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Technology Adoption in Broiler Farming-A Methodical Study among the Broiler Farmers of Sonitpur District of Assam

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Authors' contributions

This work was carried out in collaboration between both authors. Author MB carried out the survey, performed the statistical analysis, managed the analyses of the study, managed the literature searches and wrote the first draft of the manuscript. Author RAH designed the study and wrote the protocol of the study. Both authors read and approved the final manuscript.

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ABSTRACT

The study undertaken is an attempt to investigate and analyse the level of technology adoption across different size groups of broiler farms in Sonitpur district of Assam during 2011-12. The study was conducted with a sample of 100 numbers of broiler farms using specially designed pre-tested schedules and questionnaires through personal interview with the respondent farmers. Sampling design followed for the study was stratified random sampling design. The results of the study reveal that the entire sample followed scientific rearing and management practices right from housing and feeding to utilization of equipments to medication and vaccination, with some deviation from the recommendations. However, large sized farms were more technology oriented than the small farms. In terms of adoption of recommended stocking density, vaccination, utilization of equipments etc. the level of adoption is satisfactory for the entire sample, while in regard to housing, utilization of litter and lime, feeding and nutrition, large sized farms were close to recommendation than the

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smaller farms. Financial self-sufficiency, education, exposure to the outer world, decision making capacity *etc*. were the factors that determined the level of adoption of recommended technologies by the broiler farmers. Lack of proper training and awareness along with poor financial condition stood as a hinder for the small sized farms in adopting scientific rearing practices while large sized farms with sound financial condition and good awareness adopted scientific rearing practices as per recommendations

Keywords: Technology adoption; broiler farming; stocking density; feeding and nutrition.

1. INTRODUCTION

Poultry today is one of the fastest growing segments of the agricultural sector in India [1,2]. Broilers are the main type of chicken produced by modern integrated poultry raising facilities due to their high feed-meat conversion ratio. Broiler is a type of chicken which is scientifically raised using various technologies for the sole purpose of meat production [3]. Broiler farming has become more popular recently due to increase in the price of other meats, higher profitability, lesser risk involved compared to layer operation due to shorter span of the operation cycle *etc*.[4]. Adoption of technologies generated through various researches assumes paramount importance in reduction of cost of production, mortality, disease intensities, and feed - meat conversion ratio thereby reducing cycle duration, enhancing meat production and ultimately increasing net return [5,6]. The level of technology adoption in broiler farming right from housing to stocking densities to the inputs used play a crucial role and is one of the deciding factor of profitability [7].

Poultry farming forms an integral part of farming system in the state of Assam and plays an increasingly important role in improving socio-economic status of rural community and employment in the state. In spite of being a very lucrative enterprise, commercial scale broiler enterprises in the state are yet to compete with that of the rest of the nation both in number and scale [6]. Even though technology adoption plays a special role in increasing production, productivity and profitability from broiler enterprise, very little is known at the micro level about technology adoption in broiler farming in the state of Assam. Keeping this in view the present study was undertaken to highlight various aspects of technology adoption in broiler farming concerning profitability and economic viability in Sonitpur district of Assam.

2. METHODOLOGY

The study was conducted in Sonitpur district of Assam. The sampling design followed for the study was stratified random sampling design. A list of all the commercial broiler farms in Sonitpur district was prepared and out of the 513 farms, 20 per cent of the farms accounting for approximately 100 in numbers were selected at random for the study. The selected broiler farms were then stratified by cumulative frequency distribution method. The stratification was as follows:

Group I	:	0 - 500 birds
Group II	:	501 – 1500 birds
Group III	:	1501 – 3000 birds
Group IV	:	3001 and above birds

The relevant primary data were collected from the selected broiler farmers of the sample farms with the help of specially designed pre-tested schedules and questionnaires through personal interview with the respondent farmers. Collected data were compiled and tabulated for the purpose of analysis. The data collected pertains to the year 2011-12. In the study, data on technology adoption relate to one production cycle. In case of broiler farms, one production cycle consists of 5 to 6 weeks [6]. In the current study, one production cycle of 6 weeks duration was considered, thereby in a year there were 7 production cycles.

3. RESULTS AND DISCUSSION

3.1 System of Rearing

Two popular systems of rearing broilers are multiple-batch system and ‘all in all out system’. Broiler reared in ‘all in and all out system’ gives superior performance to broilers grown in the batch system [8]. The entire sample followed ‘all in all out system’ of rearing in ideal condition. However, sometimes due to marketing problems, some farmers could not sell the whole lot together as for purchasing a large lot of birds requires large wholesalers. A very few farms have more than one broiler shed and as such they can keep two lots of different age at the same time in two separate broiler sheds.

Keeping birds of different age together in one broiler shed is not scientific as it leads to high disease intensity, high mortality, low weight gain which ultimately leads to low profit [6]. Ithika et al. [9] and Hegde [10] reported that 'all in and all out system' was practiced by 98.66 % 55.56 % of the farms in their respective studies. As far as intensive, semi–intensive and free-range rearing system is concerned; all broiler farms adopted intensive system of rearing. Commercial broilers in South Asian region are reared essentially on deep litter floors [8]. Broilers in the intensive system of rearing in Assam are also basically reared in floor rearing system or deep litter system. In the sample, all the farmers used deep litter system of broiler rearing. Similar observations were also reported by Ithika et al. [9], Hegde [10]. Safalaoh et al. [11] and Rahman et al. [12] also reported higher adoption of deep litter system in their respective studies.

3.2 Housing

Apart from balanced feed, good chick breed and proper health coverage, a successful broiler farmer will need a scientifically appropriate broiler shed for rearing the birds [6]. Broilers need houses to protect them from extremes of climate, theft, predatory animals like cats, dogs etc., to ensure easy and better management; to facilitate automation and to provide ideal, comfortable rearing condition [8]. In the sample (Table 1), 18% of the farms have concrete walled broiler shed with wire netting. The table also reveal that majority of the farms (58%) had bamboo walled broiler shed with wire netting. Ideally, a concrete walled or cement plastered shed is more hygienic and recommended scientifically for broiler rearing [8]. The flooring of the broiler shed should be such as to prevent dampness and to keep away vermins including rats *etc* from burrowing themselves inside the broiler shed. As such the best flooring consists of cement concrete and is recommended over mud floor [6]. In the surveyed sample, 45% per cent of the farms used concrete floor and the rest used mud floor. Concrete floor was mostly observed among the large farmers. These results are in conformity with Hegde [10]. The roof of the shed should give protection to birds with minimum stress under different climatic condition. Different types of materials such as tin, thatch, asbestos etc. can be used as roofing material in broiler shed [8]. However, a costly but satisfactory and durable roofing material is cement asbestos [6,8]. The findings reveal that, majority of the farms (57%) used thatch as roofing material. Hegde [10] in his study found that 25% of the studied farms used thatch roof and only 7.41% used asbestos.

In addition to a scientifically designed shed, a commercial scale broiler farm should have some other provisions related to housing like water channel, foot bath, feed godowns and raised house floor etc [6]. In the sample, 80% of the farms had raised house floor, 32% have the provision of foot bath, 30% of the farms have feed godowns and only 10% have water channel.

3.3 Stocking Density

Overcrowding is not desirable in broiler houses, as it gives rise to heavy mortality due to easy spread of diseases, less intake and excessive dampness of the litter. Similarly if more than adequate floor space is given per bird, there is greater loss of energy in the form of feed intake due to unnecessary movement of the birds for unproductive purposes [6]. Maximum number of broilers that can be reared at a time in one house or room depends upon the age up to which they will be reared or up to how much weight they will be kept. The floor space requirement per broiler depends on their body weight, housing system and climatic condition [8]. A broiler reared for 6 weeks or 42 days of age yield 2.25 to 2.50 kg if managed properly. For a broiler of this weight 0.08 to 0.093 square metre or 0.9 to 1 square foot area is required and considered sufficient [6]. Saikia in his study inferred that birds performed well in the stocking densities of 1 square feet per bird [7]. From Table 2 it was observed that stocking densities of bird in the entire sample was almost within the recommended level, except in group II, where the floor spacing provided per bird was slightly above the recommended level (1.30 square feet per bird). On an average the stocking density adopted by the sample was 1.06 square feet per bird.

3.4 Use of Broiler Chick

Chick is the primary contributing input in broiler farming. For commercial scale broiler farming, day old chicks of high quality hybrid stock should be used [6,8]. Different breeds of broiler chick were found to be used by the sample farmers. Table 3 shows the distribution of broiler farms according to different commercial breeds of broiler chick used. The data reveals that six different commercial breeds namely Cobb-400, Vencobb, Hubbard, Avion–34, Anak–2000 and

Samrat were used by the farmers across different size groups. Cobb–400 was found to be the most widely adopted broiler breed with 57% of the broiler farms using it.

3.5 Feeding and Nutrition

In today's intensive system of broiler rearing, the role of feed is considered very important aspect of broiler production. Since, in this system birds are not allowed to roam outside for feed, thus, all the nutrient ingredients required for them needs to be provided thorough feed [3,8]. In regard to feed source, it was observed that the whole sample of broiler farms surveyed used commercial, company manufactured readymade broiler feed and none used homemade feed prepared by mixing ingredients. Yhome also found out that 96.67% of the respondents in Kohima and 89.17% in Dimapur fed their chickens with commercial feed [13]. Singh et al. [14] and Hegde [10] also revealed that 68.7% and 77.78% of farmers in their respective studies purchased readymade feed. Ithika et al. [9] also revealed that most of the broiler (99.46%) farmers were providing balanced/ readymade feed, providing feed according to age and providing mineral mixture as per scientific recommendation. As far as feeding pattern is concerned the entire sample adopted unrestricted feeding for the broilers and they provide feed for 4 to 5 times a day. Recommendations say that in broiler management, the birds should be fed as much amount as they want. Because, the more they feed, the more will be their growth and so the profitability of the farm and it is better to feed the broilers 4-5 times a day [6,8].

Table 1. Distribution of broiler farms according to the types of broiler shed (number)

Size group	Number of farms	Types of broiler shed			
		Brick/concrete walled with wire netting	Bamboo walled with wire netting	Wooden walled with wire netting	Bamboo walled without wire netting
Group I	25	-	14 (56.00)	2 (8.00)	9 (36.00)
Group II	26	3 (11.54)	17 (65.39)	2 (7.69)	4 (15.39)
Group III	26	7 (26.92)	15 (57.69)	-	4 (15.39)
Group IV	23	8 (34.78)	12 (52.17)	-	3 (13.04)
Pooled	100	18 (18.00)	58 (58.00)	4 (4.00)	20 (20.00)

Figures within parentheses indicate percentage to total farms

Table 2. Stocking density adopted by various size groups of sample farms (Square feet per bird)

Size group	Number of farms	Total number of birds	Average number of birds per farm	Total floor space of the farms (sq. ft.)	Average floor size of one farm (sq. ft.)	Stocking density (sq. ft./bird)
Group I	25	9700	388.00	9117.50	364.70	0.94
Group II	26	28400	1092.31	36912.50	1419.50	1.30
Group III	26	64000	2461.54	68269.50	2625.75	1.07
Group IV	23	125000	5434.78	126286.10	5490.70	1.01
All farms	100	227100	9376.63	240585.60	9900.65	1.06

Table 3. Percentage distribution of broiler farms according to different commercial breeds of broiler chicks used

Size group	Farms using different commercial breeds of broiler (percent)					
	Cobb-400	Vencobb	Hubbard	Avion -34	Anak-2000	Samrat
Group I	44	36	12	16	20	0
Group II	50	61.54	50	0	0	19.23
Group III	69.23	42.31	38.46	26.92	15.38	11.54
Group IV	65.22	52.17	65.22	26.09	30.43	21.74
Pooled	57	48	41	17	16	13

Three different types of feed are used to feed broiler depending upon their age namely Prestarter feed, Starter feed and finisher feed. In the present survey, it was revealed that 86% of the total farms used prestarter feed while 100% used both starter and finisher feed. All the farms in higher size group (Group III and IV) were observed to use Prestarter feed. On an average, feed utilization by the sample in terms of quantity, as worked out is well within the recommended level.

Efficient feed utilization and conversion to meat, wastage reduction, reduction of disease intensity, uniform nutrition of the whole lot, space requirement for feeding and ultimately the profitability of the farm depends, also upon the form of broiler feed, in addition to other parameters [6,8]. For feeding broilers raised in commercial scale three different types of manufactured feed are available with their respective advantages and limitations. They are – mashed feed, pellet feed and crumble feed. Mashed feed has many disadvantages. Crumble feed is the most developed feed among all. Even though, pellet feed cannot be fed to younger chick, it is profitable to use pellet feed than mashed feed after around first week of the birds [6]. The findings show that mashed feed was used by majority of the farms (96%), while pellet feed was used by 58% and crumble feed by 42% of the farms. Pellet and crumble feeds were used by higher proportions of farms in group IV, following an increasing trend along the increasing farm size group. It was found out that pellet form was the most popular form in the sample in terms of amount utilized.

Feed additives are special nutritional supplements other than a basic feed stuff present in feed which are added in the feeds to cover nutritional imbalances [6,8]. Feeds with different kinds of additives and supplements like vitamins, minerals, antibiotics, pellet binders *etc.* were used by the sample surveyed. In the sample all the farms in all groups used feed supplied with vitamins and minerals. While 97% of the farms used antibiotic supplemented feed, probiotics supplemented feed were used by 69% of the farmers, being highest in group IV. In the sample 90% of the farms used coccidiostat supplemented feed and 86% of the total farms used feed with pellet binders as additives.

3.6 Equipments

High quality scientifically designed equipments are unavoidable part of a broiler farm. Depending upon size and age, broiler needs different equipments for their management such as brooder, chick guard, feeder, waterer, sprayer, spade, bucket etc [8]. In floor rearing or deep litter system of broiler rearing, a brooder is used to provide right amount of artificial heat (warmth) to the newly hatched chick for the first few weeks of age of the chicks [6,8]. Five types of brooders namely gas brooder, battery brooder, basket brooder, bukhari's brooder and hover brooder were found to have been used by the sample. Data reveals that hover brooder was the most widely adopted brooder throughout the sample and was used in 74% of the farms. Gas brooder and battery brooder were not widely used by the sample as they were comparatively more expensive. Feeder is used to feed the broilers. Three types of feeders namely chick feeder, grower feeder and adult feeder were used by the sample depending on age of the birds. Numbers of feeders of all types, utilized per hundred birds were more in smaller size groups than the large sized group. This was due to the fact that, larger farms generally used feeders of higher capacity in more judicious and cost effective way. Feeders generally come in two different types: longitudinal feeders and hanging feeders. Longitudinal feeders are used to feed chicks and sometimes grower as well. Hanging feeders are generally useful for adult birds [6]. It was observed that hanging feeder was the most popular feeder in the sample, which accounted for 92.46% of the total feeder utilized. A waterer or watering trough is used to provide water to the birds reared [6,8]. While chick and adult waterer were used by all the farms in the sample, grower waters were used by 83% of the total farms. Pan and jar type waterer were used by all the farms in the sample, while pan and grill type by 87%, bucket and wooden frame type by 17% of the sample farms. Besides brooder, feeder and waterer the sample broiler farmers were found to utilize other equipments like chick guard, forked spade, sprayer, bucket, table fan *etc*. Sprayers and table fans were mostly used by large sized farms.

3.7 Medicine and Health Cover

Rearing broilers in disease free and healthy condition requires a number of medicines, disinfectants and other health cover measures. The life cycle of broilers is only 5 to 6 weeks and thus it needs to be vaccinated against Ranikhet disease, Gumboro disease and Marek's disease. The chicks need to be vaccinated against Marek's disease just after hatching and in general, the chick supplying companies arranges

for such vaccination. Lasota F_1 vaccine is given for the prevention of Ranikhet disease. Gumboro disease is prevented by the application of Gumboro live vaccine [6,8]. From the survey, it was found out that the entire sample used both Lasota F_1 and Gumboro live vaccine. Among all health care measures, proper cleaning and disinfection of the broiler house stands as the most important measure [8]. Disinfectants like Detol, Phenol, Disfect–S, Malathion-50–EC, bleaching powder, detergents *etc.* were found to be utilized by the sample. Apart from vaccines and disinfectants the sample also used vitamins, antibiotics, glucose *etc.* as a part of health care measure. Utilization of medicines and other health care measures were as per recommendations mostly for the large sized farms.

3.8 Utilization of Litter and Lime

In Assam the rearing system followed for broiler is mostly deep litter system [6,16,17]. In commercial scale broiler farming, litter is required to rear the birds comfortably without getting any pressure and related discomfort [6,8,15-17]. The materials commonly used as litter are paddy husks, groundnut hulls, sawdust, wood-shavings, coir pith, chopped straw, bagasse and even sand. The choice of litter material depends mostly on cost and local availability of the material [8,15-17]. Three types of materials namely paddy husk, saw dust and sand were used as litter material throughout the sample, out of which paddy husk was used by the entire sample, whereas saw dust and sand were used by 24 and 4% of the farms respectively. Paddy husk is the most preferred and recommended litter material for broiler raising in Assam condition [16,17]. Rahman et al. reported that 80.7% farmers in his study used deep litter system with saw dust or rice husk [12].

Broiler farmers in general replace litter materials with new and fresh litter periodically in order to get rid of dampness and to provide the birds a clean surrounding [6]. In the sample surveyed all farms replaced litters for 7 to 8 times per cycle (42 days). Average replacement interval of litters in case of chick was 7 days and in case of adults litters were replaced with fresh ones after every 5.75 days. Table 4 shows litter replacement intervals in one cycle across the sample farms. The litters were replaced more frequently in the sample than recommendations, thus amount of litter material required were more affecting cost effectiveness.

Lime is used in broiler farming at a regular interval to prevent the litter from dampening [6]. Among the farm groups, group I was the highest user of lime per bird and group IV was the lowest user. This indicates that the quantity of lime used decreased with the increase in size groups of the farms. This may be attributed to more judicious, cost effective use of resources in large sized farms and operation of economies of scale.

Table 4. Litter replacement interval per cycle followed by various size groups of sample farms (days)

Size group	Average replacement interval of litter (days)	
	Chick	Adult
Group I	7.00	4.50
Group II	6.50	5.00
Group III	6.00	6.50
Group IV	8.50	7.00
All farms	7.00	5.75

3.9 Light and Heat Source

Light and temperature in adequate amount are unavoidable prerequisite for broiler rearing [6,8]. Both as a source of light and warmth, electricity were used most commonly in broiler houses in the sample. In Assam electrically operated brooders are most common. In rural areas, where there is frequent electricity breakdown, it becomes difficult to follow the recommended lighting schedule. Big commercial farms have generators and invertors to compensate such situations. Small farms, devoid of such arrangements generally use kerosene stove, oil lamp, bukhari etc. to provide required warmth and light to the chicks up to 10 days [6]. The findings reveal that the entire sample used electricity as a source of light and heat. In large sized farms electricity consumption was found to be more than the smaller sized groups. This may be because of more utilization of electrically operated equipments like table fan *etc.* Large sized farms have the provision of generators and inverters in the sample, while small ones mostly used oil lamp, stove etc. during electricity breakdown. The duration of time for which broiler shed should be kept illuminated is also one of the important factor in broiler rearing [6,8]. In all the groups, broiler houses were illuminated for 24 hours with artificial light at brooding stage during winter. On an average during summer 22 hours of light was provided during brooding stage and 14 hours during adult stage. Similarly during winter, average 24 hours and 18.50 hours of

artificial light was provided at brooding and adult stage respectively. Hegde [10] also found that a 24 hour lighting programme was followed. However, recommendation say that for the first two days of the chicks, the broiler house should be kept illuminated for entire 24 hours and from third day onwards till the birds are ready to sell, they should kept under light for 23 hours [6,8,18].

4. CONCLUSION

Meat production in broiler farming is governed by appropriate farm management practices through application of required resources at recommended level, time and doses and recommended techniques and practices of scientific rearing. Adoption of recommended technology in broiler farming has a direct relationship with the profitability of the enterprise [18,19]. Unlike other agricultural and allied sectors, broiler farming requires strict scientific management. Improper rearing operation may cause complete ruin of the enterprise. Present study reveal that large sized farms with sound financial condition and good awareness adopted scientific rearing practices as per recommendations while, small sized, economically less sound farms deviated from recommendations in terms of rearing system, housing, utilization of lime and litter, feeding and nutrition *etc.* Lack of proper training and awareness along with poor financial condition stood as a hinder for the small sized farms in adopting scientific rearing practices. Proper emphasis on veterinary, training and extension facilities along with Government incentives could revolutionize this sector of agriculture in the state, which has so far remained a relatively neglected sub sector of agriculture.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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