Backyard poultry farming as a catalyst for socio-economic advancement in rural hill regions: a review

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Abstract

Backyard poultry farming (BYPF) is a vital aspect of sustainable livelihoods for farmers in Meghalaya, India, contributing significantly to food security and employment for rural youth. This traditional practice involves the rearing of small numbers of native chickens under free-range scavenging conditions and currently accounts for approximately 17.8% (18.41 billion) of India's total egg production (103.32 billion). Despite the growth of commercial poultry production in the North-Eastern states, traditional backyard husbandry remains prevalent, primarily utilizing indigenous breeds known for their hardiness but limited productivity, with egg production ranging from 80 to 100 eggs per bird per year. Recent advancements have introduced high-yielding breeds such as Vanaraja and Kuroiler, which combine the resilience of native breeds with improved growth rates and egg-laying potential, transforming BYPF into a more remunerative enterprise. BYPF has demonstrated potential to alleviate poverty, eradicate malnutrition, empower women, and provide subsidiary income and employment in rural and tribal areas. This review gives a glimpse of the current status of BYPF, exploring its production systems, and role in socio-economic development, while identifying critical factors that influence its success. It offers recommendations to optimize production and expand this system, thereby supporting sustainable rural development and improving the economic standards of farmers across the region.

Key words: Backyard poultry farming (BYPF), Sustainable, Remunerative, Malnutrition, Socio-economic development.

Introduction

Globally, the majority of chicken meat and eggs are produced through intensive farming systems that rely heavily on high input costs related to technology, capital investment, specialized chicken breeds, and advanced management practices. In India, poultry development has experienced significant advancement over the past fifty years; however, this growth has predominantly occurred within the commercial poultry sector, which is largely concentrated in urban and peri-urban regions (Rajkumar *et al*., 2021). Consequently, access to chicken meat and eggs from these intensive farming practices remains limited for residents of rural and tribal areas. India ranks 3rd in egg production and 5th in meat production globally. However, the availability of chicken products remains significantly below recommended levels, especially in rural areas (Rajkumar *et al*., 2010) and highlands (Kandpal and Kumar 2023). This limitation is primarily due to the absence of cold chain infrastructure and the minimal demand for processed and stored chicken meat in these communities.

Approximately 65 % of India's population resides in rural areas, where the primary staple foods are rice and wheat, resulting in a markedly low intake of protein. It is crucial to address this nutritional gap by providing these populations with access to nutritious foods that include sources of animal protein, thereby mitigating the risk of protein malnutrition and promoting healthy growth and development. While the intensive production system is firmly established, there is a growing interest in BYPF using improved chicken varieties or native breeds.

BYPF has been an age-old traditional practice in the rural hilly regions of India for generations. This practice plays a crucial role in alleviating poverty by generating income through the sale of eggs and chicken (Hussain *et al*., 2017). It also enhances family food security (Nagar *et al*., 2020) and provides essential protein for growing and malnourished children. Despite the rise of large-scale industrial poultry farming, backyard poultry remains a significant part of the national poultry population, meeting the demand for eggs and meat in rural areas (Nath *et al*., 2012). Although local birds tend to have lower productivity, backyard poultry contributes approximately 21% to India's egg production (DADF, 2018). Generally characterized as a low-input or no-input venture, BYPF is primarily managed by rural families. Consequently, it significantly supports the upliftment of rural communities in terms of socio-cultural and nutritional needs, thereby bolstering the country's poultry sector. BYPF can be described as a low input or no input business wherein small numbers of native chickens are reared by households either for domestic consumption and or for game purposes (Mandal *et al*., 2006). The characteristic features of backyard poultry production includes – i) poor productivity of birds, ii) night shelter, iii) generally consumed in local market, iv) Rely on scavenging which was pointed to have insufficient nutrients for local chicken, v) Less supplementary feeding, vi) Natural hatching of chicks and vii) No health care practices are provided. In India, the rural family poultry system is referred to as backyard poultry and it functions as a form of organic farming since the birds are raised under natural conditions. This approach is also eco-friendly, as it provides manure for farmers' fields and helps control pests (Selvam, 2004). The use of native breeds is common in backyard poultry production but some places are found to have crosses of these indigenous breeds too. Free range backyard native breeds contributed about 14.60 % of total egg production in India (Kumaresan *et al*., 2008). Indigenous breeds of poultry are commonly utilized in rural and tribal households due to their resilience in adapting to various challenging climatic conditions (Adbhai *et al*., 2019). However, these breeds tend to produce fewer eggs and have slower growth rates. To improve the production efficiency of backyard poultry, improved varieties that resemble native fowl are now being introduced on a larger scale. A list of some native chicken breeds of the North Eastern Hill region is provided in Table 1 (ICAR–National Bureau of Animal Genetic Resources, 2025).

Meghalaya, which is located in the North Eastern part of India, is characterized by its unique socio-economic and cultural landscape. The state’s rural population relies heavily on agriculture for their livelihoods, and poultry farming offers a supplementary source of income that can improve household resilience. BYPF in Meghalaya is predominantly practiced by women, making it a key driver of gender empowerment and social equity. The indigenous breeds of poultry are not only well-suited to local conditions but also carry cultural significance, often being associated with traditional practices and community events.

Table 1. List of indigenous chicken breeds of North Eastern states of India.

Sl. No.	Name	Home tract
1.	Daothigir, Miri	Assam
2.	Kaunayen	Manipur
3.	Chittagong	Meghalaya and Tripura
4.	Zora	Mizoram
5.	Naked neck Chicken	Sikkim

Despite the recognized potential of BYPF in enhancing socio-economic conditions, comprehensive studies exploring its impacts in Meghalaya remain limited. The existing literature lacks a systematic evaluation of how BYPF influences farmers' livelihoods, food security, and community resilience in this specific context. This review aims to fill this gap by analyzing relevant studies and providing insights into the socio-economic impacts of BYPF in Meghalaya. By doing so, important inform can be made accessible to the policymakers and stakeholders about effective strategies to leverage this practice for sustainable rural development.

Current status of poultry farming in India

The total poultry population in India is 851.81 million, out of which 317.07 million are categorized as backyard poultry and the remaining 534.74 million are under commercial poultry (BAHS 2019). The egg production from commercial poultry is 118.16 billion while backyard poultry account for 20.20 billion, contributing 85.40% and 14.60% of total egg production in the country (138.38 billion) respectively (BAHS 2023). Backyard poultry production has experienced significant growth, increasing by 45.78% since the last census, while commercial poultry has grown only by 4.5%. Poultry meat production is 4.995 million tons, contributing about 51.14% of total meat production (9.77 million tons) (BAHS 2023). The growth of poultry meat production has increased by 4.52% over previous year. The per capita availability of eggs and meat in 2022-23 is 101 eggs per year and 7.10 Kg per year respectively. However, this is below the Indian Council of Medical Research's recommended consumption levels of 180 eggs and 10.8 kg of poultry meat per person per year (Singh *et al*., 2020).

In India, there are two primary poultry production systems- a commercial system that accounts for approximately 79% of the chicken population, and a traditional village or backyard system (21%). These systems employ different breeds and varieties of poultry based on productivity and consumer preferences. The commercial sector predominantly utilizes hybrid strains, while the village system relies on indigenous or locally improved breeds, suitable for either dual-purpose or meat production.

The commercial poultry represents more than 50% of India's chicken population. The majority of layer strains are derived from White Leghorn and Hy-Line breeds, while broiler strains predominantly come from Plymouth Rock and Cornish breeds. India ranks third in global egg production and fifth in poultry meat production, with annual growth rates of 5-6 % for chicken eggs and 6-8% for broiler meat (Chatterjee, 2017). Most of the production occurs within intensive farming systems, primarily concentrated in regions such as Andhra Pradesh, Telangana, Tamil Nadu, Maharashtra, Chhattisgarh, West Bengal, and Haryana. Industrial poultry growth is largely focused in urban areas where demand for eggs and meat is higher, while rural regions experience a significant shortfall in availability. In rural areas, poultry products are often more expensive (10-40% higher), due to limited availability and transportation costs.

Potential of BYPF.

BYPF in India has significant potential, offering numerous benefits and opportunities (Singh *et al*., 2022). Some of the key aspects are listed below:

1. Backyard poultry can endure severe and unpredictable weather conditions, showcasing resilience to climate change and adaptability to various environments.
2. These birds transform waste materials such as kitchen scraps, vegetable peels, and grass into valuable animal protein.
3. Starting a backyard poultry operation requires a low initial investment.
4. This venture generates employment for rural farmers, women, unemployed youth, and elderly family members, offering a supplementary income stream.
5. Eggs and meat from backyard poultry are often sold at higher prices than those from commercial farming.
6. The products from backyard poultry provide a rich source of quality animal protein, bolstering food and nutritional security for vulnerable communities.
7. Backyard poultry can be effectively integrated with other agricultural practices, such as poultry-fish farming systems.
8. The manure produced by backyard poultry is nutrient-rich and can significantly improve soil fertility.
9. BYPF empowers women, as it is typically managed by female members of the household, giving them a sense of ownership and financial independence.
10. This practice aids in conserving biodiversity by utilizing native or indigenous breeds that are well-suited to local conditions and resilient to diseases, ensuring a rich genetic and phenotypic diversity for enhancing productivity.

Housing and feeding management in BYPF:

Proper housing should not only create a favorable microenvironment and meso-environment to reduce environmental impact but it should also ensure adequate ventilation. This is essential for birds to lay eggs in nest boxes, feed, and sleep comfortably and securely.

Local chickens were primarily raised using a free-range scavenging method. During the day, they foraged freely around the house, while at night, they were provided with shelter. The poultry houses are mostly constructed

from bamboo and elevated 2-3 feet above the ground (Rahman, 2017). Similar observations were noted by Mandal *et al*. (2006) and Deka *et al*. (2013). Most poultry houses lacked any lighting facilities. A majority of farmers (97.64%) utilized a semi-scavenging system for poultry rearing. Most poultry houses were constructed from tin and bamboo (88.82%), with a small portion of farmers maintaining houses that did not meet satisfactory standards (11.2%). Bedding materials were used by 78.82% of farmers, who used a mix of polythene, sacks, ash, sand, straw, and paper, while 21.18% of farmers opted not to use any bedding. Furthermore, only a small percentage of farmers (26.47%) regularly cleaned their poultry houses, whereas a significant majority (73.53%) did so irregularly (Rahima *et al*., 2023). Housing is crucial for birds as it protects them from fluctuating temperatures, rain, wind, and predators (Sarwar *et al*., 2015). A larger number of families preferred to keep their birds outdoors, with 60% housing them openly compared to 40% in coops. Typically, the birds were allowed to forage during the day and were confined at night. A study conducted by Popy *et al*., 2018 revealed that 61.54% of farmers constructed their poultry houses in close proximity to their homes, while 38.46% opted for completely separate structures, maintaining a minimum distance. The majority of poultry houses (53.85%) were built using wood and tin. Concrete houses comprised 23.08%, earthen structures accounted for 15.38%, and 7.69% were made from bamboo, polythene, and other materials. The graphical presentation is given fig. 1 and fig. 2 respectively. In extensive system, all the farmers manage their backyard poultry by providing night time shelter. Among these farmers, 80.8% built separate shelters with wooden floors raised about 1-1.5 feet above ground, using locally available materials such as wood, tin or plastic sheets, and wire netting.

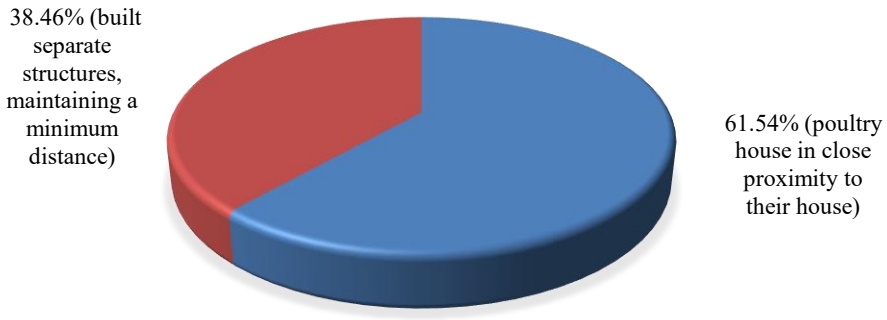

Fig. 1. Distribution of backyard poultry farmers based on location of pultry house (Popy *et al*., 2018).

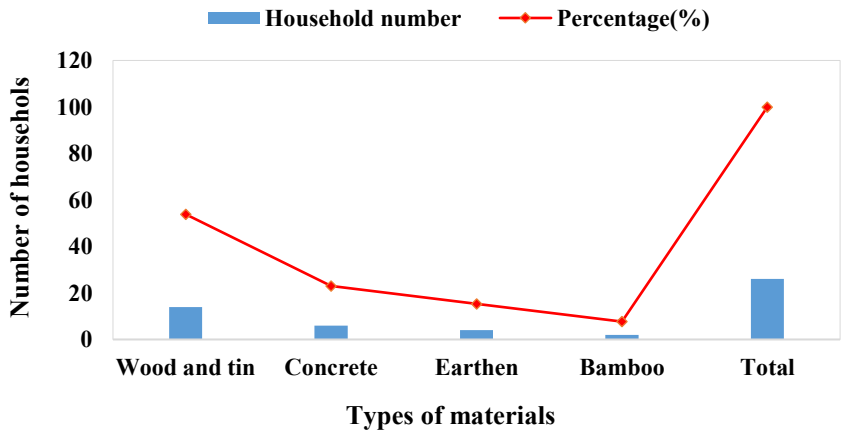

Fig. 2. Graphical presentation of number of households and the types of materials used for constructing poultry houses (Popy *et al*., 2018).

The remaining farmers housed their birds in temporary box like wooden structures. A limited number of farmers offered well-ventilated shelters, and very few provided electricity in their poultry houses (Nath *et al*., 2012). Similar results were reported by Khandait *et al*. (2011). Majority of the backyard poultry farmers were aware of the feed available through scavenging, the importance of providing kitchen waste, and the necessity of supplying feed three times a day along with drinking water. Additionally, 73.33% and 71.67% of these farmers knew about ready-made feed and the need for supplemental feed for their birds. This knowledge about feeding and providing water were likely acquired from their exposure to various local resources and training on nutritional requirements. Similar results were found by Jagalur *et al*. (2022) while studying on BYPF in two districts of Northern Karnataka. Rahima *et al*. (2023) from their study on BYPF in Bangladesh observed that farmers primarily provided rice (84.71%) as the major feed for their poultry, with commercial feed being used in a small number of households (5.88%). Most farmers fed their birds twice a day (62.94%), while some fed once or three times. A majority of farmers (55.88%) utilized feeders and waterers made of soil, plastic, or metal, but 44.12% did not use any feeders or waterers at all. Backyard birds primarily obtain their feed by foraging in yards, animal sheds, bushes, neighboring properties, and nearby grain fields. Their scavenging diet mainly consists of small worms, insects, snails, rice, fallen cereal grains, kitchen scraps, household vegetables, and green grasses, collectively referred to as the scavenging feed resource base (SFRB) (Samanta *et al*., 2018). They also observed that in several Asian countries, including India, Bangladesh, and Thailand, women often provide supplementary feed and drinking water from local ponds to the birds once or twice daily. As per Sarwar *et al*. (2015) BYPF birds of all ages scavenge together during the day. After hatching, chicks would roam freely with their mothers. Water was provided intermittently in clay pots. Only 22% of respondents reported feeding their birds grains such as wheat and millet once a day. In free-range environments, birds typically fulfil their protein needs by foraging, but they often face the risk of energy shortages. To enhance production in free range farming, it is beneficial to provide them with locally available grains such as maize, bajra, jowar, and broken rice, mixed with equal amounts of rice polish or rice bran. Additionally, supplementing with calcium can improve their health and is crucial for egg production (Rath *et al*., 2015). In NEHR including Meghalaya poultry houses are typically constructed with locally available materials, such as bamboo and wood. Similar findings were reported by Deka *et al*., 2013 and Islam *et al*., 2020. Birds are set free during early morning hours and left for scavenging in the surroundings of the house, gardens, fields etc. from where they fulfil their requirement of feed. During scavenging, the birds generally feed on kitchen waste, earthworms, insects, green grasses, leafy vegetables, seeds etc. In addition to scavenging, women offer broken rice and boiled rice to their birds. These findings are in alignment with Nath *et al*., 2012 and Borah *et al*., 2020.

Suitable breeds and size for BYPF

It is important to understand how different poultry breeds perform in various agro-ecological settings, particularly when introducing improved breeds into new backyard farming systems (Guni *et al*., 2021; Chaiban *et al*., 2020; Kumaresan *et al*., 2008). Several improved poultry varieties suitable for backyard farming-such as Vanaraja, Gramapriya, Srinidhi, Giriraja, Kuroiler, and Rainbow-Rooster have been developed in India. These breeds are known to produce between 110 and 180 eggs per year under backyard conditions (Rajkumar *et al*., 2021). The success of these breeds has been reported not only across India but also in Africa (Singh *et al*., 2018c; Andrew *et al*., 2019; Sanka *et al*., 2020; Guni *et al*., 2021). Among these, the Vanaraja-an improved dual-purpose breed has demonstrated strong adaptability to the sub-tropical to sub-temperate climates of the Indian Himalayan ecosystem (Singh *et al*., 2017). The breed's body weight at 24 weeks ranges from 1.7 to 2.7 kg depending on climatic and production conditions, while egg production at 72 weeks varies between 90 and 112 eggs. Under sub-temperate climates, Vanaraja chicks show high survivability, ranging from 83% in winter to 96% in summer (Singh *et al*., 2018b). The Giriraja breed of chicken has been found to be successfully adapted to the environmental conditions of Manipur, demonstrating superior performance compared to desi chickens in both valley and hill districts under backyard farming. This includes better outcomes in average age at first egg production, egg weight, annual egg production, and live body weight at 48 weeks of age (Singh *et al*., 2023). However the mortality rate of Giriraja (14%) was found to be higher when compared to indigenous breed (8%) which might be due to better adaptability and disease resistance of indigenous poultry. A summary of these comparative performance indicators is presented in Table 2.

Various studies have been conducted regarding the performance of different poultry breeds in NEHR, with respect to their capability of egg production per year, feed to weight conversion, average body weight at 42nd weeks, mortality rate at different ages, etc., it can be noted that the varieties Viz., Vanaraja, Kuroiler, Giriraja, Srinidhi, Gramapriya, Kalinga Brown and Kamrupa were well adapted to the agro climatic condition of this particular region and they are found to perform better than the native or indigenous breeds of the NEH region. Especially Vanaraja and Kuroiler have the potential to improve the socio-economic status of poultry farmers in Meghalaya. The studies conducted by Das *et al*., 2021, Islam *et al*., 2020, Haunshi *et al*., 2009 and Singh *et al*., 2023 supported the above findings. In Tanzania, Andrew *et al*. (2019) found that the Sasso strain had the highest net present value, net cash farm income, and likelihood of achieving economic returns, with kuroiler coming next, while local chickens were the least economically viable. The average size of poultry in rural backyard farming varies significantly. In Ethiopia and Sudan,

households reported average flock sizes of 8.5 and 16.7, respectively (Wani *et al*., 2014; Yemane *et al*., 2013). A separate study in Ethiopia indicated a lower average of 4.1 (Sambo *et al*., 2015). In other countries, like Bangladesh and Belgium, BYPF had an average sizes of less than 11 (Alam *et al*., 2014; Van Steenwinkel *et al*., 2011). Meanwhile, in several districts of West Bengal, India, including Jalpaiguri, Dinajpur, West Medinipur, Howrah, and South 24 Parganas, the average size was reported to be between 20 and 25 (Samanta *et al*., 2014). Experts suggest that the ideal number for effective free-range chicken rearing is between 15-20 chicks per family (Banerjee and Ghosh, 2021). In many villages across India, families often keep small flocks ranging from 5 to 20 chickens of various ages (Samanta *et al*., 2016). Laxmi *et al*. (2021) observed that in India, backyard poultry production is typically characterized by small flocks of 5 to 10 mostly non-descript birds, raised in extensive systems with little to no input. Rural poultry owners in the Jorhat district of Assam were classified into three categories based on flock size: small, medium, and large. As shown in Table 3, the majority of poultry owners (87%) fell into the small sized flock category, while 13% had medium-sized flock. Notably, none of the respondents reported having large flock size. The study indicated that the smallest flock size was 5 birds, while the largest was 25 birds (Deka *et al*., 2013).

The flock size in NEH region varies significantly. An average flock size varying between 5-25 was reported from the tribal villages in Jorhat district of Assam by Deka *et al*., 2013 while Nath *et al*., 2012 from their study in Dzongu area, North Sikkim located in the North-Eastern part of India classified flock size into three categories- i) Small (1-5 birds), ii) Medium (6-10 birds) and iii) Large (11 and above birds).

Economic benefit of BYPF

Backyard poultry farming (BYPF) serves as a valuable supplementary income source in rural India, especially for smallholder and tribal households. It provides a regular supply of protein-rich meat and eggs with minimal investment and management effort (Rajkumar *et al*., 2021; Das *et al*., 2021). The following section presents a breed-wise economic analysis to provide a clearer picture of profitability and cost-efficiency across various improved and indigenous poultry breeds.

1. Vanaraja

Vanaraja is one of the most commonly adopted improved dual-purpose breeds for BYPF across India. Singh *et al*. (2019) reported significantly higher net income for Vanaraja birds (Rs. 995.97 per bird) compared to local birds (Rs. 287.22 per bird), with a benefit-cost (B:C) ratio of 4.41 versus 1.52. The detailed economic breakdown is provided in Table 4.

Baruah and Raghav (2017) found that Vanaraja yielded 46.78% higher net returns than native breeds in a group of 20 birds, achieving a B:C ratio of 2.84. Singh *et al*. (2018a) documented a net income of Rs. 71,31,525 from the sale of Vanaraja and Srinidhi birds (3–4 months old, 2.5–3.0 kg), with Rs. 302.00 per bird and a B:C ratio of 2.93. In Ri-Bhoi district of Meghalaya, Islam *et al*. (2020) noted that Vanaraja generated the highest gross return (Rs. 2,536 per bird), with a profit margin of 290% and B:C of 3.90. Comparative figures are presented in Table 5 and Figure 3.

2. Kuroiler

Kuroiler, another improved breed, also showed strong performance under BYPF conditions. According to Islam *et al*. (2020), the gross return per bird was Rs. 2,227, with a profit margin of 242.61% and B:C ratio of 3.42. Its performance is summarized in Table 5.

3. Indigenous Breeds

Although generally less productive, indigenous breeds are still integral to BYPF due to their adaptability and low-input requirements. Islam *et al*. (2020) found that indigenous birds yielded a gross return of Rs. 1,060 per bird, with a profit margin of 134.30% and a B:C of 2.58 (Table 5; Figure 4). Singh *et al*. (2019) also reported lower net income and B:C ratios for local poultry compared to Vanaraja.

4. Kalinga Brown and Kamrupa

Borah *et al*. (2020) evaluated the economic performance of several improved breeds in Arunachal Pradesh. Kalinga Brown had the highest B:C ratio (3.3), followed by Vanaraja and Indigenous chickens (2.9 each), and Kamrupa (2.4). Kalinga Brown also showed the highest egg production, while Vanaraja had the greatest body weight gain.

5. Divyan Red

Jha and Chakrabarti (2017) reported total gross income of Rs. 88,808 from Divyan Red poultry, with a gross return of Rs. 569.28 per bird and net return of Rs. 232.74 per bird. The annual net income per household was Rs. 3,025.68, with a B:C ratio of 1.69 and a meat-to-feed ratio of 2.89.

6. Rhode Island Red (RIR)

Das *et al*. (2014) examined the B:C ratio for Rhode Island Red chickens used primarily for egg production in West Bengal. Their study found that farmers using lower crude protein feed and allowing scavenging achieved higher profitability, underlining the importance of feed cost management in BYPF systems.

Table. 2: Performance of Giriraja and Indigenous chicken in Manipur under backyard system of rearing

Sl. No.	Breed	Average age at first egg (days)	Average weight of egg (gm)	Egg production (Number /year)	Average body weight at 48th weeks		Mortality Rate (%)
					Male (Kg)	Female (Kg)	
1	Giriraja	155	52	136	3.1	2.3	14
2	Indigenous	184	40	53	1.6	1.2	8
	t value	33.65*	29.32*	199.82*	55.01*	42.86*	28.71*
	P- values	8.62E-25	4.20E-23	4.46E-47	6.92E-21	8.86E-28	7.56E-23

(Singh *et al*., 2023)

Table 3: Categorization of respondents based on flock size (n=100).

Variable	Category	No. of respondent
Size of flock	Small (< 20 birds)	87
	Medium (20-50 birds)	13
	Large (> 50 birds)	0

(Deka *et al*., 2013)

Table 4: Economic Performance of vanaraja and local poultry breeds

Particulars	Vanaraja	Amount (Rs.)	Local Poultry	Amount (Rs.)
Revenue from Egg Sales (10 Vanaraja hens and 5 local hens)	Average yearly egg production: 130 ± 7.89 eggs/hen, Total production: 1300 eggs @ Rs. 10/ egg	13,000 (40.37)	Average yearly egg production: 40 ± 4.45 eggs/hen, Total production: 200 eggs @ Rs. 10 per egg	2,000 (23.83)
Revenue from Sale of Cocks (10 Vanaraja cocks and 5 local cocks)	Average weight: 3.25 ± 0.87 Kg, Total weight: 32.5 Kg @ Rs. 300/Kg	9,750 (30.27)	Average weight: 1.89 ± 0.48 Kg, Total weight: 9.45 Kg @ Rs. 300/ kg	2,835 (33.79)
Revenue from Sale of Spent Hens (10 Vanaraja hens and 5 local hens)	Average weight: 3.12 ± 0.94 Kg, Total weight: 31.5 Kg @ Rs. 300/Kg	9,450 (29.34)	Average weight: 2.37 ± 0.68 Kg, Total weight: 11.85 Kg @ Rs. 300/ kg	3,555 (42.37)
Gross Revenue		32,200		8,390
Net Revenue		24,899.25		2,872.2
Net Revenue per Bird		995.97		287.22
B:C		4.41		1.52

Figures in parentheses indicate percent of total return (Singh *et al*., 2019)

Table 5: Comparative assessment of vanaraja, kuroiler, and indigenous poultry breeds under BYPF in Ri-Bhoi District, Meghalaya

S. N.	Parameters	Vanaraja	Kuroiler	Local Poultry
1.	Average Body Weight (kg per Bird)	4.5	3.81	1.84
2.	Annual Egg Production per Bird (No.)	137	126	59
3.	Rearing Cost (Rs. per Bird)	650	650	410
4.	Selling Price for Meat (Rs. per Bird)	1,440	1,219	589
5.	Revenue from Egg Sales (Rs. per Bird)	1,096	1,008	472
6.	Profit Margin (%)	290	242.61	134.30

(Islam *et al*., 2020)

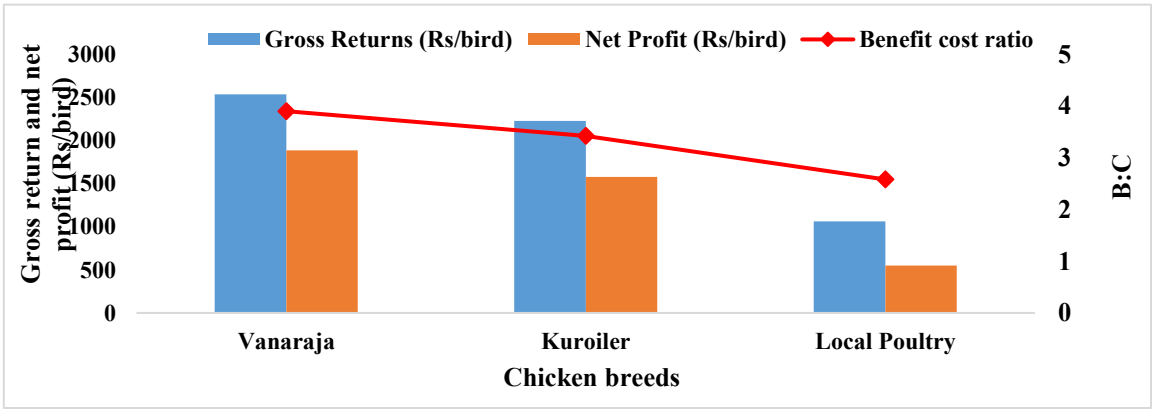

Fig. 3: Comparative performance Vanaraja, Kuroiler and indigenous breed in terms of gross return, net profit and B:C from three breeds of poultry under BYPF. (Islam *et al*., 2020)

Marketing channel and source of chicks for BYPF

A study by Rahman, 2017 on BYPF in Mizoram, indicated that the marketing system was straightforward, with middlemen involved only in a few instances. Farmers typically sold their eggs and poultry meat directly from their homes to achieve better prices. The research indicated that 78% of respondents sold their products directly to consumers, while 22% sold at the village market. Generally, farmers chose not to sell their female birds for meat. These findings align with those of Mandal *et al*. (2006) and Deka *et al*. (2013). All backyard poultry farmers were aware of selling their products (egg and bird) directly from their homes and at local markets. They either utilized poultry manure as fertilizer or sale when they needed money. Additionally, 40% of these farmers knew about the specific weight gain of their birds as they aged, which assist their decisions about selling live birds (Jagalur *et al*., 2022). Majority of the poultry owners (85%) did not sell the eggs and used them for domestic consumption, whereas, only 15 per cent respondents sold the surplus eggs. However, with regard to selling of bird's majority of the poultry owners (90%) sold birds and only 10 per cent respondents did not sell birds. Desi poultry or look alike of desi poultry definitely fetch more prices both for eggs as well as meat. Most poultry owners (88.89%) sold their eggs directly from home, with others selling at consumers' doorsteps (69.44%) and to village shopkeepers (55.56%). Only 8.33% and 5.56% of poultry owners reported selling eggs to Feriwala and at village markets, respectively as shown in Table-6 (Mandal *et al*., 2006).

Lakshan and Harisuthan (2020) reported that there is no organized marketing system for indigenous chickens and eggs. Instead, middlemen, households, and village shops play key roles in marketing. The primary channel for sales is directly from producer to consumer, accounting for 75% of sales through households. In their study it was observed that around 23.3% of respondents had access to markets, while 61.7% did not. The survey also found that decision-making regarding market participation-such as selling eggs and chickens or consuming them at home-was predominantly handled by housewives (95% of cases). Additionally, about 31.7% of market information was obtained from the Department of Animal Production and Health.

All the poultry owners reported that natural hatching was the main source of chicks where desi broody hens were used as natural incubator. Respondents also collected grown up chicks from local market or neighbours/relatives. None of the poultry owners purchased their chicks from commercial hatcheries. All poultry owners confirms that natural hatching was their primary method for obtaining chicks, utilizing desi broody hens as natural incubators. Additionally, they obtained mature chicks from local markets or from neighbours and relatives. None of the poultry owners bought chicks from commercial hatcheries (Deka *et al*., 2013). The data regarding sources of chicks are given in Table-7. Similar findings were reported by Alam *et al*. (2014), where he observed that maximum farmers opted not to buy or borrow birds, instead they rely on broody hens to incubate their chicken and duck eggs. About 50% of farmers incubated chicken eggs, while 43% incubated duck eggs. Additionally, they sought poultry from local markets and neighbours, with 18% obtaining chicken and 32% duck from markets, and 21% sourcing chicken and 36% duck from neighbours.

From the survey conducted by Rahman (2017) it was shown that a majority of respondents (75.5%) hatched chicks naturally at home, using bamboo caskets for the eggs. These caskets were cushioned with sufficient litter and bedding. Each broody hen typically had 8 to 10 eggs, and after 21 days, the hatchability ranged from 60-70%.

In contrast to these findings Weyuma *et al*. (2015) reported that 21.88% respondents purchased chickens from private/government hatcheries. His finding from the four smallest administrative unit (Kebeles) in Ethiopia are presented in Table-8

Table 6: Distribution of respondents across different egg marketing channels (N=36)

Marketing Channel	Number of Respondents	Percentage (%)
1. Direct Sales to Consumers at Their Doorstep	25	69.44
2. Sales to Village Shopkeepers	20	55.56
3. Sales Through Feriwala (Hawkers)	3	8.33
4. Selling at the Village Market	2	5.56
5. Sales from Home	32	88.89

(Mandal *et al*., 2006)

Table 7: Respondent distribution based on chick sources (n=100)

Source of Chicks	Number of Respondents
1. Hatched Naturally	100
2. Obtained from Neighbors or Relatives	36
3. Purchased from Local Market	15
4. Sourced from Commercial Hatcheries	0

(Deka *et al*., 2013)

Table 8: Sources of chicks in four kebeles within the study area

Source of Chicks (%)	Filtino (N=40)	Dalota (N=40)	Kaliti (N=40)	Gote (N=40)	Overall (N=160)
Obtained from Private Hatcheries	8 (20.0)	10 (25.0)	11 (27.5)	6 (15.0)	35 (21.88)
Naturally Hatched at Home	21 (52.5)	16 (40.0)	19 (47.5)	19 (47.5)	75 (46.87)
Bought from Local Markets	11 (27.5)	14 (35.0)	10 (25.0)	15 (37.5)	50 (31.25)

Figures in parentheses indicate percent of total return (Weyuma *et al*., 2015)

Table 9: Economic returns from backyard poultry farming

Birds sold (nos.)	Body weight (Av.)	Rate/kg live weight (Rs.)	Income (Rs.)	Cost of production (Rs.)	Net Profit (Rs.)	B:C
245	2.5 kg	250-380	2,39,100.00	1,40,000.00	99,100.00	1.7

Table. 10: Comparative performance of improved varieties vs. local poultry birds

Traits	Poultry breed	
	Improved breeds	Local birds
Body weight (10 weeks)	750-850 g	450-500 g
Body weight (40 weeks)	1.7-2.2 kg	850-900 g
Body weight (60 weeks)	3.7 kg (male) 2.5 kg (female)	1.7 kg (male) 1.3 kg (female)
Age at first egg (Days)	185 days	197 days
Annual egg production (nos.)	138 -155 nos.	45-60 nos.
Egg weight	47-52 g	28-32 g
Egg colour	Brown/ Light brown	Creamy white

Das *et al*., 2021

. **Table 11**: Economic analysis of backyard poultry farming.

Birds sold (nos.)	Body weight (Av.)	Rate/kg live weight (Rs.)	Income (Rs.)	Cost of production (Rs.)	Net Profit (Rs.)	B:C
70	2.5 kg	250-300	49,000.00	27,200.00	21,800.00	1.80

Table. 12: Economic advantages of backyard poultry farming

Birds sold (nos.)	Body weight (Av.)	Rate/kg live weight (Rs.)	Income (Rs.)	Cost of production (Rs.)	Net Profit (Rs.)	B:C ratio
172	2.6 kg	250-300	1,24,344.00	65,770.00	58,574.00	1.89

Table 13: Challenges Faced by Hill Farmers in Backyard Poultry Farming (BYPF) (n=100)

Sl. No.	Challenges	Number of Respondents	Rank
1.	High mortality due to disease outbreaks	100	I
2.	Poor productivity of indigenous poultry	91	II
3.	Low hatching success rate	84	III
4.	High early-stage chick mortality	84	III
5.	Year-round unavailability of day-old chicks	84	III
6.	Insufficient financial assistance	67	IV
7.	Limited technical knowledge	52	V
8.	Shortage of quality feed ingredients	34	VI
9.	Weak market connections	30	VII
10.	Losses due to predator attacks	13	VIII

(Deka *et al*., 2013)

Fig. 4: BYPF with improved breeds of Vanaraja and Kuroiler

Fig.5: BYPF during 2020-21 under the initiative of FFP

Fig.6: Poultry farmer Mr. M. Raja (Nalapara village)

Fig.7: Poultry farmer Mrs. Saila Maharana (Borkhatsari village)

Fig.8: Poultry farmer Mr. Julan Sylliang (Borgang village)

Fig 9: Kuroiler birds being handed over to Mrs. Saila Maharana's home by FFP staff

Fig10: Lasota vaccine for prevention of Ranikhet Disease

In the NEHR, there is no organized market for the products (egg and poultry meat) of BYPF. The eggs and meat are mostly used for home consumption. The surplus eggs and meat are sold within the village itself. There are very few instances where middlemen are involved in the marketing. Mostly the owner sold their output from door to door and in village market. Regarding the pourcument of chick, the poultry farmer collects fertilized eggs from his own farm, relatives and neighbors. There was no record of purchasing chicks from commercial hatchery. Mostly the eggs were hatch under natural condition, by using broody hen. To facilitate the hatching process, baskets made from bamboo are used. The baskets were cushioned by providing a layer of straw to avoid damage to the eggs. The studies conducted by Deka *et al*., 2013 and Rahman, 2017 found similar results.

Scenario of BYPF under the intervention of Farmers' FIRST Programme (FFP) in Meghalaya

In 2022-23, the FFP implemented a scientific intervention by distributing improved breeds of Vanaraja and Kuroiler chicks for BYPF. On April 20 and September 29, 2022, a total of 1,290 chicks were given to 32 beneficiaries. The live birds, weighing between 2.5 and 3.5 kg, were sold for Rs. 250-380 per kg, yielding approximately Rs. 625.00 to Rs. 1,330.00 per bird after an 8-10 month rearing period. The income generated from this BYPF is summarized in Table 9.

The growth and productive performance of the improved varieties in terms of body weight, age at first egg, annual egg production, egg colour and egg weight was recorded and compared with local poultry birds (Table 10). It was observed that body weight of 2.5-3.7 kg and 1.3-1.7 kg was attained by the improved breeds and local birds at 60 weeks, respectively. Annual egg production (nos.) was 138-155 and 45-60 in improved breed and local birds, respectively. The egg weight was also higher in improved breeds (47-52g) than the local indigenous birds (28-32g).

In the 2021-2022 periods, the FFP contributed by providing 100 improved breeds of backyard poultry chicks, specifically Vanaraja and Kuroiler varieties. These chicks were distributed to two beneficiaries. The advantages of this initiative are highlighted in the Table-11

During the 2019-2020 period, the FFP initiative distributed improved breeds of Vanaraja and Srinidhi for BYPF. A total of 3,324 chicks were given to 78 beneficiaries. The live birds, weighing between 2.5 to 3.5 kg, were sold for Rs. 250.00 to Rs. 300.00 per kg, allowing each bird to generate an income of Rs. 625.00 to Rs. 1,050.00 after 8 to 10 months of rearing. The Table-12 represent the details of income from this BYPF.

In 2019-20, the FFP provided 200 poultry birds to farmers in Mawphrew village, additionally vaccination was done against Ranikhet disease. Mrs. Saila Maharana from Borkhatsari village received 100 poultry birds in 2018-19 and earned Rs. 59,000. She saved Rs. 5,400 from this income and bought 80 Kuroiler birds in July 2019. After raising them for 3-4 months, she sold the birds for a total of Rs. 78,470 at a rate of Rs. 300 per kg, with the total weight of the sold birds being around 262 kg. Her feed expenses amounted to Rs. 50,900, resulting in a profit of Rs. 22,170. Additionally, five poultry houses were built in the adopted villages.

The study on the scientific intervention under FFP highlights that over the past four years, it has significantly promoted BYPF as a viable option for economic sustainability. This initiative encourages rural youth to systematically engage with BYPF, helping them unlock its full potential. As a result, it supports the establishment of BYPF as an entrepreneur, contributing to the economic stability and sustainability of farmers in rural hill areas.

Major constraint in BYPF in NEHR:

The various constraints faced by the rural hill farmers in NEHR in BYPF, are outlined in the prepared schedule (Table 13). As per survey it was revealed that high mortality due to various infectious diseases was a major concern, followed by low production potential of native birds (91%), low hatchability and early chick mortality, along with the unavailability of day-old chicks throughout the year (84%). Other notable constraints included lack of financial support (67%), insufficient technical knowledge (52%), shortage of feed ingredients (34%), weak market channel (30%), and predator attacks (13%). This findings are in agreement with Bhattacharjya *et al*., 2020.

Strategies for improving BYPF in NEHR:

To enhance backyard poultry farming (BYPF) in the North Eastern Hill Region (NEHR), a holistic strategy integrating breeding, health, feed, extension services, and market support is essential. Key strategies are outlined below (Kadirvel *et al*., 2021):

1. Selective Breeding and Chick Supply

Promote selective breeding of indigenous poultry to develop hardy, dual-purpose varieties suited to local agro-climatic conditions. Improved breeds like Vanaraja, Kuroiler, Srinidhi, and Gramapriya should be propagated through institutional support and distributed to farmers via local hatcheries.

2. Establishment of Mini Hatcheries

Block-level mini hatcheries should be set up and supported with technical and financial assistance, enabling self-sufficient chick production and local breed preservation.

3. Balanced Feeding Using Local Resources

Develop low-cost, nutritionally balanced feed from locally available resources such as Azolla, kitchen waste, and cultivated crops like maize and soybean. Extension services must train farmers in feed formulation and management.

4. Disease Management and Vaccination

Implement regular deworming and vaccination drives, especially against Ranikhet disease. Veterinary infrastructure, including cold chains and mobile health units, must be strengthened for effective outreach.

5. Veterinary Training and Extension Services

Capacity-building through training for rural youth and women is essential. Modules on scientific poultry practices — housing, feeding, and disease prevention — should be widely disseminated.

6. Support for Self-Help Groups (SHGs)

Strengthen SHGs with financial literacy training and access to microcredit. Given the high involvement of women in BYPF, targeted support can empower them and enhance farm productivity.

7. Insurance and Risk Mitigation

Design and implement community-managed insurance schemes to protect farmers from poultry losses due to predation and disease outbreaks.

8. Market Access and Livelihood Linkages

Create village-level market linkages to reduce exploitation by middlemen. Organize training and facilitate access to buyers, cooperatives, and agri-markets.

9. Biosecurity Measures

Raise awareness and support farmers in implementing biosecurity protocols to prevent disease transmission in backyard flocks.

10. Skill Upgradation and Motivation

Provide ongoing training to keep farmers updated on improved technologies. Sharing local success stories can act as motivation and promote adoption of modern practices.

11. Data and Policy Support

Improve collection of real-time data on poultry population, productivity, and market trends. Collaboration with research institutions will help address discrepancies in data and support evidence-based policymaking.

12. Stakeholder Collaboration

Regular interactions among farmers, policymakers, and institutions like FAO can support inclusive planning, improved policy formulation, and program monitoring.

Conclusion

In conclusion, BYPF plays a pivotal role in enhancing the economic status of hill farmers in Meghalaya. By providing a sustainable source of income, improving food security, and fostering local entrepreneurship, this practice empowers farmers to diversify their livelihoods. BYPF not only contributes to the economic upliftment of hill farmers but also supports the overall development of rural communities in Meghalaya. Furthermore scientific interventions implemented through the Farmers' FIRST Programme (FFP) by ICAR for NEH Region, Umiam, Meghalaya, have greatly benefited backyard poultry farmers in the FFP adopted villages of Ri Bhoi, Meghalaya. These intervention namely introduction of improved breeds (Vanaraja/Srinidhi) of backyard poultry chicks (3weeks), dissemination of knowledge regarding feeding and health care management, organizing training programs and inputs distribution in the form of veterinary medicines and vaccination against Ranikhet and fowl pox, had significantly improved their productivity and livelihoods by boosting their income with low input costs. As a result, poultry farming represents a lucrative enterprise for educated unemployed youths, women, and school dropouts in rural areas, allowing them to generate income year-round.

Conflict of interest The authors declare that they have no conflict of interest in this study.

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