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PRODUCTION SYSTEM OF SELECTED COMMERCIAL BROILER CHICKEN FARMS IN THE PHILIPPINES

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ABSTRACT

The study implemented a descriptive research design to assess the production system and management practices of selected commercial broiler chicken farms in the Philippines. Among the fifty-five respondents who participated in an online survey, 48 were contract growers while 7 were broiler integrator companies. Results showed that broiler farms were either producing two types of products: lechon manok (liveweight of <1.6 kg) and or big birds (liveweight of >1.7kg). The most commonly used housing was the climate-controlled system with elevated plastic slatted flooring. The majority attained seven harvests per year under the all-in-all-out system. The majority of the respondents were practicing basic biosecurity protocols and have moderate to high familiarity with GAHP. Bird welfare indicators were also being monitored regularly. All the respondents indicated that they have production performance standards set by the integrators. Production targets by the integrators were higher with narrower ranges compared with the targets of the grower farms. Climate-controlled system showed an advantage over the open-sided housing system in terms of better feed conversion ratio and higher broiler performance efficiency index. This study implies that, generally, the production system and management of commercial broiler chickens in the country conform with the standards based on published management guides.

Keywords: animal welfare, broiler farm, chicken industry, GAHP, production system

INTRODUCTION

Broiler is a meat-type poultry species and is considered the cheapest source of animal protein in the human diet. Broiler chicken is a major food resource for Filipinos. In 2019, the per capita consumption of broiler chicken is 13.83 kg. As of April 2020, the total chicken inventory in the Philippines was 185M birds, 33% of which were broiler-type with commercial farms concentrated in Central Luzon, CALABARZON, and Northern Mindanao (PSA, 2020).

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The Philippine broiler industry is a widely diverse system that consists of a few large integrated and many independent small enterprises. According to The Broiler Production Committee (2006), (as cited in NAST, 2005) medium-scale farmers, who rely largely on major integrated livestock enterprises for breeding supplies and stock, sit at the center of these operations (The Broiler Production Committee, 2006). There are two types of broiler farms in the country. The first type are farms producing lechon manok birds weighing at most 1.6 kg live weight with the rotisseries as the major market outlet. The second type are the broiler farms producing heavier birds with liveweight of at least 1.7kg supplying dressed chicken in wet markets and fast-food chains. Given the diversity of the broilers growers in the country, different production systems and management are being employed by the broiler raisers.

Boosted by rising incomes, particularly of the middle class and increasing demand in food service and retail outlets, the Philippine broiler sector has surged over the past decade and is expected to continue in the coming years. The covid-19 pandemic and recent outbreak of African swine fever greatly accelerated the transition from pork to poultry meat consumption of Filipinos. These have put great pressure on the broiler sector to meet the very high demand for animal protein. This is in addition to the continuous threat of Avian Influenza (bird flu) in the country. With these, information about the production system of the commercial broiler production will provide relevant information for the policymakers, broiler producers, and industry associations to revisit the broiler production/marketing system and existing guidelines on good animal husbandry and make necessary adjustments toward a more sustainable, profitable, and competitive industry. Moreover, these information are very valuable in crafting the industry roadmap. Compliance with animal welfare within the production sites and food safety standards along the supply value chain is a prerequisite when harnessing industry potential for the domestic and export markets. Documented information about the production system, management practices implemented, and production targets of the commercial broiler chicken farms in the country is very limited, hence this study.

MATERIALS AND METHODS

The study primarily used a descriptive research design in assessing the production system of commercial broiler chicken in selected farms in the Philippines. Technical persons handling the contract growing division of major broiler integrator companies and independent/organized broiler raisers were the major respondents selected thru purposive sampling. The respondents for this study represented all the major administrative regions in the Philippines. Structured questionnaires for each targeted group of respondents were formulated covering information, such as housing and production systems, general management practices, biosecurity measures and performance targets. The survey questionnaires were pre-tested prior to dissemination thru online platforms (i.e., email and Google form). Virtual meetings and phone interviews with stakeholders from government and private companies, particularly the industry association and decision-makers involved in broiler production, were also done. Informed consent was obtained from all respondents. Data collected were analyzed using descriptive statistics (mean and standard deviation, frequency counts, and percentages). Test of association among selected variables was done using chi-square test ($P<0.05$).

RESULTS AND DISCUSSION

The Philippine broiler industry is dominated mostly by a few large integrator companies that have contract growing operations and independent growers. In this study, a total of 55 individuals served as survey respondents: 48 were contract growers while 7 were considered integrator companies. For both respondent sets, a large number identified their farms located in regions 4A-CALABARZON (20), 8-Eastern Visayas (7), 9-Zamboanga Peninsula (7), 12-SOCCSKARGEN (3), 3-Central Luzon (2), and 5-Bicol (2).

The two types of poultry housing system employed by poultry growers in the country are conventional housing and climate-controlled system (CCS). Conventional housing system has open sides and usually with elevated flooring with monitor-type roofing to ensure better ventilation inside houses. On the other hand, CCS is a closed housing with exhaust fans and evaporative cooling pads to maintain a microclimate to meet the bird's optimum requirements. Conventional housing system has been adjudged to be a good method of housing in tropical countries like in the Philippines because of its simplicity, cost, and ease of management; however, there is an increasing number of poultry raisers using CCS (Oloyo and Ojerinde, 2018). Increased production efficiency has been noted when modern broiler housing with better environmental control is implemented (Liang *et al*., 2013), such that, most of the commercial poultry integrators now require their contract growers to use CCS. It is noteworthy that out of the 48 grower farm respondents, 30 have a CCS, 16 have conventional housing system, and 2 respondents have both. The type of housing system used is a major factor in the type of management employed in the poultry farm. The production system for CCS and conventional housing systems are shown in Tables 1 and 2, respectively.

Flock sizes of the farm using CCS housing system have 20,000 to 50,000 birds (36.67%) followed by 50,001 to 80,000 birds (26.67%), while operations with 110,001 to 140,000 and with more than 140,001 birds both accounts for only 10%. Based on the classification of PSA, broiler farms under this type of housing system can be categorized as medium to large-scale broiler operators. Given these flock sizes, 33.33% of the respondents reported that the average population per house ranges from 30,000 to 40,000 and 40,000 to 50,000 birds. The reported average flock sizes are consistent with the minimum volume requirement of integrator companies which is 36,000 birds per building (SMFI, 2017).

More than half of the respondents (53.33%) have one laborer for 10,000 to 15,000 birds. Since these houses were equipped with fully automated drinking and feeding systems, as also reported in this study, fewer laborers are required. This agrees with the observation of Verma *et al*. (2014) that two flock men are required to manage a flock with 35,000 birds. Moreover, a higher number of harvests per year or the number of batches of birds grown per year is expected to be higher for CCS. Around 60% of the respondents reported that they have 7 harvests per year and 30% have 6 harvests annually. For most broiler farms in the country, broilers were harvested 6 to 12 times per year (Tanquilut *et al*., 2020). With the current genetic potential of the birds and with the improved production system, the target harvest per year is 8, given the assumption of 30 days growing period and 14 days downtime period. In this study, 3.33% reported that they can attain this target.

Most of the farms use an all-in/all-out system (76.67%) wherein the farm will only have one batch of broilers grown at any given time. This type of practice is implemented to minimize and control disease outbreaks on the farm. About 13% of the respondents use multiple batch system in which at any given time, the farm is rearing birds of different ages.

Table 1. Production system under climate-controlled housing system (CCS).

Criteria	Frequency (n=30)	Percentage, %
Current Farm Population, number of birds		
20,000-50,000	11	36.67
50,001-80,000	8	26.67
80,001-110,000	5	16.67
110,001-140,000	3	10.00
140,001 and above	3	10.00
Ave Population per House, number of birds		
20,000-30,000	8	26.67
30,001- 40,000	10	33.33
40,001- 50,000	10	33.33
50,001 and above	2	6.67
Labor to broiler ratio		
1:10,000 and below	8	26.67
1:10,001-15,000	16	53.33
1:15,001-20,000	5	16.67
1:20,001 and above	1	3.33
Number of cropping per year		
6	9	30.00
7	19	63.33
8	1	3.33
No answer	1	3.33
System of Broiler Raising		
All in All Out	23	76.67
Multiple Ages	4	13.33
Both	3	10.00
Feeding System		
Manual	1	3.33
Automatic	29	96.67
Drinking System		
Manual	0	0.00
Automatic	30	100.00
Type of Flooring		
Elevated Plastic Slats	26	86.67
Litter Flooring (Rice Hulls)	4	13.33

Table 2. Production system under conventional housing system.

Criteria	Frequency (n=16)	Percentage, %
Current Farm Population, number of birds		
5,000 and below	1	6.25
5,001-15,000	6	37.50
15,001-25,000	3	18.75
25,001-35,000	2	12.50
35,001-45,000	0	0.00
45,001-55,000	0	0.00
55,000 and above	4	25.00
Ave Population per House, number of birds		
1,000-5,000	5	31.25
5,001-10,000	8	50.00
10,001-15,000	3	18.75
Labor to broiler ratio		
1:3000 and below	4	25.00
1:3001-4000	2	12.50
1:4001-5000	8	50.00
1:5001-6000	1	6.25
1:6000 and above	1	6.25
Number of cropping per year		
5	1	6.25
6	7	43.75
7	7	43.75
8	1	6.25
System of Broiler Raising		
All in All Out	12	75.00
Multiple Ages	0	0.00
Both	4	25.00
Feeding System		
Manual	15	93.75
Automatic	1	6.25
Drinking System		
Manual	15	93.75
Automatic	1	6.25
Type of Flooring		
Elevated Plastic Slats	2	12.50
Litter Flooring (Rice Hulls)	11	68.75
Slatted Bamboo	2	12.50
Combination	1	6.25

Broiler farmers who want to provide a steady and continuous supply of mature broiler weekly adopt this system (FAO, 2003).

A majority (86.67%) of the floor type in CCS poultry houses uses elevated-floor type, and plastic slats were commonly used as the flooring material. A small number use litter flooring with rice hulls as litter material. Rice hulls have been identified as an appropriate litter material for poultry houses (Garcês *et al*., 2013).

Table 2 shows the production system of broiler farms using a conventional housing system. Smaller flock sizes can be observed for farms using the conventional housing system. Majority of the respondents (37.50%) have 5,001 to 15,000 birds per farm, followed by 15,001 to 25,000 (18.75%) birds per farm. This housing system is predominantly used by small to medium-scale poultry raisers as this type requires lower cost compared to CCS. The average population per house in this housing system is 5,001 to 10,000 birds (50%) followed by 1,000 to 5,000 (31.25%).

It is expected that higher labor is required for conventional housing system since the majority (93.75%) of the farms reported to have manual feeder and drinker system. It is worth noting that 50% of the respondents reported that every laborer is assigned to 4000 to 5000 birds. This is also in agreement with the observation of Verma *et al*. (2014) that six to seven flock men are required to manage a 35,000-bird capacity facility. It can also be noted that the harvest per year under conventional housing system is at par with CCS. More than 80% of the respondents can attain 6-7 harvests per year. This can be attributed to the number of birds grown and the number of labor allotted per house. Given this labor-to-broiler ratio, the flock men can effectively manage the birds.

Broilers marketed in the Philippines are either "big bird" with an average liveweight of at least 1.7 kg supplying dressed chickens in wet markets and supermarkets or "lechon manok" with a maximum liveweight of 1.6 kg with rotisseries as the major market. (Inciong, personal communication, September 29, 2020). Among the 48 contract growers surveyed, 28 were producing "lechon manok", 8 for the "big bird" market and 12 farms were producing both. The management practices based on the broiler produced are presented in Table 3.

The majority of the lechon manok-producing farms (82.1%) and all the big bird farms do not measure ammonia levels. Ammonia in a poultry house is produced by the breakdown of uric acid by bacteria in the bird's manure. This gas if not maintained at its allowable concentration can affect the performance of the birds negatively (Lambio, 2010). Ammonia over 25mg/kg, according to Xing *et al*. (2016), could decline carcass traits such as decreased breast and thigh yield percentage. Excessive ammonia exposure can also trigger immunological alterations in broiler upper respiratory and intestinal systems (Zhou *et al*., 2020). However, on-farm, some experienced flock men can use practical guides and or observe the behavior of the birds to determine the ammonia concentration. Prolonged exposure to high levels of atmospheric ammonia can cause irritation, conjunctivitis, swelling and reddening of the eyelids. And thus, control measures can still be implemented despite the ammonia concentration not being measured especially if the abovementioned clinical signs were observed. In managing ammonia levels on-farm, provision of right ventilation and temperature, litter management and dietary management and the addition of phytogenic additives are the most common control measures for the reduction of ammonia in poultry houses (Sheikh *et al*., 2018).

The majority of the farms do not measure light intensity inside poultry houses. On

Table 3. Management practices of broiler farms categorize based on type of broiler produced.

Management Practices		Type of broiler produced			*P*-value
		Lechon (n=28)	Big bird (n=8)	Both (n=12)	
Ammonia Measurement	Yes	2 (7.1%)	-	2 (16.7%)	0.09
	No	23 (82.1%)	8 (100%)	6 (50%)	
	Sometimes	3 (10.7%)	-	4 (33.3%)	
Light Intensity Measurement	Yes	10 (35.7%)	3 (37.5%)	5 (41.7%)	0.82
	No	14 (50%)	5 (62.5%)	6 (50%)	
	Sometimes	4 (14.3%)	-	1 (8.3%)	
Vehicle Disinfection	Yes	28 (100%)	8 (100%)	12(100%)	0.72
Cleaning and disinfection	Yes	28 (100%)	8 (100%)	12(100%)	
Average downtime period, days		17.28	16.29	19.77	
Fly Control Program	Yes	27 (85.7%)	6 (75%)	7 (58.3%)	0.39
	No	-	-	1 (8.3%)	
	Sometimes	4 (14.3%)	2 (25%)	4 (33.3%)	
Rodent Control Program	Yes	24 (85.7%)	6 (75%)	7 (58.3%)	0.25
	No	-	-	1 (8.3%)	
	Sometimes	4 (14.35)	2 (25%)	3 (33.3%)	
Bird welfare indicators[1]	Plumage quality	9 (32.1%)	1 (12.5%)	3 (25%)	0.25
	Hock burn	7 (25%)	2 (25%)	1 (8.3%)	
	Foot pad dermatitis	12 (41.9%)	2 (25%)	1 (8.3%)	
	Breast blisters	7 (25%)	3(37.5%)	2(16.7%)	
	Gait	8 (28.6%)	2 (25%)	1 (8.3%)	
	Others	4 (14.3%)	2 (25%)	2 (16.7%)	
	Do not measure	12 (41.9%)	1(12.5%)	7 (58.3%)	

[1]Multiple responses

a commercial scale, low light intensity may somehow have negative effects on bird welfare or quality of production. Light intensity does not have a significant effect on broiler production and mortality but has an effect on carcass characteristics (Deep *et al*., 2010). Farms also monitor bird welfare using indicators such as the presence of foot pad dermatitis, plumage quality, gait score, breast blisters, and hock burns. A number (41.9%) of the lechon manok-producing farms and 12.5% of the big bird-producing farms do not measure bird

welfare. With the increasing concerns of the consumers for the welfare of the animals raised, implementation of these management practices should be improved. All farms practice basic biosecurity measures such as vehicle disinfection and cleaning programs. This is in agreement with the study conducted by Tanquilut *et al*. (2020) that 90% of broilers farms practice cleaning and disinfection. These management practices are implemented to reduce the entry and transmission of disease-causing organisms on farms. Thorough cleaning and disinfection ensure proper growth and development of broilers by reducing the accumulated load of disease-producing organisms (Prabakaran, 2003). Lechon manok-producing farms have a higher downtime period (17.28 days) than big bird-producing farms (16.29 days). The downtime period from the farms falls in the recommended range of 10 to 14 days after a batch of birds is reared and sold and disinfection is done on the pens (Prabakaran, 2003).

Fly infestation is one of the common problems in poultry enterprise. Rodents are also a concern in poultry farms as they can damage building facilities and contaminate poultry feeds. With that, it can be noted that the majority of the respondents have rodent and fly control programs. Effective fly control can help prevent the incidence of chicken-borne campylobacteriosis, which is a severe gastroenteric human disease (Hald *et al*., 2007). Additionally, good rodent management can prevent extensive harm such as food contamination, structural damage, productivity loss, and disease and ectoparasite spread (Villafañe *et al*., 2009).

Production targets for broiler farm operations are set to check the profitability of the business enterprise. All the respondents indicated that they have production performance standards with 94% of the growers' targets given by the integrator companies. The type of housing is the most common basis of integrators for setting their targets, together with strain, market demand, and season of the year (Figure 1). It can be seen from Table 4 that the production targets by the integrator companies were higher with narrower ranges compared with the targets of the growers. For example, the age at harvest for big birds (>1.7 kg) set by the integrators is between 30 to 35 days, while for growers it is longer by three days. Moreover, some growers tend to raise broilers for lechon market nine to ten days longer than what the integrators have set. The same trends can be observed for other production parameters. Although UBRA does not normally set targets for its members, the values given by the authorized representative fell within the targets enumerated by most of the broiler integrators.

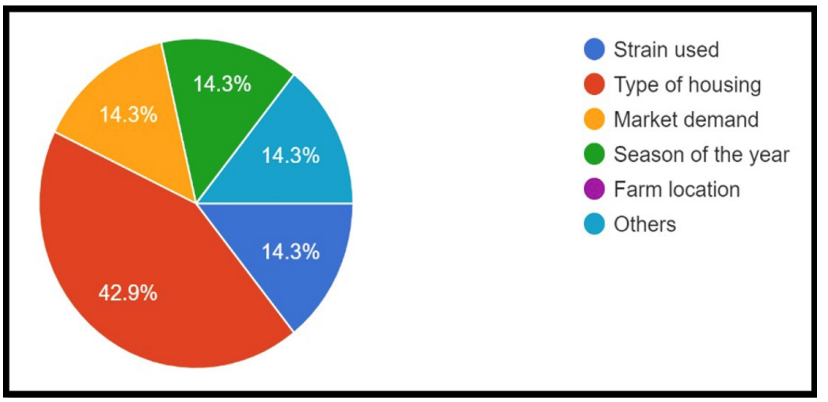

Figure 1. Bases of integrators for setting production performance standards.

Table 4. Broiler production performance targets of the integrators, growers, and industry association.

Variable	Integrators (n=7)		Growers (n=48)		UBRA (n=1)	
	Big bird[1]	Lechon manok[2]	Big bird[1]	Lechon manok[2]	Big bird[1]	Lechon manok[2]
Age at harvest (in days)	30-35	28-29	30-39	28-38	30	28
Flock uniformity (%)	80-99	75-99	80-98	75-96	90	90
Feed conversion ratio	1.40-1.65	1.45-1.60	1.48-1.83	1.37-2.00	1.4-1.5	1.4-1.5
Livability (%)	92-97	95-98	92-98	85-98	97	97
BPEI[3]	250-380	250-360	300-375	230-375	380	380

[1]Big bird are live broilers with live weight of ≥1.7kg.
[2]Lechon manok are live broilers with live weight of 1.6kg.
[3]Broiler Performance Efficiency Index = (live weight, in kg x livability, %) / (Age at harvest, in days x FCR) x100

Moreover, Table 5 shows that the climate-controlled housing system has an advantage over the open-sided housing system in terms of better feed conversion ratio and higher broiler performance efficiency index.

The discrepancy in the differences between the target production performance is further supported by the results in Figures 2 and 3. While a majority of the integrator-respondents have 51 to 80% of their company-owned and contract growing farms attaining the targets, about 17% of them indicated that there were only 31 to 50% of contract growers who met the target set. The result can be validated with the data from the growers with the majority indicating that they can meet the performance targets most of the time, while 33% indicated meeting the targets sometimes or not at all (Table 6). Based on the data, the type of housing does not influence the degree of attaining the targets. This may be because the type of housing is one of the bases used by integrator companies in setting flock performance. According to the growers, there were several factors affecting their production including among others the poor quality of chicks delivered to the farm, extreme weather conditions, disease outbreaks, and disruption of farm schedules particularly delay in the delivery of production inputs and harvest due to restricted movements.

Comparing the technical performance parameters specifically the average liveweight (kg) of broilers in the Philippines against those major broiler producers in the world market, it can be observed that the target for average liveweight is lower, 1.6 to 1.7 kg compared to 2.1 to 2.5 kg of other countries (Tandoğan and Çiçek, 2016). This can be attributed to the preference of Filipino consumers for smaller carcasses (Chang, 2007). But in terms of livability, we are at par with other countries.

Table 7 shows that generally, the respondents (i.e., integrators, growers, and industry associations) agreed that broiler production must follow the minimum standards set in the guidelines for Good Animal Husbandry Practices in the Philippines. They also approved the idea that not just profitability, but bird welfare, biosecurity and food safety must be

Table 5. Broiler production performance targets of growers based on type of housing.

Variable	Big bird[1]		Lechon manok[2]	
	Open-sided	CCS	Open-sided	CCS
Age at harvest (in days)	30-34	30-39	28-38	26-35
Flock uniformity (%)	80-98	80-96	80-95	75-96
Feed conversion ratio	1.50-1.83	1.48-1.70	1.50-2.00	1.37-1.70
Livability (%)	94-95	92-98	93-96	85-98
BPEI3	320	315-375	230-300	300-375

[1]Big bird are live broilers with live weight of 1.7kg and above.
[2]Lechon manok are live broilers with live weight of 1.6kg.
[3]Broiler Performance Efficiency Index = (live weight, in kg x livability, %) / (Age at harvest, in days x FCR) x100

Table 6. Percentage of growers attaining the production targets based on type of housing.

Type of Housing	Percentage of growers attaining the production targets				
	All the time	Most of the time	Sometimes	Not at all	Total
Open-sided (n=16)	6%	63%	31%	0%	38%
Climate-controlled system (n=30)	0%	65%	31%	4%	62%
Total	2%	64%	31%	2%	100%

Table 7. Perceptions of broiler producers on good animal husbandry practices and promotion of animal welfare.

	Integrator (n=7)	Grower (n=48)	UBRA
Broiler production must follow the Code of Good Animal Husbandry Practices for Poultry.	4.71	4.31	5.00
Management practices for broilers must always consider the welfare of the birds.	4.43	4.42	5.00
Stricter measures of biosecurity must be in place in any broiler farm.	4.86	4.58	5.00
Broiler production must always consider food safety.	5.00	4.63	5.00
There should be a right balance between profitability and bird welfare.	4.57	4.35	5.00

1-Strongly disagree; 2-Slightly disagree; 3-Neither agree nor disagree;4-Slightly agree; 5-Strongly agree

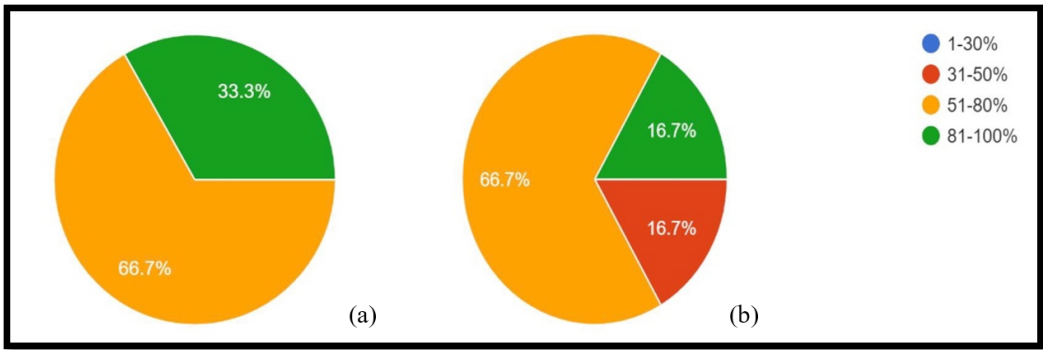

Figure 2. Percentage of company-owned broiler farms (a) and contract growers (b) attaining the production targets at any given time.

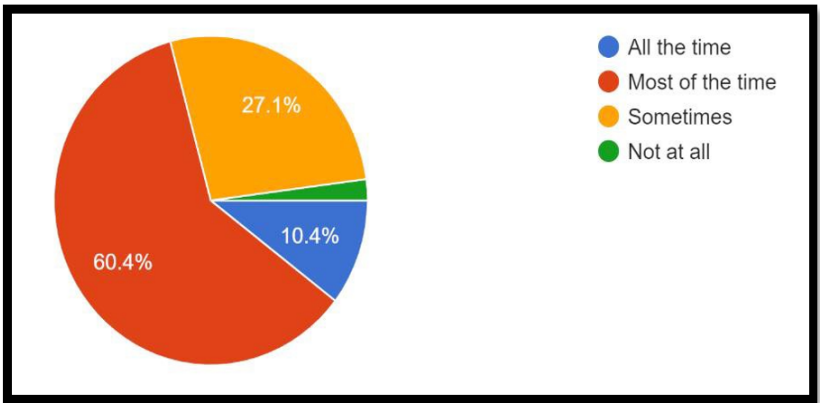

Figure 3. Frequency of attaining the production targets by the growers at any given time.

considered in broiler production and management. This implies that these concepts are already integrated in the system and it would be easier to convince broiler farmers to comply with animal welfare and GAHP accreditations should the integrator companies, industry associations, and government agencies target their 100% compliance.

This study showed that the most commonly used housing system was the climate-controlled system. Differences in the average farm and house population, labor to broiler ratio, and feeding and drinking system were the observed differences between the two housing systems. The majority of the respondents were practicing basic biosecurity protocols and have moderate to high familiarity with GAHP. Bird welfare indicators were also being monitored regularly. Production targets by the integrators were higher with narrower ranges compared with the targets of grower farms. Climate-controlled system showed an advantage over the open-sided housing system in terms of better feed conversion ratio and higher broiler performance efficiency index. This study shows that the production system and management practices of the commercial broiler farms in the country conform with the standard. This preliminary study on the production system of commercial broiler farms in the Philippines provided a situational assessment of the Philippine broiler industry that can help the industry players to set targets and strategize toward to more competitive, profitable and sustainable broiler industry. For future studies, face-to-face interviews and data gathering with a larger number of participants should be conducted.

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