Journal of Agricultural Development and Policy, 2024
Volume 34, No. 2, 194-202
https://doi.org/10.63066/23220457.34.2.002

NAAS - 4.34
UGC CARE List Journal

Backyard Farming of Pig and Poultry in Arunachal Pradesh: A Case Study

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Abstract

The study was conducted in nine villages from three districts of Arunachal Pradesh, and a total of 90 farmers participated in the study. The respondents were predominantly female. Chang Ghar and ground systems were traditionally used for housing pigs and poultry, and the night shelter was provided to poultry in a basket in the coop, which is unique in Arunachal Pradesh. Stall feed, scavenging, and a combination of stall-feed and scavenging feeding systems were prevalent. Scavenging was less commonly practised for the pigs. A significant economic constraint, cited by 33.3 per cent of respondents, was the lack of capital. Additionally, 76.7 per cent of respondents reported outbreaks of diseases as a major concern, which had a notable economic impact. The issue of foul smell was negatively perceived by 65 per cent of respondents. Despite these challenges, both pig and poultry farming proved to be profitable ventures, with pig farming yielding slightly higher profits than poultry farming.

Keywords: Backyard farming, housing, feeding, constraints, perceptions

JEL Classification: Q1, Q100, Q120, R2

Introduction

The livestock sector contributes to the national economy and the country's socio-economic development. It provides employment and income to millions of people in urban and rural areas (Rathod et al., 2020). Livestock is the source of food for humans, and it gives manure for agriculture. Several reports highlighted that the primary purpose of keeping pigs was to obtain emergency cash (Nirmala et al., 2012) and to meet food for home consumption (Patel et al., 2014). The income from pigs constituted a high share of household income (Epprecht, 2005). In the mountainous farming system, the primary sources of income are crops, animal husbandry, and off-farm activities. Arunachal Pradesh is a hilly state inhabited by many tribes. The tribal families rear poultry and livestock in the backyard as a tradition for their livelihood and nutritional security since time immemorial (Jha and Chakrabarti, 2017). Backyard poultry plays an important role in generating income for rural people by using locally available feeds and natural resources under the scavenging system. Backyard livestock comprises rearing sheep, goats, pigs, and poultry, and most women feel comfortable managing the small animals (Nirmala et al., 2012). Ninety per cent of the activities of livestock rearing, such as cleaning, milking, and feeding animals, are taken up mainly by rural women. Women in Asia and Sub-Saharan Africa participate in all livestock-related activities (70 %) but are less involved in marketing livestock products, constructing livestock houses, and slaughtering (Farinde and Ajayi, 2005).

Despite several opportunities in backyard farming (BYF), farmers face challenges due to high feed costs, lack of quality germplasm, and health care services in daily operations (Patra et al., 2014). BYF is emphasized by the need to improve village chicken and livestock production and identify the significant constraints to production. Moreover, enormous contributions from BYF of chickens and livestock, such practices are poorly studied in Arunachal Pradesh. The urgency of understanding and preserving these regional and traditional practices in the states is required. The present study aims to explore and evaluate different rearing methods used in BYF systems in Arunachal Pradesh for pigs and poultry. The primary objectives are twofold: first, to assess the rearing practices, and second, to identify the constraints that hinder improving the BYF system in this region. Additionally, the study includes positive and negative perceptions of farmers towards BYF for understanding the financial viability and potential profitability of BYF.

Data Sources and Methodology

Sampling framework

The study was conducted in the three most populous

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districts of Arunachal Pradesh, namely, Papum Pare, Changlang, and Lohit. The agro-climatic zone of the selected districts is tropical. Three villages from each district were selected. All the eligible households of the three villages were identified and a total of ten households were randomly selected from each village after a discussion with the village head, i.e., Gaon Burha. Therefore, a total of 90 respondents were selected for the study. These farmers who had at least three years of experience in BYF, willingness to participate in the study, and currently practicing BYF were selected. Written consent was obtained from the selected farmers. Prior approval from the Ethical Committee of the Institute was obtained for the study. The period of the study pertained to the period October 2020 to February 2021.

Data collection

A structured questionnaire was developed to collect information. Both close-ended and open-ended questions were included in the questionnaire. Initially, a pilot survey was conducted on 15 respondents from Papum Pare district of Arunachal Pradesh. After analyzing the data from the pilot survey, the questionnaire was modified. The modified questionnaire was divided into five sections: demographic and social information, livestock details, housing and feeding details, constraints, and negative and positive perceptions on the family. Demographic and social information were age, gender, education, BYF experience, family size, landholding size, and training completed. Livestock information includes farm size and the source of piglets and chicks. Housing details included details of livestock, dimensions of houses, housing material, pen type, and wall. Feeding details included the type of feeding and feeding materials. The constraints in the questionnaire were economic, social, natural, and technical. Profit was included as a benefit to the family, and foul smells, hygiene, noise, allergies, and others were included as the negative perceptions.

A total of four surveyors who knew the activities of livestock farming were appointed to collect information. The surveyor was imparted training on the procedure to conduct the survey and to improve communication to increase data accuracy. The BYF information was gathered by the appointed surveyor through personal one-to-one interviews with the help of a developed questionnaire. The subjects' native language was used to explain the questions, and their responses were noted in the respondents' native language. The responses provided by respondents were translated into English for data analysis.

Analytical framework

The qualitative responses were encoded into numerical values for ease of analysis. For instance, responses such as "Yes" and "No" were converted to binary values, with "Yes" encoded as 1 and "No" encoded as 0. All respondents' encoded data were compiled into a single Excel sheet. This comprehensive data set served as the basis for subsequent analysis. Frequency distribution analysis was performed. The mean and standard deviation (SD) of the numerical responses were calculated.

Results and Discussion

Demographic information

The demographic and social information of the respondents is given in Table 1. The mean age of the respondents was 43.3 years. The respondents were either marginal or small farmers, with no medium or large farmers. The family size is big, and the mean size of the family is 13. Most of the respondents were female. A large number of respondents were illiterate. None of the respondents had passed higher secondary school examinations or possessed higher qualifications. About 89 per cent of respondents have not undergone any training on livestock rearing. Staal et al. (2009) also reported that almost two-thirds of the world's billion poor livestock keepers are rural women, and women play a major role in livestock development in rural India. A socio-economic survey revealed that most rural women know more about poultry rearing than other livestock as they habitually reared country birds for income in the backyard (Nirmala et al., 2012). More than 50 per cent of the respondents have a family size of more than 10 members. Only 11.11 per cent of respondents have experience of less than 10 years.

Details of livestock

The details of farm size and the source of piglets and chicks received by the respondents in BYF is given in Table 2. About 22.22 per cent of the respondents rear the pigs only, and about 33.33 per cent of respondents rear the poultry only; however, 44.44 per cent rear both the pigs and poultry. The mean number of poultry in the respondents' houses was considerably low. Most respondents obtained their chicks or piglets from natural sources such as in-house breeding, while others got them from government departments and farms and private farms. In pig farming, indigenous breeds and the large white Yorkshire breed were reared. Besides raising their piglets, farmers bought two-month-old piglets from private farms and government departments and farms. Pigs were reared for two main purposes: breeding and meat production. Young boars were reared for 8 to 12 months for self-consumption or sale, and sows were kept for breeding for up to three years. Villagers generally reared white leghorn, kuroiler, and indigenous chicken, known for their disease resistance. From the hatching day, these chickens were reared for egg and meat production. Cocks were sold or consumed on gaining weight around two kilograms. For egg production, hens were kept until they consistently laid eggs.

Pig and poultry houses

Housing details in BYF of the pigs and poultry are shown in Table 3. The pigs were housed in both the ground house and *Chang ghar*. *Chang ghar* is a house on which the floor

Table 1. Demographic and social information of the respondents

Variables	Categories	Number of respondents	Mean (SD)	Percentage
Age, years	Less than 35	20	26.1 (8)	22.22
	36–50	50	43.3 (7)	55.56
	More than 50	20	61.2 (8)	22.22
Gender	Male	30		33.33
	Female	60		66.67
Education	Illiterate	40		44.44
	Primary	30		33.33
	High school	20		22.22
BYF experience, years	Less than10	10	6.3 (3)	11.11
	10 to 20	40	16.4 (3)	44.44
	More than 20	40	32.3 (9)	44.44
Family size	Members less than10	40	6 (4)	44.44
	Members more than10	50	18 (7)	55.56
Size of landholding	Marginal	50		55.56
	Small	40		44.44
Training undertaken	Yes	10		11.11
	No	80		88.89

Table 2. Details of farm size and source of piglets and chicks in BYF

Variables	Criteria		Number of respondents	Mean (SD)	Percentage
Farm size	Pig	Less than 5	10	3 (1)	11.11
		More than 5	10	8 (3)	11.11
	Poultry	Less than 10	20	7 (3)	22.22
		More than 10	10	23 (8)	11.11
	Both	Less than 10	20	5 (4)	22.22
		More than 10	20	16 (5)	22.22
Source of piglets	Natural		31		51.67
	Private farmers		21		35.00
	Government farms		8		13.33
Source of chicks	Natural		65		92.86
	Private farmers		5		7.14

is raised above the ground, as shown in Fig. 1 and 2. *Chang ghar* is similar to the pigsty and coop for housing the pigs and poultry, respectively in BYF. The floor of the pigsty (Fig. 1) was made of bamboo mesh and concrete for 26.67 per cent of respondent and for more than 70 per cent the floor is made of bamboo and wood (Table 3) About 0.6 to 1 m high cement and brick or bamboo mesh walls were provided. There were two types of pigsties for accommodation of the pigs: single (20 %) and group (80 %) (Table 3). The pigsty had half wall, and a half wall was preferred over a full wall. The roof of the pigsty was constructed either with palm leaf or galvanized iron sheet. Patra et al. (2014) also reported that a pigsty roof was made of palm thatch or galvanized iron sheet in northeast India. The mean dimensions of the pigsty were 2.48, 2.50, and 1.48 m in length, breadth, and height, respectively, and the floor of the pigsty was 0.75 m from the ground.

All the respondents informed that night shelter is provided for poultry in *Chang garh*. Tribal people had the

Table 3. Housing details in BYF of the pigs and poultry

Particular	Livestock	Description	Number of respondents	Percentage
Housing material	Pig	Bamboo, wood, and palm thatch	44	73.33
		Brick, cement, and tin	16	26.67
	Poultry	Bamboo, wood, and palm thatch	51	72.86
		Brick, cement, and tin	19	27.14
Pen type	Pig	Single	12	20
		Group	48	80
	Poultry	Group	70	100
Wall	Pig	Half	60	100
	Poultry	Full	70	100

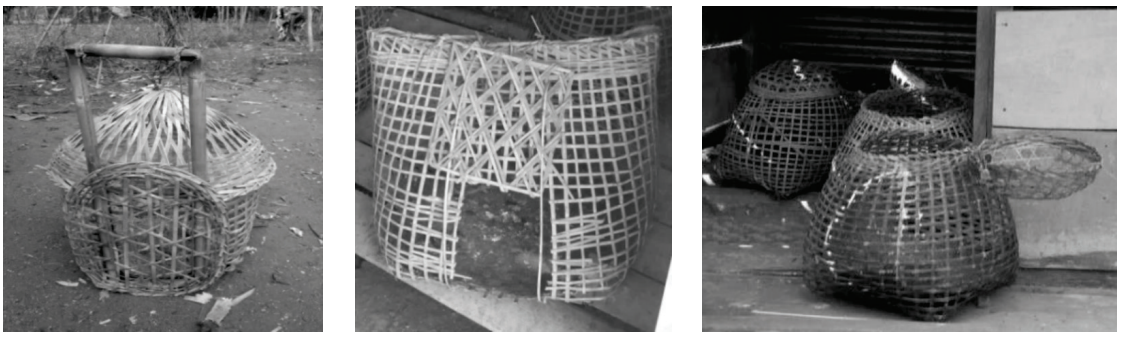
Figure 1: Pigsty

Figure 2: Coops

right to use bamboo and wood from the forest. Forest Policy Resolution declared that the sole object with which the State Forests were to be administered was the public benefit. Concessions and privileges granted regarding fuelwood, timber, grazing, etc., were confined only to villages in and around the periphery of forest areas and only for non-reserved forests (Kulkarni, 1987). Therefore, bamboo and wood were used for the construction of coops. All the coops provided shelter for a group of hens (Table 3), with a full wall to protect them from predators (Fig. 2). All coops provided a full wall as informed by the respondent (Table 3). The coop walls were made of bamboo mesh; however, the roof was made of palm thatch. A few respondents also informed that the roof was made of galvanized iron sheets. Individual hens and cock were accommodated in a basket locally known as *tokri*. The different types of *tokri* used for providing night shelter in three selected districts are shown in Fig. 3. The shape of the *tokri* was different in all the districts. Using *tokri* for shelter to poultry in BYF is a unique practice prevalent in Arunachal Pradesh. The respondents informed that night shelter in the *tokri* reduced fighting among poultry and therefore, decreased injuries of poultry. The use of the *tokri* also helped to accommodate more birds in the coop. Most respondents didn't sell poultry eggs, and almost all the respondents practiced natural incubation to produce chicks to replace the stock. The respondents however consumed eggs. Natural brooding of chicken was done on a basket that was attached to the wall, as shown in Fig. 4. The brooding box materials used in natural incubation included plastic baskets, bamboo baskets, cane baskets, and bamboo racks. The nesting materials inside the brooding box were paddy husk, straw, clothes, dry leaves, maize ears, and sacks. The mean dimensions of the coop were two, 3.36, and 1.93 m in length, breadth, and height, respectively, and the height of the floor from the ground was 1.20 m.

Feeds and management

The feeding practices of the pigs and poultry in BYF are given in Table 4. The respondents informed that two types of feeding systems namely a combination of scavenging and stall-feed and stall-feed only were practiced on the pigs. There was no scavenging system for feeding the pigs. The stall-feed feeding system (86.67 %) was practised considerably more than the combination of scavenging and stall-feed (13.33 %) feeding system. The feed ingredients used for the pigs were kitchen waste, a concentrated mixture of broken rice,



Lohit **Changlang** **Papum Pare**

Figure 3: *Tokri* used for night shelter of chicken

Figure 4: Natural brooding of chicken attached to the wall

rice bran, and maize. Besides this, the respondents also fed tuber crops like Colocasia, tapioca, sweet potato, and many non-conventional grasses and tree leaves either cooked or in raw form. Moanaro et al. (2011) and Patra et al. (2014) also reported these feeding materials to the pigs. Pigs on stall-feed were fed twice daily, i.e. in the morning and evening. However, at the time of birth, the pigs were fed three times every day. The feeding system for the poultry was different than that of the pigs. Only a stall-feeding system did not exist for the poultry. Most respondents (75.71 %) informed that poultry was fed through scavenging only, and a combination of scavenging and stall-feed was fed by 24.28 per cent of respondents. Poultry was released early in the morning for scavenging and was fed once in the evening after returning for shelter in the tokri. The stall feed to the poultry included broken rice, paddy, and kitchen garbage.

Constraints associated with BYF

The constraints associated with the pigs and poultry BYF are reported in Table 5. A total of 66.67 per cent of respondents informed that economic constraints were a major hurdle in the BYF. Lack of capital was a common economic constraint, as reported by 33.33 per cent of respondents. The respondents informed the need for money to buy piglets and chicks, feed materials, and construction and repair of either pigsty or coop; however, owing to monetary constraints, the respondents could not increase the capacity. The respondents informed that the large capacity of pig and poultry farming could increase income. Sinha et al. (2014) reported that an efficient rural credit system is desirable to the farmers. Sharma (2021) reported demand for adequate institutional credit support so that farmers can invest more. One of the best policies by the government is to provide loans so that

Table 4. Feeding practices of the pigs and poultry in BYF

Livestock	Type of feeding	Number of respondents	Percentage
Pig	Scavenging + stall-feed	8	13.33
	Stall-feed	52	86.67
Poultry	Scavenging only	53	75.71
	Scavenging + stall-feed	17	24.28

Table 5. Constraints associated with the pigs and poultry BYF

Constraints	Categories	Number of respondents	Percentage
Economic	Lack of capital	30	33.33
	Sell price fluctuation	10	11.11
	Lack of market	20	22.22
Social and natural problems	Predatory animals	19	21.11
	Outbreak of diseases	69	76.67
	Problem of theft	31	34.44
	Availability of feedstock	50	55.56
Technical	Housing problem	10	11.11
	Lack training facility	10	11.11
	Lower quality of chicks and piglets	30	33.33
	Inadequate parent stock	30	33.33

production and productivity levels can be increased. The lack of a market to sell poultry and the fluctuation in the sales price were informed by 22.22 per cent and 11.11 per cent of the respondents, respectively. The respondents informed that the selling price was lower during the prevalence of the disease in pigs and poultry.

Keeping the pigs and poultry healthy was important for the respondents to get more profit; therefore, spread of disease was the natural constraint in the production of BYF. Outbreaks of diseases affected more than three-quarters of the respondents. Bell (2009) and Njagi et al. (2010) that disease outbreaks were a major obstacle to livestock production in developing countries. The respondent informed that the chicken died due to a lack of veterinary support, and it was difficult to identify the cause of the sickness and death of the chickens. The mortality rate of chickens was very high, and out of 15 chicks, only four to five could survive until adulthood. The most common reason for the high mortality rates in small-scale poultry flocks was an outbreak of viral disease, which is highly infectious among chickens, and virulent strains could cause up to 100 per cent mortality annually (Suarez, 2020). Due to unconfined BYF rearing, disease control was difficult (Aini, 1990). Lack of training on BYF of pigs and poultry could be another reason for the high mortality rate. However, only 11.11 per cent of respondents said a lack of training was a constraint. Knowledge of precautions and cures for poultry diseases could be imparted through training to the BYF farmers. The major constraints faced by the respondents included the non-availability of proper veterinary health care (72.97 %), frequent outbreaks of diseases (46.85 %), the lack of availability of good breeding boar (45.95 %), and the lack of market linkages (45.04 %).

The availability of feedstock in rural areas and the problem of theft were also major constraints. There was no rain in the winter season in Arunachal Pradesh; therefore, many plants slowed down, stopped growing, or died during this season. Thus, locally available feed for BYF became very scarce. Patra et al. (2014) also reported the major constraint faced by the respondents was the high cost of concentrated feed (81.08 %). Lower-quality chicks and piglets and inadequate parent stock were the technical constraints that 33.33 per cent of respondents informed. A lack of quality piglets (60.36 %) was also reported by Patra et al. (2014).

Perception of respondents towards BYF

Positive perception

The positive perceptions of the respondents on BYF of pigs and poultry are summarized in Table 6. The positive perceptions included personal consumption, cultural value, profit, and manure. Over 75 per cent of respondents highlighted that BYF met their dietary requirements for meat and eggs, which are staple foods. Being non-vegetarians, the respondents emphasized the importance of meat products in diversifying and balancing their diet. Livestock products provide essential proteins and nutrients that help diversify and balance diet. Approximately 69 per cent and 59 per cent of the respondents practised BYF of the pigs and poultry, respectively for cultural purposes. Livestock held significant cultural importance, especially in traditional rituals and festivals. Pigs and Mithun were frequently used in ceremonies and as part of marital customs (e.g., as a bride price). Additionally, annual chicken sacrifices were a longstanding tribal tradition for ensuring family prosperity and honouring household deities. Similarly, indigenous chickens, prized for their quality, fetched higher prices than commercial broilers. The selling price of local eggs was Rs. 12 each, and hens were sold at Rs. 350 to Rs. 450 per kilogram. Around 63 per cent of respondents viewed BYF as a source of immediate cash. Selling livestock and their products, such as meat and eggs, provided critical income, especially in rural areas with limited employment

Table 6. Positive perceptions of BYF among the respondents

Livestock	Particulars	Number of respondents	Percentage
Pig	Personal consumption	47	77.78
	Cultural value	40	66.67
	Profit	38	63.33
	Manure	25	42.22
Poultry	Personal consumption	56	80.00
	Cultural value	41	58.57
	Profit	14	20.00

opportunities. Livestock also served as a financial asset that could be liquidated during times of need. For example, piglets were sold after weaning (2 months after birth) at a price of Rs. 2,800 per piglet depending on scarcity and raising piglets costs Rs. 6,000. For meat purposes, the fattening of pigs takes 8 to 12 months to fully grow. Fully grown pigs were sold for Rs. 15,000 to Rs. 50,000, with a profit margin of approximately 50 per cent. Similarly, indigenous chickens, prized for their quality, fetched higher prices than commercial broilers. Islam et al. (2014) and Patel et al. (2014) reported that rural poor households generate cash income by selling poultry and poultry products, which they do not consume. The respondents stated that the poultry BYF was quite efficient. Capital and labour inputs were extremely low, so the production cost per egg or kg of poultry was very small despite low production levels. Indigenous chickens fetch a price two to three times that of commercial broilers. The selling price of local eggs was Rs. 12 each, and hens were sold at Rs. 350 to Rs. 450 per kilogram. Only one-fifth of respondents were rearing poultry for selling purposes. According to nationally representative data from the developing world, 68 per cent of households earn income from livestock (Davis et al., 2007). Livestock is often one of the main assets that rural households possess. Access to, control over, and ownership of assets are critical aspects of well-being (Carter and Barrett, 2006). Assets are stores of wealth that can be sold to finance investments such as school fees or in times of need such as an illness or drought. Assets can act as collateral, facilitate access to credit and financial services, and increase social status. Among respondents who raised pigs, 42.22 per cent recognized manure as a valuable organic fertilizer. While poultry manure was less intentionally collected, it was indirectly beneficial as it spread naturally in scavenging systems. None of the respondents intentionally collect poultry excreta for manure.

Negative perceptions

Respondents also expressed various concerns associated with backyard farming, as summarized in Figure 5. A majority (63 %) identified foul smell as a significant challenge. Around 48 per cent raised hygiene concerns, particularly as pigsties were cleaned weekly, and the wastewater was discharged into nearby water sources. Noise (38 %) and allergies (31 %) were considered lesser concerns. The impacts of livestock on the environment have received considerable attention since the publication of Livestock's Long Shadow study (Steinfeld et al., 2006). However, there was acknowledgment that improper management of manure could lead to water pollution, though it also served as a nutrient source for smallholder crops (Herrero et al., 2013). The perceptions highlighted the dual nature of BYF – while it offers critical economic, nutritional, and cultural benefits, challenges like hygiene, environmental impacts, and labour demands must be addressed to improve sustainability and efficiency.

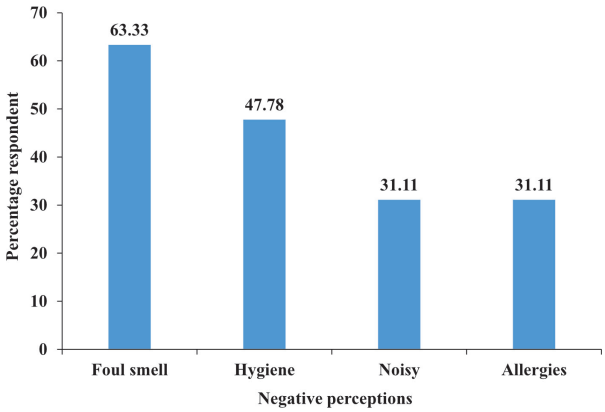


Figure 5. Negative perceptions of BYF among the respondents

Conclusion and Policy Implications

BYF of the pigs and poultry is practised in Arunachal Pradesh mostly by females for multiple purposes. The livestock is reared in *chang ghar* and ground houses which are generally constructed with locally available timber and wood. Individual hens and cock are accommodated in a basket locally known as *tokri,* which is a unique method of rearing poultry in Arunachal Pradesh. Locally available feed is generally used to feed livestock. Around 63 per cent of respondents rear pigs, while 20 per cent raise poultry, primarily for profit. Livestock plays multiple roles in supporting the livelihoods of the respondents, and BYF serves as one of the most significant sources of household

food security and income. The profit in the pigs and poultry BYF is notably high compared to the rearing cost. However, the most common economic challenges include a lack of capital, followed by limited market access and fluctuation in sales prices. The primary concern associated with BYF is the outbreak of diseases in livestock. Approximately 63 per cent of respondents identified foul smell as a challenge for BYF. Around 63 per cent of respondents rear pigs, while 20 per cent raise poultry, primarily for profit.

Livestock productivity in Arunachal Pradesh remains low, creating a significant gap between production and demand, despite government and NGO efforts like training, subsidies, and healthcare facilities. Traditional backyard farming (BYF) practices persist, but policies such as the Arunachal Pradesh Pig Breeding Policy (2018) and the Arun Pig Development Scheme (2019-20) aim to enhance pig genetics, promote scientific rearing, and improve feeding, housing, and marketing mechanisms. Similarly, the Arunachal Pradesh Livestock and Poultry Breeding Policy (2008) focuses on increasing poultry productivity through backyard systems, introducing high-yielding strains like Giriraja and Vanaraja, and developing infrastructure like hatcheries. These initiatives also include plans to diversify into turkey farming for meat, striving for rural economic sustainability and modernized practices.

Livestock and Poultry Breeding Policy - 2008 and Pig Breeding Policy – 2018 were implemented in Arunachal Pradesh, which has increased the involvement of more farmers in BYF. To meet the demand for poultry and pig production the Krishi Vigyan Kendras (KVKs) in Arunachal Pradesh have successfully implemented various activities, such as the implementation of improved crossbreed variety of the pigs in BYF, scaling up backyard poultry farming with breeds such as Kamrupa, Vanaraja, and Kalinga brown, horizontal spread of integrated farming systems involving fish, poultry, and horticulture, promotion of pig upgradation with 75 per cent Hampshire breed, horizontal spread of scientific low-cost pigsty, demonstration of the Vanaraja breed of poultry. The KVKs organised capacity-building programs, provided critical input supplies, and performed extension activities among the farmers on BYF.

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Received: September 03, 2024 Accepted: October 31, 2024