

Desi poultry integration in litchi orchard for enhancing farmer's income

Litchi (*Litchi chinensis* Sonn.) is one of the major commercial fruit crops of Northern India. Litchi orchards are the main source of income for the farmers who used to care for orchard themselves or give orchard to pre-harvest contractors. One developed orchard of litchi can give net profit up to ₹ 2.0-2.50 lakhs per ha but integration of *desi* birds in litchi orchard ecosystems can help to enhance farmer's income further through organic fruit production. Looking for an organic method of reducing insect-pests in litchi orchard and enhanced soil fertility [due to poultry litters], poultry rearing can be considered as an option. There are many benefits to letting chickens roam around litchi orchard. These birds can help us to manage both weeds and insects without the use of pesticides, while also naturally fertilizing orchard soil. Poultry eggs are additional benefits. The article highlights the main details concerned with litchi orchard based *desi* poultry farming system.

Why litchi orchard based poultry farming?

Majority of litchi orchards are raised as sole crop and spaced at 10 × 10 m or 8 × 8 m. Flowering takes place in litchi during March-April and fruits mature during May-June. Litchi orchard is highly vulnerable to climatic vagaries and most of orchardists are victim of this. The livelihood of litchi growers depends solely on sale of litchi fruits, rather traditional orchards have sufficient spare land space available in gulley and alley of the rows which can be used for *desi* bird rearing. In recent years, the production cost of litchi has been increased due to indiscriminate use of pesticide to inhibit infestation of loopers, mite and fruit and shoot borers. Failure of litchi crop (sometimes show bienniality in bearing, hailstorms during fruit growth and development and severe attack of fruit borer at harvesting after outbreak of rain during second fortnight of May) severely affects the livelihood options of the farmers. There is need for diversification in litchi orchards and rearing *desi* birds is the options. Overall, the North India is fond of meat of *desi* birds. Litchi orchard ecosystem suits rearing of poultry birds especially under high density planting (spaced at 8×4 m) and rejuvenated blocks during hot summer and chilly winters. Not only this gives farmers much needed income throughout year but it also reduces the pest load (particularly fruit borers and stem borers) and reduces the need for pesticide which eventually reduces the cost of production. The excreta of birds while scavenging also has added advantages to improve fertility of orchard. It was also observed that litchi leaves, peel and seeds are also eaten by *desi* birds, which ultimately reduces feed cost of rearing (70% cost of rearing *desi* birds is on feed only).



Scavenging of Kadaknath in rejuvenated litchi orchard;
Vanaraja chicks in high density orcharding of litchi

Housing in litchi orchards

Housing is important for the birds as it protects them from extremities of temperature, rain, wind and predators. Shelters should be constructed at corner of litchi orchards in the dimensions of 60 × 13 × 8 feet (length × breadth × height) in high density orcharding (HDO) area and in rejuvenated blocks, this is suitable for 250-300 birds. The small huts can also be constructed with size of 10 × 7 × 8 feet or 12 feet (L×W×H) and 50-60 chicks can be kept in this night shelter house. It can be extended as per the need using plastic net, polythene sheet for roof, asbestos sheet can also be used as roof top and a small door made of wire mesh or bamboo splits. The boundaries of the orchards need to be fenced so that *native* chicken freely move around. One to two layer of bamboo may be tied in between rows of litchi orchard like in large shade house for adult chicks to take rest.

Suitable poultry breeds for litchi ecosystem

Three poultry breeds, viz. *Vanaraja*, *Kadaknath* and *Shipra* were used in litchi orchards of ICAR-National Research Centre on Litchi, Muzaffarpur, Bihar (Table 1).

Table 1. Comparison of Chick breeds for nutrition and farming point of view

Name of Breed	Expenditure to produce 1 kg meat	Egg production	Get ready period	Colour of meat	Cholesterol level (mg per 100 g meat)	Fat (%)	Protein (%)
Kadakhnath	₹ 200 (in caged area)	80-90	4-5 months	Black	184	1.0	25-30
Vanaraja	₹ 150 (in caged area)	110-120	6 -7 months	Red	214	4-5	18-20
Shipra	-	100	5-6 months	Red (poor in texture)	-	-	-
Sonia	-	-	-	-	-	-	-
Broiler	₹65-70	130-140	2-3 months	Reddish white	232	5- 6	16-17

According to experts, the CARI-Devendra and CARI-Nirbheek can also be suited for litchi orchards. At our farm, the *Vanaraja* and *Shipra* gave maximum eggs (155-175) and egg laying starts from 5th month onwards. *Vanaraja* attains body weight of 1.8 kg in 6 months time; *Kadakhnath* took 6.5 months for 1.00 kg weight. *Vanaraja* and *Shipra* strains gain body weight faster and fetch ₹350-500 per bird. *Kadakhnath* attains 1.5 kg in 7.5 months but fetches ₹700-900 per bird in the market. *Kadakhnath* was found to be very agile and controls litchi pests from upper canopy also.

Feed for litchi orchard based poultry

Strains identified for litchi based poultry farming can scavenge /graze well for its feed in the litchi orchard. During the process of grazing in the litchi orchard, these birds feed on fallen leaves, insects, green weed's seeds, grass seeds, etc. Feed supplementation in the form of crushed grains of wheat, rice, and maize, usually given in morning/evening and chicks are allowed to feed during day hours. Vegetable wastes, crushed *litchi* seeds, peels, snail shell is also provided to the birds as feed supplements/substitutes. The snail shell is used as supplemented feed because it contains Calcium besides being rich in other minerals and vitamins. Depending on the availability of orchard area, the requirement of supplemented feed [in litchi orchard] varies from 20-30 g/bird/day, in caged rearing it varies from 60-70 g/bird/day (Table 2).

Age of the orchard

In rejuvenated orchard or in young plantations (i.e. > 6 years old plantations) planted at high density, the sunlight availability is more in initial years. This makes ideal situation for chicks scavenging during hot summer or winter season. The *Azolla* cultivation is also possible in litchi orchard like it is practice a in mango orchard of Malihabad, Lucknow. Use of FYM and regular ploughing will invite more insects as it exposes eggs, larvae and

Table 2. Cost reduction on feed in poultry rearing in litchi orchard

Growth stage	Age of chicks	Quantity of feed	
		Caged rearing	Free range rearing (in litchi orchard)
Chicken (younger)	Up to 8 weeks	40-45 g / day	15-20 g /day
Chicken (growing)	8 to 24 weeks	50-70 g / day	25-30 g/day
At egg laying stage		80-120 g / day	50-55 g /day

pupa which may be a source for poultry. Therefore, space requirement will vary among new and old plantations. Generally 5-10 m²/bird space is sufficient if supplementary feeding is not done. Furthermore, the micro-climate of the orchard will also influence the space requirement. In young plantations, if manuring and *Azolla* is practiced the space requirement will be much lower and about 2-3 m²/bird space (grown) is sufficient.

Improvement in orchard ecosystem

The birds derive their food from the pupa, larvae, maggot and borers underneath the litchi canopy. As a result of this technology, there is reduced pest population and requirement for pesticide sprays. Certain bird strains such as *Kadakhnath* exhibited high flight capacity and fed on litchi looper and bark eating caterpillar situated on upper canopy. Reduced weed population in litchi orchards was observed owing to integration of *desi* poultry. According to ICAR-CISH, Lucknow, each bird in a mango orchard supplemented 45 kg manure in the form of droppings in its entire life cycle. Orchard having flock size of 500 birds gets around 225 q of poultry manure. The same can be true to the litchi orchard also. It was observed that the birds while scavenging, pulverized the soil and ensured better aeration. At ICAR-NRC on Litchi, Muzaffarpur,



Iron frame fencing in litchi night shelter house in HDO of litchi orchard



20% feed replacement with grinded litchi seeds / peel; 5% with crushed snail shell as Ca supplement

the litchi orchards with integrated *desi* poultry were found to have improved orchard ecosystem requiring lesser pesticide which is way towards reduced cost of production.

In our research farm, we found that available N per ha was enhanced to 294 kg per ha (against 200 kg per ha), likewise P_2O_5 content improved to 13.71 kg per ha (against 9.14 kg per ha) and soil content of K also increased to 116 kg per ha (against 83.00 kg per ha) after six months of intervention. Surprisingly, the level of leaf webber infestation was also reduced to 50% due to rearing of backyard poultry in litchi orchard, red weevil infestation was reduced to 9.75% against 11.11% in normal orchard.

Sustainability of the system

Many profitable models developed by researchers disappeared once the interventions are dependent on outside input or lack of expertise. Keeping in view the facts, this model was developed to have simplicity, easy adaptability and cost effectiveness. The shelters are sustainable for 3-5

years except replacing the polysheet's cover, bamboo structures, etc. The capital investment is around ₹25,000-30,000 and thus can be easily adapted by resource poor farmers. Marketability is also not a problem as raw chicken or its products or produce have wide market acceptance everywhere. The only remaining input are chicks and *Azolla* as feed. *Azolla* in North Indian climate can be propagated itself in 2 seasons extending upto 8-9 months. In feeding practices, litchi seeds/peels can be used for 10% feed substitutes and 5% feed can be replaced with snail shell as Ca supplements. The main input is continuous chick supply in the system and it is still a major challenge. The new orchardists should start with at least 3-4 weeks old chicks, later they can go for one to two weeks old chicks to reduce mortality in early age. Chicks of



Natural hatching in Vanaraja, Shipra and Kadaknath at the corner of litchi orchard

desi poultry breeds should be reared in batches of 200-250 for 4 to 6 cycles in a year. Birds are gradually disposed off after achieving body weight of 1.5 kg and fresh batches are provided after 2 months of initial batch and the cycle continued. The lower egg production by parental stock and thus lesser chicks per hen limits the profitability of the commercial ventures. This is reason why private hatcheries are not producing the chicks needed for such system. Here in litchi orchard, natural hatching is also recorded with 50% hatching based on number of eggs used for hatching purposes.

Another factor is demand of chicks which can create interest of private entrepreneurs. The hatcheries in government sector do not have the capacity to supply on demand by orchardists. As the demand will increase, the local youth will come forward for entrepreneurship development in low cost hatcheries. Private hatcheries with established infrastructures and operational facilities will be compelling to participate and share the market demand as soon as the model adoptability will increase. In this scenario, such interventions can be recommended/adopted locally wherever, the models are being practiced by litchi farmers.

General observation and hardship in integrating *desi* poultry in litchi orchard

It was observed that the high mortality rates exists in tropical conditions when temperature crosses 40°C (during summer) and <5°C (during winter). The presence of common predators (such as snakes, dogs, jackal, cats, eagles, hawks and thieves) around orchard made the orchard's benefit at risk. The lack of veterinary healthcare and extension services in rural areas deter farmers to adopt this technology. The unavailability of small hatchery units to cater the need of young chicks is another area of concern.

Steps to reduce early chick mortality and economic management

The litchi orchardists were advised to rear indigenous *desi* birds in separate herd (i.e. breed wise and age wise). They should not allow *Kadaknath* breed with other breeds simultaneously for grazing in litchi orchard. In the orchard, one male per 10 female birds ratio should be maintained. If possible, install halogen lamp/or brooder (during winter season) in night shelter house and use antibiotic, multivitamin, vitamin C round the year /or as and when a chick is ill or dead. The farmers should get regular help of paravets for health check up. Regular cleaning and maintenance of feeder, drinker and night shelter houses, etc is required.

Augmenting income through litchi based poultry farming

Farmers can realize the net return of ₹1, 50, 000 per acre by integrating rural poultry in litchi orchard which is higher in comparison to non integrated orchards (₹13,500 per acre). The returns per rupee of expenditure of litchi orchard-based poultry farming was significantly higher (1.75) as compared to mono-crop of litchi

production which registered lower returns per rupee of expenditure (1.15).

SUMMARY

The demand for quality protein can be fulfilled at the orchard gate by using this technology and can be supplementary source of cash income for the litchi orchardists. For the reach of the technology at the grass-root level, the State Horticulture Department could promote this technology by providing low cost hatcheries, seed chicks of *desi* bird and technical know-how to the litchi or mango farming community. The litchi (especially cv. China) is highly vulnerable to alternate bearing, attack of pests and diseases, and hence it is essential to practice poultry farming [of indigenous breeds] in the orchard. Thus, integration of *desi* poultry generates family employment which results in better management of orchards. In non-intervened orchards, farmer's presence is usually observed during fruiting period only and total absence in non-fruiting period which results in poor management of orchard and integrated poultry rearing has helped get rid of this problem. To promote this technology, where there is high cost incurred on

fertilizes and pest/or disease management, this technique is a great intervention for sustainable litchi production, complementarily.

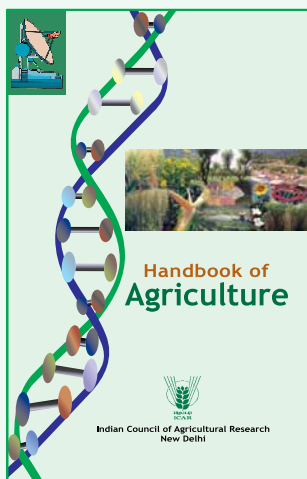
Way forward

Under integrated farming concepts, the existing concepts of having cattle, sheep/goat/ducks and vegetables integrated with horticulture has not received much interest as the large animals' damage fruit crops/and vegetables and fail to grow satisfactorily under the shade of fruit trees. With this backdrop, the rearing of *desi* birds in orchards can be thought of for increased dietary intake as well as additional income generation. The orchard of not only apples/or mango, but litchi, if exploited for poultry based farming will yield better profits, and organic cultivation of litchi with better fruit quality and yield sustainability can be realized.

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TECHNICAL SPECIFICATIONS

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