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Validation of Horti-Poultry System in High Density Apple Orchards of District Shopian

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Abstract

An On Farm Trial was laid by KVK Shopian in collaboration with Division of Livestock Production Management, under Department of Bio Technology (India) funded project to workout feasibility and economic viability of integration of back yard poultry in apple orchards under the tag of Horti-Poultry Model. The average cost of production for High Density Apple orchard of 3 kannals is 4.5 Lakh. The net return in terms of Apple is 7.0 lakh. The Benefit cost ratio is 1.5:1. Adding Vanraja birds into the apple orchard of 3 kannals, the net returns from 150 birds had added Rs 1.43 lakh. The Benefit cost ratio had increased up to 1.8:1. The growth of plant trees was normal with zero percent mortality of trees and the yield percentage of the crop (apple) was increased by integration with Vanraja birds. The plant health parameters like leaf health were found normal without scab. The fruit setting and fruit health was also without any abnormality and disease. However, in later stages, it was observed that lower fruits were eaten by birds, so we can recommend that clonal apple trees should be pruned and trimmed so that branching starts above three feet. The density of birds in apple orchards was also observed to be a main factor for controlling the birds in damaging the trees, which should always be below 50 birds per kanal. It was observed that if only 50% of apple orchard area of district Shopian is brought under this IFS system, there would be 92 Crores flow of revenue in Shopian district only as there is around 21777 hectares of apple orchards.

***Key words*:** Horti-poultry model, Participatory research, Temperate fruits

More than 90% of farmers in district Shopian are associated with apple industry directly or indirectly. Due to efforts of development departments and backstopping from Sher-e-Kashmir University of Agricultural Sciences and Technology Kashmir (India), more than 900 high density apple orchards have been established in district Shopian. With expedition and holistic approach for ultra-high density orcharding, it is expected to meet apple demand of 40 million tones in India. At present it is always at the mercy of weather, market and weather driven insects' pests and diseases. The recent weather vagaries like hailstorm, dry spells, untimely snowfall and abrupt spread of scab, *alternairia* have prompted the policy makers to chalk out alternative sources of livelihood in these eventualities. So, integration of other enterprises in holistic manner to secure farmers livelihood opportunities were need of the hour. The Jammu & Kashmir has 69% shortfall in poultry meat production and 97% in egg production**.** While some headway has been made in commercial broiler production, layer farming is still virtually non-existent. Hence, an attempt was made to introduce quality poultry breed Vanraja in apple orchards with complete synergism. It not only stimulated production of main crop (Apple), but simultaneously utilized orchard floor for rearing backyard poultry birds**.** The poultry birds will feed on insects and pests. Weed management is highly laborious and cumbersome process and directly compete with crop for nutrition, moisture and space [1]. Due to scavenging process of poultry birds, the weed growth remains under threshold level. This biological management will reduce consumption of pesticides. It will assist orchard sanitation which is reported to reduce disease infestation by 90%. The poultry birds by digging process ensure aeration in root zone area. Further slogan of doubling farmers income could be achieved by vertical expansion of present cropping system. Poultry sector in India is growing @ 15-20% annually. The per capita availability is 2.0 Kg of meat per person per year and about 60 eggs per person per year, yet we have a long way to go in order to make available the poultry meat and eggs to our growing population as per the minimum recommendation of Indian Council of Medical Research which stands at 180 eggs and 10.8 kg of poultry meat per person per year. The State of Jammu and Kashmir in general and valley of Kashmir in particular by virtue of its unique agro-climatic conditions and food habits favours higher per capita consumption of animal products viz meat and egg. As poultry can be reared with utmost efficiency it can be an appropriate answer to supply much needed animal protein at faster rate on one hand and provide full time and part time employment to the men and women. State of Jammu and Kashmir has an area of ~ 1.6 lac hectares under apple orchards. The area between the trees

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remains underutilized. Allowing hens to scavenge in the fruit orchards would substantially decrease the feeding cost which constitutes the major input in poultry production. The poultry droppings would in turn improve the soil fertility. This innovative integrated farming system has a potential to boost local poultry production, strengthen integrated farming systems, optimize resource utilization and increase farm income. There shall be no adverse impact on environment. Manuring of orchards by poultry droppings will reduce use of chemical fertilizers. Poultry birds are likely to devour pests, thus act as biological control. This integrated farming system demonstrates a holistic approach to agriculture, promoting sustainability, environmental stewardship, and economic viability. However, effective management practices are crucial to ensure that the integration of poultry droppings into agriculture is carried out responsibly and in a manner that maximizes benefits while minimizing potential risks.

The production potential of *desi* birds is very low with the result farmers get disheartened and do not pay any attention towards the backyard sector. For revival of this age-old family venture, it is therefore required to make available a bird which could adapt to our agro-climatic conditions, would be similar in appearance but is moderately fast growing and produce good number of eggs under low input management system so that it provides a supplementary source of income to the farmers. Vanraja, a dual-purpose chicken has become popular among the rural people of as one of the income generating activity [2]. Keeping these facts under consideration an on-farm trial (OFT) was laid out with the objective to evaluate practicability and adoptability under Shopian district of Kashmir valley.

MATERIALS AND METHODS

An on-farm trial (OFT) was laid by Krishi Vigyan Kendra (KVK) Shopian in collaboration with Division of Livestock Production Management (Faculty of Veterinary Science, SKUAST-Kashmir) under Department of Bio Technology (India) funded project in 2021-2022. Three farmers were selected having high density orchard (around 3 Kannals of land). Orchardists were sensitized about the integrated farming approach through trainings. One hundred and fifty (150) days old Vanraja chicks were provided to farmers. The farmers were also given feed for the initial growth of chicks up to 4-weeks. Afterwards, birds were allowed free access to apple orchard during day and confined to shelter during night. Birds fed on herbage insects and other scavenging resources during the day. During early age, care was required to habituate them to reach the night shelter in the evening. The farmers were advised to restrict their birds for scavenging in open orchards for at least three days during pesticide sprays. Necessary health care support by way of vaccination, de-worming and other medication was also provided. Vanraja day old chicks were procured from ICAR-Poultry Seed Project. Vaccination against Ranihet disease, Mareks disease and Infectious Bursal Disease were carried out. Night shelter was clean, well-ventilated and predator proof. The animal scientist and horticulture scientist monitored the important parameters of both main crop (Apple) like leaf health, fruit setup and body weight, mortality of intercrop (poultry bird) were recorded at regular intervals. Finally, economics of integrated farming system (IFS) was carried out and compared with sole cropping.

Fig 1 Selection of apple orchardists and distribution of chicks along with feed and medicine

RESULTS AND DISCUSSION

Extension strategies

The farmers were taken on board and sensitized so that they feel confident in adopting their technology. Farmers in vicinity were also invited by conducting Field days in which 70 farmers participated. In field days farmers enquiries were addressed with scientist farmer interaction programme. The interested farmers were guided and facilitated to initiate this IFS venture in their fields. Accordingly, research gaps were addressed with farmers and Scientist Interface. Same methodology was discussed by [3]. The three selected farmers have adopted this technology in High density apple orchard by which the farmers of this District get encouraged to adopt this intervention in traditional apple orchard as well, in this way horizontal expansion of technology has started in the area. The KVK website and other social media platform were used for mass dissemination of technology in the district.

Apple orchard

The growth of plant trees was normal with zero percent mortality of trees. The yield percentage of the crop (apple) was increased. The plant health parameters like leaf health were found normal without scab. The fruit setting and fruit health was also without any abnormality and disease. However, in later stages, it was observed that lower fruits were eaten by birds, so we can recommend that clonal apple trees should be pruned and trimmed so that branching starts above three feets. The density of birds in apple orchards was also observed to be a main factor for controlling the birds in damaging the trees, which should always be below 50 birds per Kanal, as the Vanraja birds are voracious eaters.

Table 1 Performance of Vanraja birds under backyard system of rearing

Economic traits	Vanraja birds
A.	Body weight (g)
Day old	35-42
1 week	60-66
2 weeks	120-135
4 weeks	500-600
Six weeks	900-1000
12 weeks	1300-1450
27 weeks	2900-3300
At sexual maturity (females)	2100-2300
B.	Egg weight
28 weeks	43-46
40 weeks	55-65
Age at first egg (day)	175-185
C.	Egg production no.
280 (days)	50-60
500 (days)	165-180

Poultry

The performance of the bird with respect to growth rate, egg production and survivability remained quite satisfactory and there is huge demand for this bird among the farmers. The birds showed fast growth rate, attractive plumage colour, better surviviability, large egg size and highly disease resistant with low mortality. Higher immune competence in Vanraja compared to Desi was reported earlier by [4]. Their growth performances are depicted in (Table 1). The results were in agreement with [5] who reported 1.62-2.56 Kg average body weight at the time of egg production in Vanraja. Further it was recommended that feeding should be kept upto 4 weeks, thereafter chicks should be tamed to feed on flora, pests, insects in the orchards. Birds came into lay eggs at 5.5 to 6-months of age. In the present study, the total mortality of 10% was seen. Disease problem accounted 90% of mortality followed by unfavourable weather conditions (10%) in the present study. Mortality in Vanraja birds in which disease problem accounted 70% of mortality was observed by [6]. The income from sale of eggs and Vanraja birds was three times more than desi birds [7] and could improve economic status of rural women.

Integrated farming system

Both the enterprises taken in this IFS (Table 2) were synergetic and ecologically balanced. The poultry birds were accommodated and reared in unutilized space between the trees. So expected outcome with and without diversification is given below. The relative economics in terms of rupees were calculated. By participatory approach production system is evaluated. Synergism was quantified accordingly as discussed by [8].

Table 2 Comparison of economy in terms of rupees of sole high-density orchard with integrated (Vanraja birds) high density orchard

Sole high density apple orchard (HDP) of 3 Kanals	Integrated high density apple orchard of 3 kanals with Vanraja birds
Average cost of production of 3 Kanals of high-density apple orchard = 4.5 lakh Average profit: 700 boxes of production from 3 kanals of land Income @1000 Rs per box = 7 lakhs Benefit cost ratio (B:C ratio) = 1.55:1	Expenditure of chicks @ 30 Rs/Chick. 150 No. (75 males and 75 Females) = Rs. 4500/- Initial feed and medicine = Rs. 12000/- Total cost of Poultry input: 12000 + 4500 = Rs. 16500/- Total expenditure (HDP + Animal input) (4.5 + 0.165) = 4.66 Lakhs Return from Vanraja birds excluding 10% mortality = Rs. 143500/- 65 male birds after 6 months weighing 2 Kg @ 400 / male = 65 × 400 = Rs. 26000/- Return on sale of eggs @ Rs. 7/egg: Rs. 75500/- [Total egg production per annum from 70 Hens = 10785 eggs] Return on sale of hens at the end of production weighing 3 Kgs: Rs. 42000 @ 600/hen Profit from poultry= Rs143500/ Total profit (Profit from high density apple orchard and poultry) = 7.0 + 1.43 = 8.43 lakhs Benefit cost ratio (8.43/4.66) = 1.8:1

Fig 2 Monitoring of body weights of birds

The average cost of production for high density apple orchard is 4.5 Lakh. The net return in terms of Apple is 7.0 lakh (700 boxes @ 1000 Rs/box = 7.0 lakh. The benefit cost ratio is 1.55:1. Adding Vanraja birds into the apple orchards, the net returns will increase. As per our study, the net profit from 150 birds will add Rs 143500/ excluding 10% of

mortality rate. The Benefit Cost ratio had increased upto 1.8: 1. The relative economics in terms of rupees were calculated. On an average there is increase of 0.42 Lakh profit / kanal of land. In district Shopian, apple area is 21777 ha and if 50% area is brought under this horti-poultry IFS system, there would be generation of 92 crores in Shopian district. Further this IFS model provides yearlong employability to growers and their family members/ households.

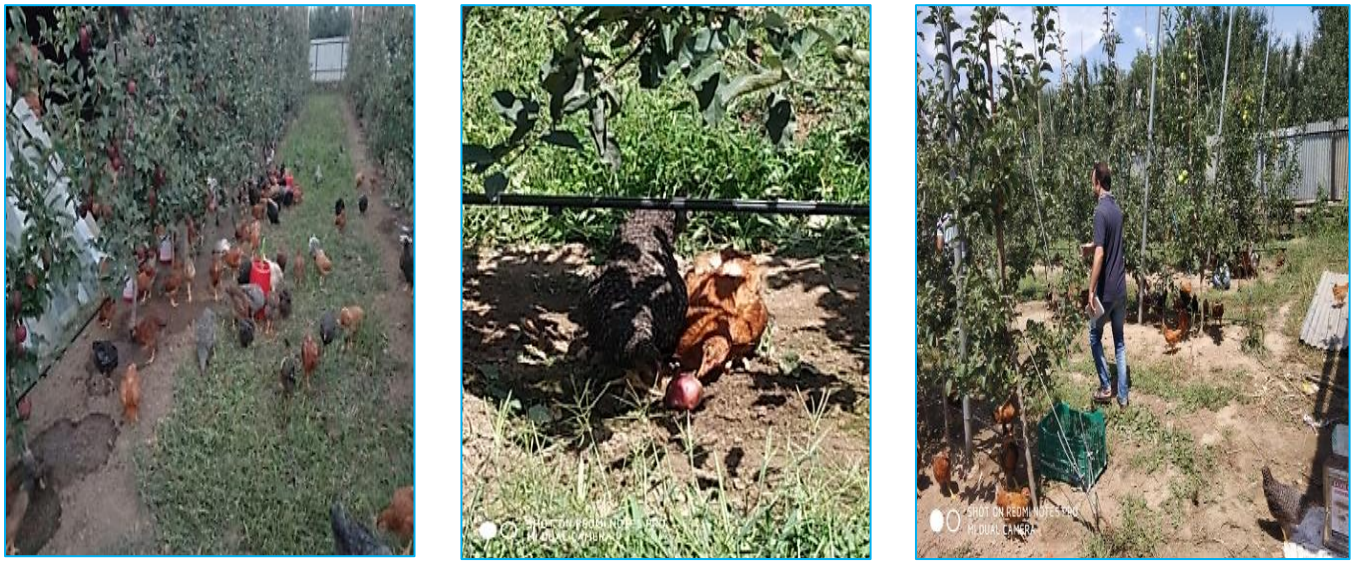

Fig 2 Free scavenging of birds and monitoring of high-density apple plants

CONCLUSION

KVK took an initiative to introduce Vanraja (a dual-purpose bird) in Shopian to revive the backyard poultry farming and improve the availability of poultry meat among common masses especially economically weaker sections in the rural areas with meager investment on feeding and management. In apple soul cropping B:C ratio recorded is 1.55:1. However in IFS, the B:C ratio gets increased upto 1.8:1. Further it is estimated that if only 50% of district apple orchard is brought under horti-poultry IFS system about 92 Crores exchequer would be pumped in district Shopian. The backyard poultry integrated farms so established shall also act as model farms for training and demonstration to other farmers. Renumeration from the venture would compel other farmers to adopt this horti-poultry IFS model in Shopian District and similar districts where apple cultivation is carried out significantly.

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Conflict of interest

Authors have declared that no competing interests exist.

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