-significant variables including age, land holding, fig growers' experience and innovative proneness did not show significant correlations with the technological gap among fig growers, indicating that factors beyond these variables might influence technology adoption in fig cultivation. The age of the growers, size of land holdings and years of fig growers' experience did not directly impact the technological gap, indicating that growers of various ages and experience levels adopt technologies. Similarly, the level of innovative proneness did not significantly correlate with the technological gap, indicating that being innovative may not necessarily influence technology adoption in fig cultivation. These findings indicate that other socio-economic or psychological factors not captured by these variables may play a more significant role in technology adoption behaviour among fig growers.

Overall, positive correlations were observed between education, annual income, extension orientation, mass media utilization, scientific orientation and management orientation with technological adoption among fig growers, indicating that higher levels of these variables lead to smaller technological gaps, as growers with more education, income and exposure to extension services and media tend to adopt technology more readily. Conversely, achievement motivation showed a negative correlation with the technological gap, indicating that higher motivation is associated with a smaller gap, due to motivated growers actively seeking out and adopting new technologies. However, age, land holding, fig growers experience and innovative proneness did not significantly correlate with the technological gap, indicating that these factors might not directly influence technology adoption among fig growers. These findings highlight the complex interplay of socioeconomic and psychological factors in shaping technology adoption behaviour in fig cultivation.

Table 3: Relationship between selected independent variables with technological gap of the fig growers. N=120

Sl. No.	Independent variables	r	p-value
1	Age	0.096^{NS}	0.298
2	Education	0.361^{*}	0.034
3	Land holding	0.149^{NS}	0.105
4	Fig growers experience	-0.074^{NS}	0.425
5	Annual income	0.631^{**}	0.000
6	Extension orientation	0.380^{*}	0.023
7	Mass media utilization	0.201^{*}	0.027
8	Achievement motivation	-0.618^{**}	0.000
9	Risk orientation	0.305^{**}	0.001
10	Innovative proneness	-0.019^{NS}	0.837
11	Scientific orientation	0.332^{**}	0.000
12	Management orientation	0.402^{**}	0.000

^{NS}: Non-significant, *: Significant at 5 per cent, **: Significant at 1 per cent

4. Conclusion

Hence, extension organizations should utilize strategies like training programs, method demonstrations, result demonstrations and field days to promote awareness and positive attitude towards recommended technologies. Training programs provide stakeholders with the necessary knowledge and skills, method demonstrations show practical applications of new techniques, result demonstrations offer tangible proof of benefits and effectiveness and field days provide hands-on experiences and direct interaction with experts. These strategies collectively build credibility and desirability for innovations, cultivating a receptive and committed audience. This ultimately leads to the successful adoption of recommended technologies.

5. Future scope

This study helps us to understand the technological gap in fig cultivation among farmers of the Ballari district of Karnataka. This data helps the agricultural extension officers in demonstrating the new technology that is needed for the fig growers.

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