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Impact assessment of GAP adoption in augmenting mango grower's income in Malihabad, Uttar Pradesh

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ABSTRACT

Malihabad region of Lucknow district is famous for world renowned Dashehari mango. The socio economic, bio and physical factors restrain farmers in realizing the full economic value of mango. The total sample size of 240 farmers and adopters and non adopters have equal number of respondents. The study entails how to enhance the profitability of Dashehari farmers with support of a team of scientists from ICAR-CISH, Lucknow with regard to adoption of good agricultural practices from pre harvest to post harvest stages. The study concludes that GAPs adopted orchard farmers could reduce substantial quantity of pesticides sprays besides reducing losses in the form of cracking and bruising during harvesting.

Key words: GAP adoption, Impact, Income, Mango

Malihabad region of the Uttar Pradesh is acclaimed for world famous Dashehari mango which is grown over 28000 ha of land. The specific climate and soil conditions of Malihabad, with extremely hot and rainless summers, help in developing premium quality Dashehari fruit, which are of better quality compared with other regions (Rajan 2016). Malihabadi Dashehari variety of mango has been conferred with Geographical Indication (No. 125) by India's Geographical Indication Registry which is testimony of its distinct quality. However, this distinction given to Dashehari has not helped farmers from this region so far owing to lack of awareness and diminishing profits from mango.

The farming community in this area is facing with the issues of high cost of insect pest management under changing pest dynamics, high post-harvest losses and wastages due to inappropriate harvesting and post harvest practices and low produce price due to dependency on intermediaries (Mishra *et al.* 2019). Prevailing marketing chains are lengthy and are dominated by a number of intermediaries like assemblers, wholesalers, sub-wholesalers, commission agents and retailers. In case of fruits and vegetables, farmers receive one-third to one-half of the final price (Gandhi and Namboodiri 2002). Enhancement in mango growers' income by adoption of good agricultural practices (GAPs) was earlier demonstrated in Krishnagiri district in Tamil Nadu, India (Kavitha and Shanmugam, 2017) and Thailand mango industry (Krause *et al.* 2016). In this backdrop, the interventions under Farmer FIRST at pre and post harvest good agricultural practices and market linkages were undertaken among mango growers to compute impact of GAP adoption on farmers' income.

MATERIALS AND METHODS

The locale of the interventions under Farmer FIRST Project was Malihabad block of Lucknow district. The data pertains to the period 2017 to 2019. The socio-economic baseline survey in the beginning of the project was conducted in villages through PRA tools to assess means of livelihood and economic condition of farmers and reveals 63% dependency of farmers on mango crop for livelihood. Three problems identified were indiscriminate use of pesticides sprays adding to production cost, improper harvesting and post harvest practices leading to 18-20% fruit losses and more number of mediators in marketing chain resulting in low profit to farmers. Sample size was 240 mango growers. Out of total, 120 farmers were randomly selected from three villages (Nabipanah, Mohammad Nagar Talukedari and Meethenagar) of Malihabad block, Lucknow where pre and post harvest GAPs demonstrated and market linkages developed. Another 120 farmers were selected who followed traditional production and marketing practices as control. Good agricultural practices such as safe and judicious use of pesticides, safe harvesting through CISH mango

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Table 1 List of agricultural practices followed by GAP adopted and non-GAP adopted farmers

Practices	Traditional practices	GAP adoption
Pesticide spray	Use of spurious pesticides, 7-8 sprays based on the advice of input dealer	Use of genuine pesticide, 4 sprays at right time, right dose based on scientific advice
Harvesting	Shaking and beating of branches, fruits dropped on the hard land surface and tree branches	CISH mango harvester, fruits collected in nylon bag and then filled in crates
Shorting and grading	Yes	Yes
Washing	No washing	Washing
Packaging	Plastic crates, wooden boxes, multilayer CFB boxes	Single layer CFB boxes printed with GI-125, with provision of ventilation
Transportation	Mini truck, tractor trolley	Mini truck, train
Marketing	Pre-harvest contractor, local fruit market	Direct marketing to consumer in local urban area through mobile van and distant marketing through marketing company and *Mandi Parishad*

Source: Field survey, 2017-18

harvester, washing, safe ripening, packaging in CFB boxes and transport were not only demonstrated but also imparted on farm trainings during March to August, 2017. Farmers were linked with other agencies such as Uttar Pradesh *Mandi Parishad* and a marketing company, NeML in Hyderabad, to remove middleman from marketing chain.

Personal interview of the farmers was carried out to collect data on number of sprays, pesticide expenditure, harvesting and post harvest losses, production cost, fruit sale value and profitably/acre. Paired t-test was used to ascertain the significance of GAP adopters on their income.

RESULTS AND DISCUSSION

Impact of judicious use of pesticides on production cost: Pesticide spray forms a major share of production cost of mango in Malihabd region. Unawareness of farmers about right dose and right pesticide to control insect pest even after 7-8 numbers of sprays annually, sometime up to 10 sprays. On farm trainings and demonstrations were conducted for educating farmers about use of right pesticides, right dose, at right time against targeted pest. Due to awareness and training, the farmers could reduce the number of pesticide sprays upto four in GAP adopted orchards compared to average 7.27 sprays in conventional management practices.

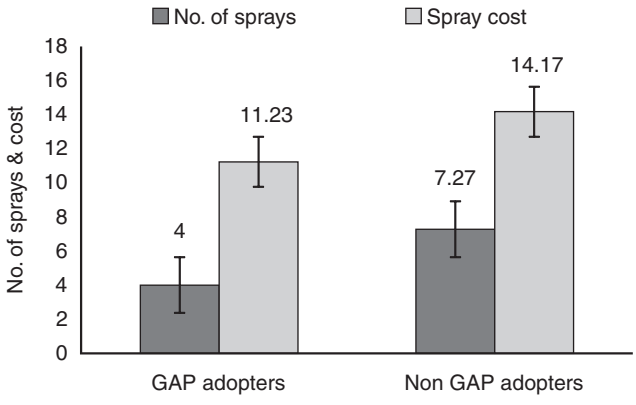

Fig 1 Number of pesticide sprays and cost per acre in orchards of GAP adopted and non GAP adopted farmers.

The cost incurred in pest and disease management was reduced to 20.77 per cent for GAP adopters (Fig 1) as compared to non adopters. This could be possible with appropriate mix of knowledge of pesticides and its usage besides maintenance of adequate population of natural enemies (Schreinemachers *et al.* 2012, Mensaha *et al.* 2017).

Impact of CISH mango harvester on harvesting losses: Harvesting and post-harvest losses are draining away the results of hard work of all stakeholders of fruit industry. The losses are not only quantitative, but also qualitative, which affect marketability of mango fruits (Subramanyam 1986). Dashehari mangoes are vulnerable to post harvest losses because it is ripened at the onset of monsoon and is mainly used for table purpose. Losses of 8.44-9.45% during harvesting were reported in Dashehari mango due to cracking and bruising of fruits (Gurjar *et al.* 2017). These losses were minimized by adoption of CISH mango harvester during harvesting and fruit cracking was reduced to 1.5% compared to 7.35% fruits in control group. Total harvesting losses due to cracking and bruising were reduced to 2.28% in GAP adopted orchards while 8.67% losses were reported in control group. Use of harvester minimizes losses considerably because it fitted with a removable high carbon steel blade which is capable of cutting the pedicel up to 10 mm length and nylon net for collection of harvested fruits which protects fruits from cracking and bruising due to direct falling of fruits on the hard soil surface. Harvesting with pedicel protect fruits surface from sap injury. Earlier, low harvesting losses with use of mango harvesting devices were reported by other researchers (Rehman *et al.* 2017).

Impact of marketing linkages on per unit price: Access to new and better-paying markets for agricultural products is vital in enhancing and diversifying the livelihoods of subsistence or semi-subsistence farmers (Barrett 2009). Market linkages especially for perishable commodities like fruits offer considerable opportunities to farmers for improvement in their livelihood (Birthal *et al.* 2007). Mango is a perishable commodity which cannot be stored for extended period. Whole crop of Dashehari mango is harvested within two weeks in Malihabad region which

results in glut in the local market. Therefore, it is essential to explore new and distant markets to get remunerative prices of mango. In our study fruits were packed in single layer corrugated fruit boxes (CFB) printed with geographical indication and marketed through two channels, i.e. direct marketing to consumer in local urban area (channel 2) and distant marketing to private company (channel 3) were followed by the selected farmers as shown below.

Channel 1 Producer → Pre-harvest contractor → Wholesaler → Retailer → Consumer

Channel 2 Producer → Direct marketing in urban areas through mobile van → Consumer

Channel 3 Producer → Transported to distant market through rail → Marketing company → Consumer

The number of intermediaries in traditional marketing channel (channel 1) was more and the farmers share in price was considerably lower than channel 2 and channel 3. The highest net price per kg mango (₹ 58.4) was obtained in distant marketing (channel 3) followed by direct marketing to local consumer (₹ 32.43) in urban area (channel 2), whereas lowest net price per kg mango (₹ 20) was obtained in traditional marketing (channel 1). The cost of marketing in channel 2 and 3 was enhanced noticeably compared to traditional marketing channel due to investment in packaging, transport and branding which led to quantum jump in net price per kg mangoes. However, higher net price received per kg mangoes can compensate this enhancement in marketing cost. This infers that remunerative prices for mango can be attained by good post harvest handling, packaging, branding and exploring new markets. Earlier studies by Birthal and Joshi (2007) on market linkages with SAFAL for spinach realized on average 78% higher profits, 8 per cent higher prices and incurred 92% less marketing costs over those supplying it in the open market.

Impact of GAP adoption on mango growers income: The expenditure on plant protection was 20.77% lower for GAP adopters compared to non adopters (Table 2). Although, total input cost per acre was 3.75% higher in case of GAP adopted orchards compared to non adopters because harvesting by CISH harvester and CFB boxes used for packaging added to the input cost. The earnings from the sale of mango fruits were significantly higher in case of GAP adopters and their market linkages compared to control group. Average gross income of GAP adopters was ₹ 76622.94/acre while non adopters got ₹ 57783.95/acre which was 32.60 per cent lower than adopters (Table 2). Average net profit of GAP adopter's was significantly higher (74.41%) than non adopters, treatment group of mango growers earned ₹ 18985.60 higher than control group. Higher benefit cost ratio (2.91) was also observed for GAP adopters along with market linkages system compared to traditional system. Fruit quality and consumer appeal for fruits were enhanced by safe harvesting and post harvest handling practices, packaging, branding and market linkages which helps in getting lucrative prices of mango fruits resulting in increase in income of the farmers. In Krishnagiri distrct of Tamil Nadu, the net earnings from per hectare mango orchards was estimated significantly higher for GAP adopters compared to control group. Higher B/C ratio was also worked out for mango orchards where GAP protocols were adopted (Kavitha and Shanmugam 2017). Earlier, adoption of public GAP standards in mango production and post harvest handling resulted in positive income effects for mango producers in Thailand (Krause *et*

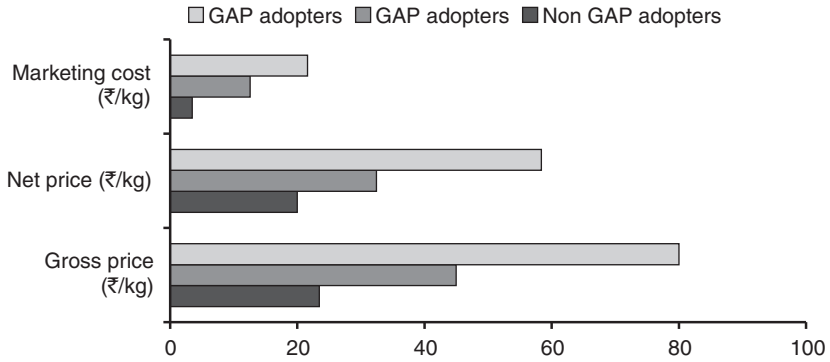

Fig 2 Mango price obtained per kg fruits and marketing cost in different marketing channels.

Table 2 Production cost and profit for GAP adopters and non adopters in mango orchards (₹/acre)

Variables	Non adopters	Adopters	Combined	Mean difference	Std error	t		% change
Plant protection cost	14178.31	11232.86	12257.37	2945.44	393.69	7.48	Decrease	20.77
Harvesting	4177.97	4788.53	4576.16	610.56	152.47	4.00	Increase	14.61
Packaging cost	3813.46	7136.20	5980.47	3322.74	217.03	15.30	Increase	87.13
Production(qt/acre)	39.61	45.57	43.50	5.96	1.37	4.33	Increase	15.04
Production loss (%)	3.45	2.79	3.02	0.66	0.15	4.27	Decrease	19.09
Total production cost	30962.69	32125.85	31721.27	1163.16	530.09	2.19	Increase	3.75
Output cost	57783.95	76622.94	70070.25	18839	2390.026	7.88	Increase	32.60
Profit	25511.5	44497.09	37893.4	18985.6	2223.42	8.53	Increase	74.41

Source: Authors calculation based on field survey data

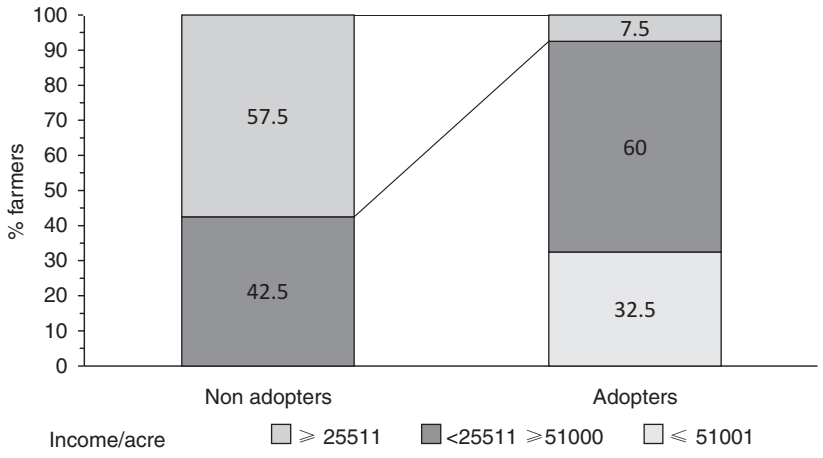

Fig 3 Variation in profit sharing by GAP adopters and non adopters from mango orchard.

al. 2016). Wu *et al.* (2016) found that adoption of improved upland rice technology had robust and positive effect on rice growers well being and reduction in poverty.

Variation in profit of mango growers: Profit earned from mango growing has varied between ₹ 20000 to 60000/ acre in both GAP adopters and non adopters group (Fig 3). This indicates GAP adoption proved highly beneficial for mango growers. Among GAP adopters, 32.5% farmers earned more than ₹ 50000/acre profit while majorities (60%) were earned profit between ₹ 26000 to ₹ 51000/acre. GAP adopters who earned more than ₹ 50000/acre captured fruit markets of Hyderabad, Mumbai and Bengaluru where they get remunerative prices for fruits (₹ 80/kg) fruits in distant market. Few GAP adopters (7.5%) received less than ₹ 25511/acre. In control group, majority (57.5%) earned money less than ₹ 25511/acre while 42.5% farmers earned profit between ₹ 26000 to 51000/acre. In this group, not a single farmer could earn profit more than ₹ 51000/acre.

Conclusions

The study concludes that training and building awareness amongst farmers about pest dynamics and pesticides usages could reduce the number of sprays substantial. This practice would reduce toxic load of pesticides in mango which will be eco-frinedly and less harmful to health besides reducing substantial input cost. Linking farmers to innovative and distant market with suitable carriage has enabled farmers to get better price and more profit per unit area. This approach had reduced distress sale of mango in local market due to more glut in production area since the mango fruit is to be harvested within time window of two weeks. The adopters of GAPs could earn around one third more than non adopters in the study region. GAP at pre harvest and post harvest stages along with branding and market linkages enabled farmers to receive lucrative prices. This resulted in increase in income and poverty reduction amongst mango farmers.

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