Productivity and business income of Sentul Selected-Kampung Unggul Balitnak (SenSe-KUB) chicken breeders in Bone Bolango Regency Gorontalo Province

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Abstract. This study was aimed to determine productivity and analyze the business income of Sentul Selected-Kampung Unggul Balitnak (SenSe-KUB) chicken breeders. This research is descriptive. Data collection techniques were field observation, interviews, note-taking and literature study. Data collected from direct observation in the field at SenSe-KUB chicken breeders and tabulated then transferred into tabular form according to analysis needs. The data obtained were then analyzed statistically. The results obtained showed that the productivity of the SenSe-KUB chickens in the breeders kept in 2 periods with different numbers (average feed conversion, egg production, peak production, age at first laying eggs, the lowest average production, the highest average production, 10–12 months of egg budding, 10–12 months of hatchability, 10–12 months of eggs entering the hatchery and the average body weight of males and females aged four and five months) was different for each period. Furthermore, the average number of eggs hatched in period-2 was more when compared to period-1. Then the average sprouting power for period-1 was 83.35% and period-2 was 87.3%; the average hatchability for period-1 was 73.56% and period-2 85.45%; the average of embryo mortality in period-1 was 23.29% and period-2 was 12.61%; the average number of DOC period-1 was 182.29 and period-2 was 668.65. The results of the business analysis showed that the SenSe-KUB chicken breeding business of 1,000 in Tunggulo Village breeders had been managed efficiently which could be observed from the R/C ratio of 1.34. The Selected SenSe-KUB chicken breeding business is a potential source of income.

1. Introduction
The need for animal protein in Indonesia is currently very high, in line with the increasing population and public awareness that animal protein is needed to meet nutritional needs. Along with this, the consumption of native chicken (native chicken) in Indonesia is increasing from year to year. The average consumption of native chicken for the 2002–2018 period was 0.647 kg/capita/year. Predictions made for 2019 to 2021 showed that domestic chicken meat consumption per capita has increased slightly. Domestic chicken meat consumption until 2021 is predicted to increase by 8.42 kg/capita/year [1].

Gorontalo Province is one of the regions where the consumption of native chicken meat has grown from year to year in the last five years (2014–2018) by 1.35%. In addition to increasing consumption, the native chicken population also experienced growth (2015–2019) of 2.49%. In 2015 the population of native chickens was 1,376,518 and in 2019 there were 1,586,633 birds [1]. In reality, this
production has not been able to meet the existing demand. Developing Kampung Unggul Balitnak (KUB) chickens and Sentul Selected (SenSe) chickens are one of the alternative businesses to consider.

Native chicken has become one of the promising businesses in recent years, the demand for chicken meat is always increasing. There are more and more restaurants to stalls selling native chicken menus. The price of the native chicken carcass is also relatively stable compared to broiler chickens which fluctuates at the farmer level, especially in independent breeders. The selling price of native chickens is higher than broiler meat, this is due to the quality of the meat. Also, the perception that native chicken meat is healthier makes its consumption continue to increase.

Kampung Unggul Balitnak (KUB) chickens is one type of native chicken as a result of research innovation from the Livestock Research Institute, Ciawi Bogor which was made for laying purposes and successfully released as one of the national superior strains (Decree of the Minister of Agriculture Number 698/Kpts/PD.410/2/2013). The advantages of KUB chicken include high egg production reaching 180 eggs per year, 60% hen-day with incubation properties of 10% of the total population [2]. Research on the superiority and performance of KUB chickens was examined by [3–6]. Recently the Agricultural Research and Development Agency has produced the Sentul Selected chicken (SenSe-1 chicken) Agrinak, a new breed of local chicken that has the advantage of producing meat. The live body weight of SenSe-1 Agrinak chickens aged 70 days, male 1,066 g/head and female 745 g/head. SenSe-1 Agrinak chicken has been designated as a native Indonesian broiler breed based on Minister of Agriculture Decree Number 39/Kpts/PK.020/1/2017, dated January 20, 2017, concerning the Release of Agrinak SenSe-1 chicken Strains. In its development, Center for Livestock Research has crossed the male line SenSe-1 Agrinak with KUB hens and was named SenSe-KUB [6]. SenSe-KUB chicken's harvest age is around 70 days, and with the right feed, it can produce a higher body weight than local chickens in general.

The results of SenSe-KUB chicken fattening showed a satisfactory development of body weight, at the age of 56 days the average body weight was 805.45±45.63 g/head (Bendan villages) and 762.41±71.27 g/head (Trayu villages). The average feed consumption during the fattening process was 1,960±98.30 g (Bendan villages) and 762.41±71.27 g (Trayu villages). Forage conversion (FC) achieved 2.43 and 2.50 for Bendan and Trayu villages, respectively [8].

Provision of superior native chicken seeds with good genetic quality is still lacking, this is due to the limited number of superior native chicken breeders. Most of the existing provision of chicken seed is limited to hatchery efforts for the needs of the breeders themselves or sold based on advance orders, and the quality of the seeds is not based on certain quality criteria.

Based on the description above, this study was aimed to analyze the productivity and income of SenSe-KUB chicken breeders.

2. Methods
This research was conducted at the Core Enclosure, Tunggulo Village, Bone Bolango Regency, Gorontalo Province in February–November 2019. The objects used in this research were productivity and business analysis in breeder breeders. This research is descriptive. Data collection techniques were field observation, interviews, note-taking and literature study. Data collected from direct observations in the field at Sentul Selected breeders and KUB chickens were tabulated, then transferred into tabular form according to analysis needs. The data obtained were then analyzed statistically. The data used were productivity data (data on the number of chickens reared, egg production, age at first laying eggs, bodyweight of males and females, the number of eggs hatched including data on fertility, hatchability, embryo mortality, DOC harvest) and business analysis in breeders [9].
3. Results and discussion

3.1. General description

SenSe-KUB chicken breeders are located in Tunggulo Village, Bone Bolango Regency, Gorontalo Province. The location of these breeders is in a less crowded residential area. Breed chickens are SenSe chickens (male) and KUB chickens (female). The chicken comes from the Animal Research Institute. Chickens are raised from DOC until the production period. The ratio of male to female ratio is 1:5 and reared in the postal cage (figure 1).

![Figure 1. Postal cage at Tunggulo Village Breeder, Bone Bolango Regency, Gorontalo Province.](image)

A good cage provides comfort for chickens. The cage used in breeders is postal. This stable is divided into two buildings, each of which is separated for each period. The litter used for postal pens are chaff, saws, or other materials that can be used [10]. The conditions of the cage must follow the ideal principles as well as the temperature, humidity and air circulation of the cage [11] because it is a very important factor to consider. The factors that affect the comfort of the chicken in the pen are temperature, humidity, density and type of floor used by breeders [12].
3.2. Productivity of SenSe-KUB chicken

The productivity of SenSe-KUB chickens in Tunggulo Village breeders was presented in Table 1.

| Parameters                                      | Period-1  | Period-2  |
|------------------------------------------------|-----------|-----------|
| Number of reared SenSe-KUB chickens (bird)     | 600       | 993       |
| The average feed conversion is up to 5 months  | 3.83      | 3.72      |
| Egg production average (%)                     | 33.88     | 36.95     |
| Egg production at 10-months-old (egg/bird)     | 15.56     | 11.54     |
| Egg production at 11-months-old (egg/bird)     | 9.74      | 10.67     |
| Egg production at 12-months-old (egg/bird)     | 9.11      | 13.27     |
| Peak production (%)                            | 54.77     | 48.44     |
| Age at first laying (days)                     | 199       | 156       |
| Lowest average production (%)                  | 25.55     | 27.72     |
| Highest average production (%)                 | 54.77     | 48.44     |
| Egg fertility rate at 10-months-old (%)        | 74.36     | 89.32     |
| Egg fertility rate at 11-months-old (%)        | 73.78     | 86.30     |
| Egg fertility rate at 12-months-old (%)        | 76.62     | 88.81     |
| Hatchability at 10-months-old (%)              | 64.93     | 88.03     |
| Hatchability at 11-months-old (%)              | 64.21     | 83.97     |
| Hatchability at 12-months-old (%)              | 72.74     | 87.45     |
| Hatching eggs at 10-months-old (eggs)          | 415.00    | 931.50    |
| Hatching eggs at 11-months-old (eggs)          | 399.50    | 903.00    |
| Hatching eggs at 12-months-old (eggs)          | 285.50    | 767.00    |
| Four-month-old male body weight average (g/bird)| 1,751    | 1,900     |
| Four-month-old female body weight average (g/bird) | 1,250     | 888       |
| Five-month-old male body weight average (g/bird) | 2,083    | 2,258     |
| Five-month-old female body weight average (g/bird) | 1,731    | 968       |

The SenSe-KUB chickens in 2 breeders with different numbers are shown in Table 1. Average feed conversion, egg production, peak production, age at first laying eggs, lowest average production, the highest average production, 10–12 months of the egg fertility rate, 10–12 months of hatchability, 10–12 months of hatching eggs and the average body weight of males and females aged four and five months was different each period. The results were obtained due to the crossing of SenSe chickens (male) and KUB chickens (females). Crosses were aimed to obtain complementary breeds with certain superior traits of both parental. This can also lead to a pure crossbreeding system and other crossbreeding which is effective in selecting superior genotypes [13].

The crossing of chickens is generally based on the productivity of the chickens, resulting in a good combination of cross-breeding effects [14]. Sen tul Selected chickens are included in the male line category of local broilers [15], while KUB chickens are included in the category of native chickens that have high egg production [16]. KUB-G6 chickens are local chickens that have much better performance and breeding ability [17], as well as KUB-2 chickens in the 4th generation that have better performance than their parent chickens, namely KUB-1 chickens [18].

Furthermore, the number of SenSe-KUB chicken eggs that were set to the hatching machines at breeders was presented in Figure 2. Figure 2 showed that the average number of SenSe-KUB chicken eggs that entered the hatching machine was more in period-2 than in period-1. This was due to the larger number of period-2 sires compared to period-1. The amount of egg production and the quality of the eggs produced greatly affect the age of the parent. Egg productivity and quality are influenced by the age of the chickens [19,20], where young chickens produce more eggs and have higher profits than old or unproductive chickens [21].
Figure 2. The number of SenSe-KUB chicken eggs hatched in Tunggulo Village Breeder Breeder, Bone Bolango Regency, Gorontalo Province.

Eggs were collected in each cage in the afternoon and cleaned using enough water and wiped using a clean cloth. Furthermore, the collected eggs are then stored in the egg storage room at a temperature of 27°C before being put into the hatching machine. Egg quality may decrease during storage [22]. Egg quality is influenced by differences in the age of the broodstock and the length of time the eggs are stored at room temperature [23]. The egg fertility rate of SenSe-KUB chicken in breeders was presented in figure 3.

Figure 3. Percentage of SenSe-KUB chicken egg fertility rate in Tunggulo Village Breeder, Bone Bolango Regency, Gorontalo Province.

The breeders used modern hatching machines. The egg fertility rate of SenSe-KUB chicken eggs was higher in period-1 compared to period-2. Factors that influence the fertility rate are the age of the hen, sperm quality, parental nutritional status, time of mating, parental sex ratio [24]. Egg fertility rate is the percentage of fertile eggs that then develop to form an embryo [25].

The hatchability of SenSe-KUB chicken eggs in breeders was presented in figure 4. The result showed that the hatchability of SenSe-KUB chickens in period-2 was higher than in period-1. The result was due to the difference in broodstock factors for each period, where on aperiod-2 the age of sires is younger than period-1. The production rate and hatchability of eggs will be different for each different parentage period, where the age of 27 weeks of broodstock has a better hatchability when compared to the age of the older parental [26].

The embryo mortality rate was counted at the end of each hatching period and expressed as the percentage of the unhatched egg from the total eggs that were incubated (figure 5). The embryo mortality rate of SenSe-KUB chicken eggs was higher in period-1 when compared to period-2. The
embryo mortality rate correlated with fertility. The more fertile an egg the smaller embryo mortality rate. Embryos are very sensitive to changes in temperature in the hatching machine. The embryo is very sensitive to high and low hatching temperatures, so it will affect the rate of growth and development of the embryo [27].

Figure 4. The hatchability of SenSe-KUB chicken eggs in breeder in Tunggulo Village, Bone Bolango Regency, Gorontalo Province.

Figure 5. Embryo mortality rate of SenSe-KUB chicken eggs in Tunggulo Village Breeder, Bone Bolango Regency, Gorontalo Province.

DOC yields on eggs hatched in breeders in Tunggulo Village Breeder were presented in figure 6. Figure 6 showed that the number of DOCs hatched from was higher in period-2 compared to period-1. The number of DOC produced in a hatchery is closely related to the fertility and hatchability of the eggs. The hatched DOC was the result of crossing SenSe chickens (male) with KUB chickens (females). Crosses were carried out between the livestocks of a different breed also called crossbreeding [28]. In this case, Sentul chickens were selected as local meat-type and KUB chickens as layer-type to increase the productivity with their respective advantages [29,30]. Aryani et al. [31] conducted the analysis of the genetic quality of the protein coding (465 bp) gene HSP70 in KUB chickens.

The average number of DOC period-1 was 182.29 and period-2 was 668.65. The number of broodstock in period-2 was higher than in period-1 so that the number of eggs produced was also higher in period-2. It is also influenced by the age of the broodstock. The mated chickens should be 7–15 months old for the male and 7–12 months old for the female, if the ages of the parental are too young or too old, they will produce infertile eggs [32]. The age of male and female chicks that reach sexual maturity will influence characteristics [33], egg production [26] and hatchability percentage [34]. The sexually mature chickens tend to produce more eggs compared to early adult chickens [35].
Figure 6. Number of Hatched DOCs from Sentul Selected-Superior Native of the Agricultural research and development agency (SenSe-KUB) Chicken Eggs hatched in Tunggulo Village Breeder, Bone Bolango Regency, Gorontalo Province.

3.3. Business analysis
The feasibility of SenSe-KUB chicken farm business in breeders was analyzed in Table 2.

Table 2. Analysis of Sentul Selected-Superior Native of the Agricultural research and development agency (SenSe-KUB) Chicken Business in Tunggulo Village Breeder Breeder, Bone Bolango Regency, Gorontalo Province.

| Component                                      | Price       |
|-----------------------------------------------|-------------|
| Revenue (IDR)                                 | 172,864,000 |
| Assumed 10% mortality                         |             |
| Sales of 450 chicken (IDR)                    | 24,750,000  |
| Sales of 18,493 DOC                           | 147,944,000 |
| Sales of cracked eggs totaling 170 eggs (IDR) | 170,000     |
| Spending (IDR)                                |             |
| Cost of seeds (IDR)                           | 8,000,000   |
| Feed costs (IDR)                              | 94,667,792  |
| Medicine socts (IDR)                          | 396,000     |
| Electricity costs (IDR)                       | 8,400,000   |
| Labor cost (IDR)                              | 12,000,000  |
| Others (IDR)                                  | 5,000,000   |
| Net Profit (IDR)                              | 44,400,208  |
| R/C ratio                                     | 1.34        |

Revenue Cost Ratio is a test of the feasibility analysis by comparing the total revenue with the total expenditure issued. The total revenue received by Tunggulo Village breeders is IDR 172,864,000 (proceeds from the sale of chickens, DOC, and cracked eggs) and the total expenditure incurred is IDR 128,463,792 (costs for seeds, feed, medicines, electricity, power, work and others). Based on the description, it can be concluded that the Sentul Selected-Superior Native of the Agricultural research and development agency (SenSe-KUB) chicken breeding business is declared to be profitable and feasible to run. This shows that the Sentul Selected-Superior Native of the Agricultural research and development agency (SenSe-KUB) chicken nurseries are profitable when compared to the KUB chickens, where 300 KUB chicken nurseries have an R/C ratio of 1.05 [3]. In addition, the R/C ratio
for native chickens and KUB chickens in Egg Cati Village, Hulu Sungai Utara Regency with intensive maintenance is 2.20 for native chickens and 2.37 for KUB chickens [35].

The analysis showed that the SenSe-KUB chicken breeding business of 1,000 in Tunggulo Village breeders had been managed efficiently which could be observed from the R/C ratio of 1.34. This means that every production costs (expenses) allocated to the SenSe-KUB chicken breeding business provides a gross income of 1.34 or a net income of IDR 0.34. Revenue from a chicken farm business is all revenue from the sale of farm products [36]. KUB chicken has a higher PAM competitiveness coefficient when compared to Joper chicken and Arabic chicken [37]. Generally, the SenSe chickens and KUB chickens are kept separately by breeders. The SenSe-KUB chicken breeding business is oriented to be a potential source of income.

4. Conclusion
The productivity and business income of SenSe-KUB chicken breeders located in Tunggulo Village, Bone Bolango Regency, Gorontalo Province showed a different analysis for each period. The business analysis showed that Sense-KUB chicken is profitable and feasible to run.

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