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











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# The Productivity of Non-AGP Broiler Small-Holder Businesses Based on Production, Economy and Social Demography

Bambang Rijanto Japutra, Ismoyowati\* and Novie Andri Setianto

Faculty of Animal Science, University of Jenderal Soedirman, Purwokerto, Indonesia

\*Corresponding author email: ismoyowati@unsoed.ac.id

**Abstract.** The study investigated the productivity of smallholder broiler farming with and without AGP to identify the difference between the utilization and absence of antibiotic growth promoter (AGP) incorporated into the broiler feed based on production (feed efficiency and cumulative performance index), economy (farming capacity and income), and socio-demography (farmers' education background, age, farming experience, and farming motivation) in Central Java Province. The study was conducted through a survey of broiler farmers in one partnership company. The data analysis included analysis of variance based on a stratified GLM (general linear model) and correlation analysis. The result did not identify significant differences in the production aspects in either AGP or non-AGP farming, among different regencies, and farm size. In 2018, when farms stop using the AGP, the farm production is better than in 2017 when the AGP was used. Based on the economic aspect, the AGP and non-AGP administration did not affect farming capacity and income. The socio-demographic aspect showed that education significantly affected the success of broiler farming, while farmers' age, farming experience, and farming motivation did not affect the production of broiler farming. The result of correlation analysis showed that education background contributed to feeding efficiency and cumulative performance index. The conclusions are (1) broilers fed with either AGP or non-AGP containing feed showed relatively similar performance, (2) the government policy on the prohibition of AGP does not contribute to the decrease of farmers' income and (3) the demographic aspect affecting the success of the broiler farming business is the farmers' education level.

**Keywords:** broilers, AGP, production aspect, farmers' education background

**Abstrak.** Penelitian mengkaji produktivitas usaha ayam broiler menggunakan AGP dan tanpa AGP bertujuan untuk mengetahui perbedaan antara penggunaan dan peniadaan antibiotic growth promoter (AGP) dalam pakan ayam broiler berdasarkan aspek produksi (efisiensi pakan dan indeks performa kumulatif), aspek ekonomi (kapasitas usaha dan pendapatan) dan aspek sosial demografi (pendidikan peternak, umur peternak, lama beternak dan motivasi beternak) di wilayah Provinsi Jawa Tengah. Penelitian ini dilakukan dengan metode survey terhadap peternak ayam broiler yang bergabung di satu perusahaan kemitraan. Analisis data terdiri atas analisis variansi berdasarkan GLM (general linier model) secara bertingkat dan analisis korelasi. Hasil penelitian menunjukkan tidak terdapat perbedaan yang nyata pada aspek produksi berdasarkan pemberian AGP dan tanpa AGP, kabupaten dan skala usaha yang berbeda. Produksi ayam broiler lebih baik dengan peniadaan AGP (tahun 2018) dibandingkan menggunakan AGP (tahun 2017). Berdasarkan aspek ekonomi penggunaan dan peniadaan AGP tidak berpengaruh terhadap kapasitas dan pendapatan usaha. Berdasarkan aspek sosial demografi bahwa pendidikan berpengaruh nyata terhadap keberhasilan usaha ayam broiler, sedangkan faktor umur peternak, lama beternak dan motivasi beternak tidak berpengaruh terhadap hasil produksi usaha peternakan ayam broiler. Hasil analisis korelasi menunjukkan faktor pendidikan berpengaruh terhadap efisiensi pakan dan indeks performa kumulatif. Kesimpulan penelitian ini adalah (1) penggunaan AGP atau non-AGP tidak menghasilkan performa yang berbeda, (2) penghentian penggunaan AGP oleh pemerintah tidak menurunkan pendapatan peternak dan (3) faktor demografik terpenting dalam usaha peternakan ayam broiler adalah tingkat pendidikan peternak.

**Kata kunci:** ayam broiler, AGP, aspek produksi, pendidikan peternak

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## Introduction

Broiler chicken dominates the population of poultry. In line with the human population growth in Indonesia, the broiler population has also increased (BPS, 2020). The increased

human population exerts a heavy strain on the demand-supply ratio of proteins, which leads to the need for improvement in animal protein supply. Therefore, broiler farming has a significant role in protein supply and the

potential to be improved. Compared to other livestock commodities, broilers have a faster growth rate. Broiler farming is among the most efficient businesses to produce high-nutrition food, and broilers play a vital role in fulfilling the demand for animal-based food.

The most contributing factor to the accelerated growth of broilers is feeding management because feed is the key factor to the success of farming. Exactly 70% of the total production cost in farming is for feed (Wardhana, 2016). Also, feed is a crucial element to promote health, growth, and energy production and supply to ensure seamless livestock metabolism.

Broilers generally consume factory-made, commercial feed that contains additives to accelerate meat growth, such as Antibiotic Growth Promotor (AGP). AGP is offered to eliminate harmful bacteria in the digestive tracts so that the body weight and feed conversion ratio are optimum (Cervantes, 2012). The administration of AGP in feed could eliminate or inhibit the growth of pathogenic bacteria in the intestines to optimize nutrient absorption (Sinurat et al., 2017). However, AGP trace in feed triggers bacterial resistance against antibiotics and potentially infects humans through the food chain from livestock. The government released an official prohibition of antibiotics as additives in January 2018 that negatively affected livestock productivity because the farmers were accustomed to using excessive AGP in the feed (Pramu et al., 2019). Today, the regulation is not fully effective, and AGP remains popular among farmers, and the feed industry has a significant effect on the success of broiler farming (Sinurat et al., 2017).

The contributing factors to the success of broiler farming include production, economy, and socio-demography. The production includes cumulative performance index (CPI) and feeds efficiency factors. The economic factor consists

of the farmer's income and farming capacity, while the socio-demographic factors are the farmer's educational background, age, farming experience, and farming motivation. Therefore, it was imperative to investigate these aspects to identify the difference between AGP and non-AGP administered broiler farming so that the farmers could avoid loss. Further investigations are required to determine the effect of eliminating Antibiotic Growth Promotor (AGP) in broiler farming.

## Materials and Methods

The study was conducted by a survey of broiler farmers who joined a partnership company in four regencies of Central Java Province, namely Banyumas, Pemalang, Temanggung, and Banjarnegara. The observation and data collection took place between August 2017 and December 2017 on the production aspect of broiler offered with AGP-administered feed, and between February 2018 and June 2018 on non-AGP feed broilers. The samples were taken using a stratified random sampling of farming scale category, namely category 1 (< 3000 broilers), and category 2 (> 3000 broilers), each contained 10% of the total sample of farmers in each regency. Therefore, of the total 148 farmers, 42 were in Banyumas, 27 in Banjarnegara, 27 in Temanggung, and 52 in Pemalang (Table 1).

The measured variables included production (feed efficiency and cumulative performance index), economic aspect (business capacity and income), and socio-demographic aspects (farmers' motivation, farmers' education, farming experience, and farmers' age). The operational definition used in the present study was as follows:

Feed efficiency is the ratio of body weight gain to feed intake, calculated with the formula:

$$\text{Feed efficiency} = \frac{\text{Carcass weight (kg)}}{\text{Total feed offered (kg)}} \times 100\%$$

Table 1. Total samples of broiler farmers in Banyumas, Banjarnegara, Temanggung, and Pemalang Regency

Regency	Business capacity		Total
	< 3000 broilers	> 3000 broilers	
Banyumas	21	21	42
Banjarnegara	13	14	27
Temanggung	14	13	27
Pemalang	26	26	52

- 1) Cumulative Performance Index (CPI) is a success parameter of broiler farming in a formula below:

$$CPI = \frac{(V \times BWGR)}{FCR \times HAR} \times 100$$

Note:

- V = Viability  
BWGR = Body weight gain Rate  
FCR = Feed Conversion Ratio  
HAR = Harvest Average Rate

- 2) Farming motivation is the goal of running a business because it is the initial step for business planning to gain an optimum income. There are two business goals for farmers, *namely the* main business or side business
- 3) Education is the level of formal education of the farmers expressed in years and divided into three categories: a) Primary Education (SD/MI/SMP/MTS), b) Secondary Education (SMA/MA/SMK), and c) Higher Education (Associate degree, Undergraduate, Master's, Specialist, and Doctorate) held by a higher education institution.
- 4) Farming experience *is* acquiring *farming* knowledge, *skills and capacity to manage the farming business*. The longer the farming experience (year), the better the farming achievement. Farming time is a period for an individual to manage the livestock (year).
- 5) Farmers' age is the age when the farmers start *venturing into smallholder broiler farming*. Farmers' age is divided into three categories: a) under 30 years old, b) 30 – 40 years old, and c) above 40 years old.

The data was analyzed using analysis of variance (ANOVA) and correlation analysis based on a stratified GLM (*general linear model*) with two periods of time, namely August 2017 – December 2017 (feed with AGP) and February 2018 – June 2018 (non-AGP feed). The subgroups were four regencies, namely, Banyumas, Pemalang, Temanggung, and banjarnegara. The number of farmers in each regency was utilized as the replications. The correlation analysis was used to identify the correlation between farmers' socio-demography and broilers' feed efficiency ratio and CPI.

## Results and Discussion

### Production Aspect

The production aspect in this study consisted of the feed efficiency ratio and cumulative performance index. Feed efficiency is the ratio of body weight gain to the total feed intake, while the cumulative performance index is the success parameter of broiler productivity. The average feed efficiency and cumulative performance index are presented in Table 2.

### Feed Efficiency

The use of antibiotics in the livestock industry is aimed at livestock medication to reduce mortality and rejuvenate livestock health; however, many farmers use antibiotics as feed additives to improve feed conversion ratio (Pramu et al., 2019). The present study identified different feed efficiency and business scale in each regency.

Table 2. The average feed efficiency and cumulative performance index

Regency	Feed efficiency (%)				Cumulative performance index			
	AGP (2017)		Non AGP (2018)		AGP (2017)		Non AGP (2018)	
	K	B	K	B	K	B	K	B
Banjarnegara	60	58	60	60	301	294	310	299
Banyumas	57	59	60	63	275	272	282	293
Pemalang	61	60	59	60	346	311	319	315
Temanggung	61	59	60	59	296	279	292	287

Note: K= small scale B= large scale

The analysis of variance showed that the feed with and without AGP did not significantly affect feed efficiency (Table 2). Broiler production efficiency can be accomplished when the feed offered is neither lack nor excessive (Zuidhof et al., 2014). In the present study the farm size did not affect feed efficiency.

The result showed no significant difference in feed efficiency across farming locations, which means that probiotics can substitute AGP without affecting feed efficiency. A Probiotic is a living organism that promotes health benefits to the consumers when taken in sufficient amounts (Hill et al., 2014). The farmers in this study can substitute AGP with probiotics and improve cage management. The results are in line with Kumalasari et al. (2020), who reported that probiotics incorporated in the commercial feed for broilers non-significantly increased feed intake and feed conversion but highly significantly affected body weight gain. Based on the feed intake and body weight gain, it was concluded that probiotics were better than antibiotics. The number of farmers who administered probiotics is presented in Table 3.

Broiler feeding that matches the requirement would improve feed efficiency. According to Siegel (2014), a feeding program that meets the primary needs of livestock at certain age and period could improve the feed efficiency; therefore, the feed offered to them was sufficient. Feed conversion was the indicator of feed efficiency; the lower the feed conversion ratio, the more efficient the

livestock converted the feed into meat (Allama et al., 2012).

Farming and feed management are different across farmers, and it is the feed intake that affects the feed efficiency. Feed efficiency is indicative of the biological capacity of livestock to convert the feed it consumes into a product. The contributing factors to feed efficiency include consumption, digestibility, and the utilization of feed substances (Liwe et al., 2014). Therefore, the utilization of feed supplemented with probiotics can provide the required nutrients in a balanced manner.

### Cumulative Performance Index (CPI)

The success of the broiler farming business is evident from the cumulative performance index. In other words, the higher the production performance index or CPI, the higher the production success rate (Suwianggada et al., 2013). The result showed a discrepancy in the CPI across the years, regencies, and business scales. The CPI without AGP (2018) was higher than that with AGP (2017) because the farmers had substituted antibiotics with probiotics and improved the farming management, resulting in the optimized broiler performance.

The analysis of variance showed that either AGP on non-AGP containing feed had no significant effect on CPI (Table 2). The good CPI standard is above 3.00, so the higher the CPI, the more successful the farming business (Ulfa and Djunaidi, 2019). Accordingly, the broiler performance in the research locations was



Table 3. Probiotic administration

Regency	Total Farmers	Probiotic Administration (Farmer)	Percentage
Banjarnegara	155	22	14%
Banyumas	112	13	12%
Pemalang	126	76	60%
Temanggung	90	13	14%

Source: The processed primary data

relatively low. The contributing factors to broiler performance are breeds, feed, and management. These three pillars are the production triangle. The production triangle is perfect when a broiler farming business has superior breeding, proper and convenient management for both livestock and the owner, and proper and clean feeding to meet the livestock needs for optimum and efficient production.

The farming management in the four regencies was relatively proper, observed from the caging and maintenance system. The reared DOCs in four regencies were derived from the commercial farming company with grade A quality and an average weight of 40-45g. The farmers used an open-house cage with standard equipment, such as feed container, drinking container, coop curtains, newsprint paper, lamp, water dipper, bucket, vaccination kits, and disinfectant. The cage was a rectangular, raised platform with a 4-meter bamboo framework and asbestos roof.

The cage was properly sanitized to prevent disease infection. The cage density across four regencies was 20 broilers/m<sup>2</sup> from brooding until 21 days old. The cage density was stretched gradually following the broiler's development on a weekly basis. Feed and water were offered in small quantities continuously to ensure sustainable, clean feeding and drinking. The farming management was influenced by the farmers' background and socio-demographic aspect, so the production index varied.

### Economic Aspect

The economic aspect consists of business capacity and income. The business capacity is

the total birds' population in a farm, whereas income is the cash-in revenue yield of a business (farming) in a period. The average business capacity and income of the farmers in the present study are presented in Table 4.

### Business Capacity

The larger the business capacity was, the higher the income gains. The business scale of broiler farming was categorized into two: small scale with <3000 chickens/farmers, and large scale with >3000/farmers. Table 4 illustrates the different business capacities across four regencies and the more chickens owned by the farmers, the higher the production and the income.

Business capacity is a vital element in farmers' income level, and the farmers must apply optimum farming management to obtain the maximum yield. The analysis of variance showed that the use and exclusion of AGP did not affect the business capacity of broiler farming (Table 4). The business scale cannot guarantee high productivity when it is not supported by proper farming management to run the business (Andri et al., 2011).

### Business Income

One of the success parameters of a farming business is farmer's income. Income is the revenue yield from sales in a certain period minus the operational cost (Lumintang, 2013). Meanwhile, the farmers' management capacity was the key factor to the optimum result of the broiler farming business.

A farming business is considered financially sufficient when the income is higher than the cost, thus ensuring the business sustainability (Cepriadi, 2010).

Table 4. Data of average business capacity and income

Kabupaten	Business capacity (chicken)				Business revenue (Rp/chicken)			
	AGP (2017)		Non AGP (2018)		AGP (2017)		Non AGP (2018)	
	K	B	K	B	K	B	K	B
Banjarnegara	2,005	2,382	2,167	3,085	2,800	3,806	3,524	4,124
Banyumas	1,994	4,381	2,084	5,519	1,175	1,696	1,848	3,088
Pemalang	2,020	3,800	2,324	3,744	4,350	3,327	3,862	3,341
Temanggung	2,000	4,495	2,116	4,719	2,517	1,982	2,787	2,636

Note: K= Small scale B= Large scale

The result identified an income gap among farmers and some obstacles that result in low income. The main obstacles in broiler farming, regarding feed, were the price and imbalance supply and distribution that make farmers receive uncertain profit. The other risk factor is the production dependency on the weather, climate condition, disease, and social risks (Yemina, 2014).

The analysis of variance showed that the use and negation of AGP did not affect the business income. According to Sudrajat and Isyanto (2018), the other contributing factors to the income of broiler farmers are the product selling volume and price. Additionally, feed was a determining factor to livestock production that eventually affects farmer's income. A proper feed would produce maximum production, but low-quality feed translates into non-optimized production and income. Feed offered to broilers in 2017 still contained AGP, but after the AGP prohibition in 2018, the farmers shifted to probiotics and herbal plants to maximize the growth of broilers.

### Socio-demographic aspects

Socio-demographic aspects included in this research were farmers' motivation, farmers' education, farming experience, and farmers' age. The average of farmers' age, education, farming experience and motivation are presented in Table 5.

### Farmers' Age

Age is an indicator of an individual's physical ability. Age is associated with the mindset to

determine the management for the farming business. Farmers' age affects their attitude in response to change or technology innovation. Otampi et al. (2017) mentioned that the non-productive age for farming is  $\geq 65$  years.

Nainggolan (2017) categorized age into three groups, namely (1) 0-14 years is young age/non-productive, (2) 15-64 years is working/productive age, (3) above 65 years is old/non-productive age.

Table 5 indicates that the majority of farmers in the partnership were in their productive age. The productive-aged farmers tend to exhibit a relatively stable emotional condition; hence it is easy for them to accept guidance and innovation from the expert in the field (Luanmase et al., 2011). Data from the four regencies consisted of 0.02% farmers in non-productive age and the rest 99.8% were of productive age.

The analysis result showed that age did not significantly affect the success of a farming business because age was not the only success parameter. Another factor in the productivity of broiler farming is business management (Dewanti and Sihombing, 2012).

### Farmers' Education

Education may reflect the quality of human resources. Farmers' education refers to the formal level of education undertaken by the farmers. Generally, the higher the education level of an individual, the higher the quality of the human resource (Suharyati and Hartono, 2015). It is reflected in the decision-making and process in managing the business.

Table 5. The average of farmers' age, education, farming experience and motivation

Indicators	Banjarnegara				Banyumas				Temanggung				Pemalang			
	AGP		Non AGP		AGP		Non AGP		AGP		Non AGP		AGP		Non AGP	
	K	B	K	B	K	B	K	B	K	B	K	B	K	B	K	B
<b>Age</b>																
Productive (%)	100	90.3	100	94.4	100	93.7	96.9	93.7	100	100	100	100	100	100	97.8	100
Non-productive	0	9.7	0	5.6	0	6.3	3.1	6.3	0	0	0	0	0	0	2.2	0
<b>Education</b>																
Primary School dropouts (%)	0	0	0	0	0	0	0	0	0	20	0	25	0	5.3	2.2	4.7
Primary School (%)	42.1	12.9	26.2	19.4	22.8	25	27.3	31.3	30	30	21	40	40	47.4	52.2	41.9
Junior High School (%)	34.2	9.7	42.8	19.4	48.6	25	39.4	18.7	20	10	15.8	9.4	20	15.7	23.9	20.9
Senior High School (%)	15.8	61.3	26.3	41.7	28.6	31.3	21.2	31.3	40	40	52.6	12.5	20	21.1	15.2	27.9
College degree (%)	7.9	16.1	4.7	19.4	0	18.7	12.1	18.7	10	0	10.6	12.5	20	10.5	6.5	4.6
<b>Farming experience</b>																
1-5 Year (%)	81.6	90.2	78.6	86.1	62.9	100	69.7	100	90	50	97.4	62.5	70	79	87	81.4
6-10 Year (%)	7.9	9.6	14.3	13.9	14.3	0	6.1	0	10	50	2.6	31.3	30	21	13	11.6
11-15 Year (%)	1	61.2	7.1	0	20	0	24.2	0	0	0	0	6.2	0	0	0	7
>15 Year (%)	0	0	0	0	2.8	0	0	0	0	0	0	0	0	0	0	0
<b>Farming Experience</b>																
Main business (%)	55.3	48.4	60	52.8	34.3	62.5	24.2	68.7	50	100	36.8	93.7	40	78.9	26.1	76.7
Side business (%)	44.7	51.6	40	47.2	65.7	37.5	75.8	31.3	50	0	63.2	6.3	60	21.1	73.9	23.3

Note: K= Small scale B= Large scale

The respondents across four regencies had a varied level of education. Farmers in Temanggung had an adequate education because 40% of them have undertaken 12-year education. It was linear to the production result because Temanggung has the highest IPT of all four regencies. Meanwhile, most farmers in Banyumas regency only had a primary level of education, so the CPI was the lowest across regencies. It shows that farmers' formal education affected their mindset in managing the broiler farming business.

Luanmase et al. (2011) stated that the proper education background could attribute to an increase in performance and management capacity of the farming business. Accordingly, the increased level of education would directly improve community welfare.

### Farming Experience

Farming experience affects the farmers' decision in handling issues during the farming management, and generally, the longer the experience, the higher the technical capacity in handling farming management. Farming

experience also influences the farmers' ability to run their business because a more experienced farmer tends to exercise caution in his attitude and decision-making (Luanmase et al., 2011).

The result showed that most of the farmers in four research locations had had one to five years of farming experience. Interestingly, the analysis of variance showed that age did not have a significant effect on business production. In Pemalang, 7% of the farmers had 6-10 years of farming experience, but their production level was not higher than those with only 1-5 years of experience in other regencies. It is evident in the present study that farming experience did not affect the performance of the broiler farming business.

Experience is a determining factor to the success of the farming business, but there are other supporting factors. An experienced farmer was not always able to take the risk in the broiler farming business. The farmer might only receive information from his fellow farmers and self-experience. Accordingly, it is

significant to improve the quality of broiler farmers to maintain maximum production.

### Business Motivation

Business motivation is crucial to achieving an optimum result (Insani et al., 2015). Farmers' motivation identified in this study varied. Farmers with high motivation tend to prioritize their job as broiler farmers and undertake broiler farming with full responsibility and dedication.

Some broiler farmers run the farming business as the main job, while others have it as a side job. The result analysis shows that the farmers' motivation did not affect broiler production. Maintenance management is, in fact, the key factor to the success of broiler production. According to Insani et al. (2015), motivation plays a significant role in an individual's attitude in business or farming

activity. It is because maintenance is the most vital factor in the production result. The management of broiler farming as a side job in the research location. The farmers used DOC and feed with equal quality, and the feeding and drinking were offered according to the broilers' need.

### The Socio-Demographic Factor Effect Toward Feed Efficiency and Cumulative Performance Index

The socio-demographic factors include farmers' age, education level, farming experience, and farming motivation had an indirect influence on the production yield received by the farmers from their business (Andri et al., 2011). The result of correlation analysis on the demographic factors to feed efficiency of cumulative performance index is presented in Table 6.

Table 6. Socio-demographic factors to Feed Efficiency and CPI

<b>Socio-demographic factors to feed efficiency</b>			
Variabl	Pearson Correlation	Sig <sup>#</sup>	N
Farmers' age	-0.81	0.081	467
Farmers' education	0.101*	0.029	467
Farming experince	-0.039	0.397	467
Farming motivation	-0.089	0.054	467
<b>Socio-demographic to CPI</b>			
Variables	Pearson Correlation	Sig	N
Farmers' age	-0.57	0.222	467
Farmers' education	0.98*	0.034	467
Farming experience	-0.018	0.693	467
Farming motivation	-0.008	0.868	467

Sig: significant level, \*: Significant

Based on the analysis of correlation, farmers' education affected feed efficiency and cumulative performance index. Also, the education parameter significantly affected the broiler farming business. Farmers with a higher level of education might be more accepting of innovation and changes regarding broiler farming. Luanmase et al. (2011) stated that a proper level of education would contribute to the increase of performance and management capacity of the farming business. Accordingly,

the level of education would directly increase community welfare.

### Conclusions

Broilers fed with either AGP or non-AGP containing feed showed relatively similar performance. The government policy on the prohibition of AGP does not contribute to the decrease of farmers' income. The demographic aspect affecting the broiler farming business is the farmers' education level.

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