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Technological Gap in Recommended Practices of Apple Cultivation in Kashmir Valley

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ABSTRACT

Apple is mainly cultivated in Kashmir valley, due to its well suited climatic conditions. The area under apple fruit has been increasing constantly, but the production as well as productivity has not improved to a satisfactory level. To notch up the goal of higher production and productivity of this important fruit in different regions of Kashmir valley, adoption of improved technologies plays an important role. A wide gap exists between the accessible technologies and its actual adoption by the apple growers, as reflected through the poor yield at the grower's field. The study was conducted during 2019-20, with a view to determine the extent of technological gap between the recommended and actually adopted technologies by the apple growers in three districts of the Kashmir valley, selected purposively having maximum area under apple cultivation. A multistage sampling procedure was adopted for the study. It was found that the highest mean technological gap was found in district Budgam, followed by district Baramulla and the least gap existed in district Shopian. The overall mean technological gap index from all the three districts was found to be 63.08 per cent indicating need for scaling up extension efforts.

INTRODUCTION

Apple is one of the important horticultural fruit grown in different regions of the world and ranks third among the fresh fruits traded worldwide (Iriarte et al., 2021). It is commercially the most significant temperate fruit and ranks fourth in terms of economic importance after, citrus, grapes and bananas (Mbovora et al., 2021). In India apple is cultivated in different areas, particularly in temperate regions of Jammu and Kashmir. Kashmir valley is endowed with congenial agro-climatic conditions for a wide range of horticultural crops, including apple (Shah et al., 2020). It is one of the ideal locations for apple cultivation and the fruit has been cultivated since ages. The valley produces almost 75 per cent of the country's apples (Tantry, 2020) and employs half a million households, besides dominates the horticultural sector and has an important role in the economic scenario of the state (Malik & Choure, 2014). It plays an important role in improving the standard of living, per capta income and employment generation in the state (Rather and Shrivastava, 2017).

The area and production of this important fruit was increasing constantly in the state with 164854 hectares and 2026472 MT respectively during the year 2019-2020, while in Kashmir valley (hotbed for apple cultivation), the area and production was estimated to be 147130 hectares and 1995101 MT respectively during the year 2019-2020 (DoHK, 2022). Obviously there was a quantum jump in the area and production of this important fruit in the country (India), but the productivity is still far behind the potential, which is nearly 06-08 tons/ha, lower than countries like Belgium (46.22 tons/ha), Denmark (41.87 tons/ha), and the Netherlands (40.40 tons/ha) (Wani et al., 2021a). Similarly, the average yield of different apple varieties in the union territory was only 11-13 tons/ha (Wani, et al., 2021b) as compared to the yield

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of other countries viz. China (17.96 tons/ha), the United States (27.85 tons/ha), Germany (25.40 tons/ha), Italy (40.11 tons/ha), France (43.98 tons/ha) and world average 15.49 tons/ha (Na, 2016), and in certain countries yield of 70-80 tons/ha was also registered (Bhat, 2019). However, the potential yield can be increased to 40-70 tons/ha, which is the indication of enormous gap between actual production and production capacity of apple crop in the state.

The possible reason for low productivity in the state was due to low maintenance of orchards, mis-management of cultural practices (Rehman et al., 2020), variability in use of technologies, in-efficient and out-dated techniques that contribute to the lack of commercial success in apple production. Certain factors viz. alternate bearing, defective pruning/training, lack of proper nutrient/water management, the deficiency of pollinizers in the orchards are responsible for low productivity and quality (Shah et al., 2017a). Such lapses need to be minimised to enhance production/productivity of this important crop by disseminating improved and low cost technologies through intensive extension system with proper training programmes (Roy & Bandyopadhyay, 2019). In order to address the problem of non adoption and low adoption of scientific package in agri-horti system, the need for enhancement of knowledge through appropriate methods in easy with supportive verbal understanding of scientific principles with description and explanation of processes and causal relationships was stressed (Nain & Chandel, 2013).

METHODOLOGY

The study was conducted in the union territory of Jammu and Kashmir, the northern most region of India. Three districts (Shopian, Budgam and Baramulla) were purposively (maximum area under apple fruit) selected. A multistage sampling procedure was adopted for the selection of districts, horticultural zones, villages and apple growers. A list of apple growers (orchardists) of selected villages was obtained from concerned horticultural development offices and a sample of different apple growers having marginal, small, medium and large land holdings, were selected proportionately. Thus, a total of 300 apple growers were selected purposively from nine (9) selected villages by using the following formula.

$$n_i = \frac{N_i}{N} n$$

Where, n_i= *Number of sampled apple growers in each village.*
n=Total number of apple growers selected for the present study (300).
N= Total number of apple growers in sampled villages.
N_1=*Total number of apple growers in it*^{h} *village.*

The structured interview schedule was prepared for working out the technological gap and was pretested on 30 apple growers in the non-sampled area for its practicability and relevancy. The apple growers were interviewed (individually with face to face contact) that enabled to get first-hand information and additional qualitative data. The qualitative data was converted into quantitative data by giving different scores. Different formulae of indexes and statistical tools were employed in order to obtain different results.

RESULTS AND DISCUSSION

Practice-wise technological gap in recommended apple production technology

From Table 1, the highest gap among the apple growers from all the three districts was found in overcoming different nutritional deficiencies in apple fruit. Among the districts, the highest gap (77.33%) was found in overcoming nutritional deficiencies in Budgam, Baramulla (73.94%) and Shopian (72.79%). The apple growers in all the three districts perceived managing nutritional deficiency of their fruits more complex and difficult as it involved sophisticated techniques of spraying with varied concentrations of different chemicals, besides the operations of managing such deficiencies were felt difficult by less educated growers. Extension agencies need to organise method demonstrations in such areas in order to minimise this gap. Similarly, the recommended fertilizer application methods were having the 2nd highest technological gap in district Budgam (75.30%) and district Shopian (69.35%), however, in district Baramulla, the 2nd highest gap (70.93%) was found in rejuvenating unproductive orchards. The lowest gap (63.95%) was found in "Harvesting and Picking" aspect of apple cultivation in district Budgam, while the lowest gap among the apple growers of district Shopian (40.27%) and district Baramulla (44.55%) was found in managing different types of pests and disease prevalent in the study area.

The low technological gap was found in pest and disease management aspect of apple cultivation in district Shopian and Baramulla, whereas in district Budgam low gap was found in harvesting and picking aspect of apple cultivation. The lower technological gap in district Shopian and Baramulla was due to higher knowledge and adoption level of this practice by the apple growers as the technology needs regular and constant spraying of different pesticides throughout the year. The application of pesticides repeatedly (10-12 sprays/year) makes the apple growers confident enough to remember different specifications besides overtime observe (perceived characteristic of adoption) the possible results of such pesticides in their orchards (decreased infections) thereby leading to more adoption in these regions. It was also predicted that different extension agencies focus more on this practice and make apple growers aware through different media channels, resulting in more adoption. However, in district Budgam low gap (63.95%) was found in harvesting and picking of apple fruits, as the practice do not require complicated procedures (complex skills and competencies), so the apple growers easily adopt this practice with zeal and zest, hence lowest technological gap.

Further perusal of data presented in Table 1, the highest mean technological gap (70.78%) was found in district Budgam, followed by district Baramulla (64.05%) and Shopian (54.40%). The overall mean technological gap index of apple growers from entire three districts were found to be 63.08 percent. This high gap was due to lack of knowledge (awareness) about improved cultivation practices. Apple cultivation usually involve complex and numerous operations throughout the year resulted in less dissemination of improved technologies, which in turn affected the adoption of these technologies by the apple growers. Further the higher technological

Table 1. Practice-wise technological gap index in recommended apple production technology

S.No.	Recommended Practice	Technological Gap Index (Percentage)		
		Shopian	Budgam	Baramulla
A.	Preparation of land and planting	48.07	67.09	63.61
B.	Training and pruning			
1.	Pruning of young non-bearing trees	53.51	72.42	68.58
2.	Pruning of bearing trees	53.86	69.88	65.56
3.	Training and pruning of dwarf trees	64.24	74.89	70.21
C.	Orchard Management			
1.	Cultivation and Mulching	59.04	68.92	68.13
2.	Thinning and rejuvenation of unproductive orchards	55.42	73.60	70.93
3.	Irrigation and drainage	60.09	69.48	63.93
4.	Pollination and pre-harvest fruit drop	56.32	71.86	66.07
D.	Nutrient Management			
1.	Organic manure's (Fully decomposed FYM)	46.91	65.99	62.52
2.	Inorganic fertilizers	47.33	73.10	64.61
3.	Methods of fertilizer application	69.35	75.30	70.86
4.	Methods to overcome nutritional deficiencies	72.79	77.33	73.94
E.	Pest and disease management	40.27	66.51	44.55
F.	Harvesting and picking	41.32	63.95	48.01
G.	Packaging and storage	47.49	71.32	59.25

Mean Technological Gap Index in Percentage

Budgam	=	70.78
Baramulla	=	64.05
Shopian	=	54.40
Overall Mean Technological Gap Index of all the three districts	=	63.08

Source: Primary data

Table 2. Distribution of apple growers according to technological gap index in recommended apple production technology

Category	District			Overall
	Shopian (n_1=101)	Budgam (n_2=86)	Baramulla (n_3=113)	(N=300)
Low	25 (24.75)	12 (13.95)	17 (15.04)	54 (18.00)
Medium	53 (52.47)	35 (40.70)	61 (53.98)	149 (49.67)
High	23 (22.77)	39 (45.35)	35 (30.97)	97 (32.33)
Mean ± S.D.	49.91±10.47	69.91±14.80	65.36 ± 19.46	61.73±14.91
Observed range	30-78	10-88	17-100	10-100

Figures within parenthesis indicate the respective percentage.
Source: Primary data

gap in all the practices among the apple growers of district Budgam was due to lower knowledge and adoption index of improved technologies, low educational status, lower scientific orientation, less innovative proneness, and low contact of apple growers with different extension agencies(Shah et al., 2021), Besides the reason for the lower technological gap index among the apple growers of district Shopian was due to high adoption index, high scientific orientation and apple growers in this area mostly rely on innovative and scientific cultivation.

Categories of apple growers, according to technological gap index

From Table 2 it is revealed that majority of the apple growers were having the medium level of the technological gap in Shopian (52.47%) and Baramulla (53.98%). In Budgam, majority of the apple growers were following traditional cultivation practices and mostly rely on local input dealers, resulted in high technological gap (45.35%) in the region, thereby low production as well as productivity. For comparative analysis, the lowest technological gap was found among the apple growers of district Shopian (24.75%), which is explicit that the apple growers in the region were innovative, having good exposure of media channels and have contacts with different extension agencies, scientists (Shah et al., 2017b), who are not merely providing them different innovative/ improved techniques and technologies, but ensure practical application of such improved technologies in their fields.

The data presented in Table 3 revealed the pearson correlation of different socio-personal characteristics of apple growers with that of the technological gap and it was revealed, that in district Shopian and district Baramulla, the relationship between the independent variables and the technological gap of the apple growers was negative and significant, except in land holding where it was negative but non-significant. In district Shopian, the correlation coefficient (r) for innovative proneness (-.346), risk orientation (-.276), scientific orientation (-.265) and knowledge level (-1.000) with the technological gap was negative but significant at 0.01 level. Similarly, in district Baramulla, the correlation coefficient (r) for education (-.318), innovative proneness (-.313), risk orientation (-.248) and knowledge level (-.994) with technological gap was negative but significant at 0.01 level. However, in district Budgam,

Table 3. Correlation between selected socio-personal characteristics and technological gap

Variable	Shopian (n_1=101)		Budgam (n_2=86)		Baramulla (n_3=113)		Overall (N=300)	
	C.C (r)	P-Value	C.C (r)	P-Value	C.C (r)	P-Value	C.C (r)	P-Value
Age	-.242*	.015	-.212	.050	-.200*	.034	-.335**	.000
Education	-.250*	.012	-.159	.145	-.318**	.001	-.119*	.040
Annual Income	-.251*	.011	-.085	.434	-.234*	.013	-.277**	.000
Land Holding	-.067	.507	.163	.134	-.097	.309	-.112	.053
InnovativeProneness	-.346**	.000	-.158	.146	-.314**	.001	-.124*	.032
Media Exposure	-.242*	.015	-.078	.477	-.190*	.044	-.199**	.001
Extension Contact	-.252*	.011	-.014	.898	-.230*	.014	-.121*	.036
Experience	-.229*	.021	.140	.200	-.206*	.028	-.391**	.000
Economic Motivation	-.245*	.013	.018	.871	-.236*	.012	-.159**	.006
Risk Orientation	-.273**	.006	.070	.524	-.248**	.008	-.242**	.000
Scientific Orientation	-.265**	.007	.046	.672	-.229*	.015	-.236**	.000
Knowledge Level	-1.000**	.000	-1.000**	.000	-.994**	.000	-.998**	.000

**. Correlation is significant at the 0.01 level (2 tailed); *. Correlation is significant at the 0.05 level

the correlation coefficient (r) for knowledge level and the technological gap was negative and significant while the relation for the rest of independent variables with the technological gap was non-significant. It is worth to mention that in district Budgam the correlation coefficient (r) for land holding, experience, economic motivation, risk orientation and scientific orientation with the technological gap was positive but non-significant. It must be noted that from the entire three districts land holding were having negative but non-significant relation indicating least role to play in technological gap in apple cultivation.

CONCLUSION

Apple is one of the important fruit crops grown in different parts of the world. There is tremendous scope for apple cultivation in almost all the regions of the Kashmir valley due to its congenial climatic conditions. The area and production of apple fruit was increasing constantly, but productivity is still far behind the potential. Different innovative techniques and technologies have been developed at different experimental stations, farm science centers and research institutes to enhance the productivity of apple fruit. However such technologies/practices were not fully adopted by the growers. A wide technological gap existed in almost all the practices recommended by concerned agencies, so it warrants the attention of extension officials and scientists to intensify their efforts to minimise such gaps through different extension programmes like training's, demonstrations, and exhibitions etc. in order to create horizons of hope among the apple growers that a better future can be ahead.

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