Analysis production of laying hens by applying supply chain management on the laying hens industry in Banda Aceh

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Abstract. This research is related to the awareness of the people who realize that it will be increasingly important to consume eggs so that it becomes an opportunity for livestock companies to fulfill the people's demand for chicken eggs. The UPTD of the Non-Ruminant Animal Husbandry as a laying hens industry is very influential on the quality of quality for businesses in producing commercial eggs to be consumed by the people. The UPTD of the Non-Ruminant Animal Husbandry Office continues to improve efficiency in the chain of business activities. The research conducted at the UPTD of the Non-Ruminant Animal Husbandry aims to analyze the supply chain management mechanism in the laying hens' industry, to analyze supply chain productivity of laying hens commodities, and to examine the benefits and obstacles in applying supply chain management in the laying hens' industry. The method used to measure productivity is Supply Chain Management. The productivity measurement is based on input identification data, the process of transforming inputs into chicken egg products and the process of sending and distributing chicken eggs. The research produced a supply chain activity flow that occurred in the UPTD of the Non-Ruminant Animal Husbandry went well, consisting of 14 main processes divided into 3 parts, which is identifying source consisting of 4 parts, identifying the make of 5 parts, identifying deliver of 5 parts. The supply chain productivity levels at the UPTD of Non-Ruminant Animal Husbandry are quite good, which are on 73.33 percent and broken eggs 0.44 percent.

1. Introduction

The development of the livestock sub-sector has provided direct contributions such as the supply of livestock-origin food, the development of rural agro-industries, employment and increasing community income, and indirect contributions through the creation of conditions conducive to the implementation of development and synergetic relations with other sectors. The success is inseparable from the role of the Department of Animal Husbandry, related Institutions and Institutions both Central, Provincial and Regency/City by coordinating and providing facilities for the implementation of livestock sub-sector development. The development of the poultry farm business in Aceh Province is still running slowly so that all production facilities from North Sumatra Province and the result of private investors are reluctant to invest in this field. Until now there has been no laying company that can be relied upon to produce eggs on a large scale in Aceh. While the availability of animal feed raw materials, especially maize and bran, is available in abundant quantities and to date most of them are sent to animal feed factories in North Sumatra and then most of their egg production is sold back to Aceh.
Under these conditions, the government should be able to invest in poultry farming until the business attracts interest from private investors, and government investment can gradually be reduced or in collaboration with the private sector as mandated in Governor Regulation number 20 of 2009. As with chicken broilers, the government is no longer directly involved and only guides supervise and regulates regulations so that farmers and partner companies must go hand in hand and mutually benefit.

One of the locations of laying hen farms in Aceh Province is located in Blang Bintang district, Aceh Besar. The cages consisting of 20 units in which each is filled with 5,000 hens with a total cage capacity of 100,000 hens. Blang Bintang laying hen farm complex is supported by a chicken feed factory with a capacity of 8 tons/ hour and equipped by other complementary facilities. The total development costs incurred by the Aceh Government in building the complex were 35.9 billion in 2013. The Blang Bintang farm unit was originally intended to develop ex-Free Aceh Movement (GAM) combatants through the Bintang Beusaree Cooperative with 100,000 hens and sufficient feed until it produced. In the course of the management of the cooperative unable to manage the chicken farm profitably, since 2017 the Blang Bintang farm complex has been repatriated to the Aceh Livestock Service Office managed by the UPTD of Non-Ruminant Animal Husbandry Office.

This year, the UPTD of Non-Ruminant Animal Husbandry production unit manages producing hens (laying hens) of 44,789 and 60,000 hens which are planned to be managed through the establishment of a Regional Public Service Agency (BLUD) in 2019, so that they can be professionally managed and profitable in hopes of providing benefits in the form of Aceh Original Income (PAA). This study aims to conduct a supply chain analysis on the business of laying hens at the UPTD of the Non-Ruminant Animal Husbandry located in Blang Bintang of Aceh Besar.

2. Material and method
The method used was supply chain management. Data processing was done descriptively and quantitatively. Descriptive data processing is carried out to describe the general condition of the company and describe the mechanism of the supply system and distribution of the company's product output.

Quantitative processing was carried out to analyze procurement and distribution, the percentage of the margin of the product. These data were then tabulated and analyzed by the description approach.

3. Result and discussion
The data used in this study were primary data and secondary data. Primary data obtained are data flow and supply chain business processes. Secondary data obtained were data on the number of incoming chickens, number of dead chickens, number of egg production and number of damaged eggs.

3.1 The input of Laying Hens

| Month   | Initial amount (chicken) | Dead (chicken) | Live (chicken) | Dead percentage (%) | Live percentage (%) |
|---------|--------------------------|----------------|----------------|---------------------|---------------------|
| January | 44.789                   | 271            | 44.518         | 0.61                | 99.39               |
| February| 44.536                   | 264            | 44.272         | 0.59                | 99.41               |
| March   | 44.292                   | 269            | 44.023         | 0.61                | 99.39               |
| April   | 44.041                   | 241            | 43.800         | 0.55                | 99.45               |
| May     | 43.849                   | 317            | 43.532         | 0.72                | 99.28               |
The number of chickens for 1 year was 518,514 and the mortality rate was 4,916. This means in one year the death rate was up to 11 percent.

**Table 2. Total Egg Production in UPTD of Non-Ruminant Animal Husbandry Unit**

| Month   | Egg Production (egg) | Productivity Egg / Day (egg) | Total % Productivity Egg/Day (%) | Egg Defect (egg) | % Egg Defect (%) |
|---------|----------------------|-----------------------------|----------------------------------|-----------------|-----------------|
| January | 90.763               | 3.025                       | 44.789                           | 6.75            | 743             | 0.82            |
| February| 353.246              | 11.775                      | 44.536                           | 26.44           | 2.893           | 0.82            |
| March   | 786.458              | 26.215                      | 44.292                           | 59.19           | 5.231           | 0.67            |
| April   | 986.432              | 32.881                      | 44.041                           | 74.66           | 5.956           | 0.60            |
| May     | 1,067.436            | 35.581                      | 43.849                           | 81.14           | 4.853           | 0.45            |
| June    | 979.577              | 32.653                      | 43.604                           | 74.88           | 5.397           | 0.55            |
| July    | 943.705              | 31.457                      | 43.152                           | 72.90           | 5.189           | 0.55            |
| August  | 995.721              | 33.191                      | 42.812                           | 77.53           | 5.971           | 0.60            |
| September| 1,004.673           | 33.489                      | 42.429                           | 78.93           | 4.739           | 0.47            |
| October | 932.509              | 31.084                      | 42.073                           | 73.88           | 5.214           | 0.56            |
| November| 821.397              | 27.380                      | 41.711                           | 65.64           | 4.759           | 0.58            |
| December| 703.471              | 23.449                      | 41.226                           | 56.88           | 4.852           | 0.69            |
| Total   | 9,665.388            | 322.180                     | 518.514                          | 513.598         | 11              | 1.189           |

Source: UPTD Balai Ternak Non Ruminansia

From the table and graph above it can be seen that the average number of egg production in one year is 9,665,388 items, which means 62.41 percent. and broken eggs 0.61 percent. Supply chain management (SCM) is the concept of business process integration from consumers to initial suppliers in order to provide products, services, and information that provide added value to consumers and all stakeholders [1].

In principle, [2] explain the SCM framework is a combination of three interrelated elements, namely (i) supply chain network structure, (ii) supply chain business processes, and (iii) supply chain management components. The supply chain structure is the network of entities and links between the
entities of the supply chain. The business process is an activity or activity that produces specific added value from each entity that exists until the final outcome that consumers enjoy.

Regulatory components are managerial activities that integrate entities and regulate business processes in the supply chain. The distribution of goods is one of the main functions in the study of SCM, which is useful for flowing material/ components/ products from factories or warehouses through transportation networks to consumers [3, 4]. Material flows and components move from suppliers to product makers while finished products move from factories to distribution centers to consumers [5].

The performance of a distribution system can be improved by designing distribution channels horizontally and vertically and improving the relationship of business processes between the parties involved in the supply chain [6]. Structuring an efficient distribution system will lead to the achievement of a logistics mission, namely to distribute goods in the right amount, be sent to the right location, and arrive at consumers at the right time [5].

The supply chain is a network of companies that work together to create and deliver a product to the end-user. These companies usually include suppliers, factories, distributors, stores or retail, as well as supporting companies such as logistics services companies.

3.2 Application Supply Chain in UPTD of Non-Ruminant Animal Husbandry Unit

Below was the application of supply chain channel in UPTD Balai Ruminant Non-Ruminant, starting from the identification of inputs (source), the process of transforming input into egg products (make), and marketing (delivery)

![Figure 1 Supply Chain Flow at the UPTD of Non-Ruminant Animal Husbandry Unit](image)

**Description of Supply Chain Flow at UPTD of Non-Ruminant Animal Husbandry Office**

| No | Source                        | No | Make                        | No | Deliver                      |
|----|-------------------------------|----|-----------------------------|----|-----------------------------|
| 1  | Pullet                        | 5  | Feeding                     | 10 | Promotion                   |
| 2  | Fodder                        | 6  | Drinking                    | 11 | Marketing                   |
| 3  | Medicines and Vitamins         | 7  | Provision of Vitamins and Medicines | 12 | Local communities          |
| 4  | Cages                         | 8  | Cages maintenance           | 13 | Agent                       |
|    |                               | 9  | Harvest Process             | 14 | Distributor                 |

3.3 Identification of Source

**Pullet.** Chickens are put into laying cages (Battery cages) at the age of 4 months before the egg production phase. The chicken used is a type of laying hens, from the strain ISA BROWN which has high egg productivity. This chicken is also called chocolate laying hens and because of its brown color.

**Layer Feed.** There are two types of layer feed used in the production process of laying hens, including [7]:
a. Type of factory feed (commercial consumption) is feed made by factories with nutritional quantities that are more in line with the needs by laying hens. Manufacturers laying hens are available in complete and concentrated form with the right formulation for each growth in laying hens.

b. Mixed layer chicken feed (Mixed feed) is very good for growth in laying hens. Even better nutrition and better-maintained authenticity compared with factory feeding. This mixed feed is usually derived from animal waste and also vegetable, and laying hens feed to quickly lay eggs will be a good source of energy for chicken growth to support egg productivity to be superior and more abundant [8].

**Medicines and Vitamins.** There are two types of medicines and vitamins used [9]:

a. One type of vitamin used is complex vitamins. How to use vitamins for laying hens is to mix it with chicken drinking water. This type of liquid vitamin you can use with more doses. Vitamin complex has the function to make chickens become immune to various diseases, reduce mortality, reduce the smell of feces and also increase egg production. The dosage is there every day or 2 days or 2 times a week. By providing vitamins at least 2 times a week will make laying hens become healthy.

b. Another type of layer chicken vitamin given in is the powder form. This type of vitamin is usually mixed with food. This type of vitamin has a lot of protein that is good for chicken growth. You must use this vitamin at least 2 times a week.

**Laying Cage.** Chickens also need a decent place to live and can guarantee their health. The cleanliness of the cage and the ideal environment of the cage are absolute requirements so that chickens can avoid various diseases. Some chicken coop models have different variations depending on the purpose of raising chickens, for example laying hens, broilers, chickens for decoration and so on. The chicken production requirements that must be considered [10] as below:

a. the location of the cage
b. The density of the cage
c. construction
d. cage equipment
e. Cage lighting

**Feeding and Drinking Equipment.** Feeding and drinking of laying hens can be given 2 times a day in the morning and evening. Feed requirements in 1 day for 1 chicken is 100 grams. Distribution and timing of feed for laying hens:

1. At 7.00 (morning) 30% to 40% are given
2. At 3:00 p.m. (evening) given 60% to 70%

Feeding contained more nutrients in the afternoon because of the desire to eat chicken was greater at that hour. Also try to provide timely feed to avoid stressed chickens [11].

**Provision of Vitamins and Medicines.** Laying hens vaccination to prevent disease attacking poultry is one of the right steps. Because poultry that has the disease will be difficult to treat rather than prevent it. Therefore, in this case, vaccination is very important. All mass-produced poultry or poultry farms certainly have management and vaccination programs.

This vaccine program is also intended to prevent germs from entering poultry farms or specifically to laying hens. A simple example of a vaccine program that is often carried out is a way of biosecurity and a strict vaccination schedule [9].

**Cages maintenance.** The position of the cage is built facing east so that the cage gets enough direct sunlight in the morning and if during the day the chicken is protected from the adverse heat of the sun. The location is separate from the residential environment and is at least 500 meters from the outer fence. The distance between chicken breeding farms and other farms (cattle/buffalo, goats/sheep, and horses) is at least 500 meters. At a minimum distance of 1000 meters from the animal droppings. The enclosure is not in one location with a hatching building or a minimum distance of 500 meters [10].
Harvest Process and Egg Collection. In the harvest process the following steps need to be considered so that the results of the process are better [12]:

1. Harvesting Process
   The main results are produced from UPTD Balai Ruminant Non-Ruminant in the form of eggs produced by chickens and there is also a medium type of laying hens, it will get additional results in the form of meat from old chickens (non-productive). The harvesting process is done 2 times a day. Because this aims to prevent damage to the contents of the eggs caused by viruses that can be avoided and the first egg collection is done in the morning at 10-11, and the last collection at 15-16 while checking the chicken coop.

2. Egg Collection
   In taking and collecting eggs that have been taken put on a tray, and egg makers must immediately separate between normal and abnormal eggs. Normal eggs are oval-shaped eggs and clean shells which also weigh 57.6 grams. And eggs that are not normal characteristics are small or too large, a cracked shell, and critical and have an oval shape

3. Cleaning
   After the eggs are finished collecting and sorting, then the eggs that are dirty due to being hit by a liter or chicken stool are cleaned. eggs exposed to liters are cleaned with fine iron sandpaper or soaked with cleaning fluid, and this cleaning is usually done for the egg hatching process

   Based on the implementation of supply chain management consisting of source, make and delivery, it was found that improvements in each line resulted in a decrease in mortality rates and resulted in increased productivity. The results of the improvement can be seen according to the table below.

Table 3. Development of the number of hens that produce in the Blang Bintang Non-Ruminant Animal Husbandry in the period January to December 2018

| Month   | Initial amount (chicken) | Dead (chicken) | Live (chicken) | Dead percentage (%) | Live percentage (%) |
|---------|--------------------------|----------------|----------------|---------------------|---------------------|
| Januari | 44.789                   | 253            | 44.536         | 0.56                | 99.44               |
| Februari| 44.536                   | 244            | 44.292         | 0.55                | 99.45               |
| Maret   | 44.292                   | 251            | 44.041         | 0.57                | 99.43               |
| April   | 44.041                   | 192            | 43.849         | 0.44                | 99.56               |
| Mei     | 43.849                   | 245            | 43.604         | 0.56                | 99.44               |
| Juni    | 43.604                   | 452            | 43.152         | 1.04                | 98.96               |
| Juli    | 43.152                   | 340            | 42.812         | 0.79                | 99.21               |
| Agustus | 42.812                   | 383            | 42.429         | 0.89                | 99.11               |
| September| 42.429                  | 356            | 42.073         | 0.84                | 99.16               |
| Oktober | 42.073                   | 362            | 41.711         | 0.86                | 99.14               |
| November| 41.711                   | 485            | 41.226         | 1.16                | 98.84               |
| Desember| 41.226                   | 776            | 40.450         | 1.88                | 98.12               |
| Total   | 518.514                  | 4,339          | 514.175        | 10                  | 1.190               |

Source: UPTD Balai Ternak Non Ruminansia, Blang Bintang (2018)
Table 4. Consumption of laying hens feed managed by the UPTD of the Non-Ruminant Animal Husbandry during the period of January to December 2018

| Fed stock (Kg) | Consumption | Consumption / Days | Total Pullet /Gram/Days | % Consumption / Days |
|---------------|-------------|-------------------|-------------------------|----------------------|
| 105,000       | 116,570     | 3.866             | 44,789                  | 86,75                |
| 145,000       | 115,850     | 3.862             | 44,536                  | 86,71                |
| 125,000       | 144,495     | 4.817             | 44,292                  | 108,74               |
| 150,000       | 147,700     | 4.923             | 44,041                  | 111,79               |
| 180,000       | 156,240     | 5.208             | 43,849                  | 118,77               |
| 100,000       | 150,635     | 5.021             | 43,604                  | 115,15               |
| 126,650       | 145,410     | 4.847             | 43,152                  | 112,32               |
| 150,000       | 154,555     | 5.152             | 42,812                  | 120,34               |
| 180,000       | 147,630     | 4.921             | 42,429                  | 115,98               |
| 168,000       | 151,150     | 5.038             | 42,073                  | 119,75               |
| 145,650       | 4.855       | 41,711            | 116,40                  | 10,18                |
| 144,590       | 4.820       | 41,226            | 116,91                  | 10,11                |
| **1,429,650** | **1,430,235** | **47,675**         | **518,514**             | **1,330**            |

Source: UPTD Balai Ternak Non Ruminansia, Blang bintang (2018)

Table 5. Total Egg Production and broken Eggs managed by the UPTD of the Non-Ruminant Animal Husbandry Office for the period January to December 2018

| Egg Production (Number of eggs) | Productivity Egg / Day | Total (Chickens) | % Productivity Egg/Day (%) | Egg Defect Pecah | % Egg Defect |
|--------------------------------|------------------------|-----------------|----------------------------|-----------------|-------------|
| 102,884                        | 3.429                  | 44,789          | 7,66                       | 682             | 0,66        |
| 487,982                        | 16,266                 | 44,536          | 36,52                      | 2,147           | 0,44        |
| 998,063                        | 33,269                 | 44,292          | 75,11                      | 4,523           | 0,45        |
| 1,146,965                      | 38,232                 | 44,041          | 86,81                      | 4,833           | 0,42        |
| 1,179,769                      | 39,326                 | 43,849          | 89,68                      | 4,219           | 0,36        |
| 1,074,917                      | 35,831                 | 43,604          | 82,17                      | 4,739           | 0,44        |
| 1,135,127                      | 37,838                 | 43,152          | 87,68                      | 4,615           | 0,41        |
| 1,171,119                      | 39,037                 | 42,812          | 91,18                      | 4,833           | 0,41        |
| 1,121,334                      | 37,378                 | 42,429          | 88,09                      | 4,100           | 0,37        |
| 1,117,985                      | 37,266                 | 42,073          | 88,58                      | 4,733           | 0,42        |
| 971,943                        | 32,398                 | 41,711          | 77,67                      | 4,431           | 0,46        |
| 856,700                        | 28,557                 | 41,226          | 69,27                      | 4,308           | 0,50        |
| **11,364,788**                 | **378,826**            | **518,514**     | **880**                    | **48,163**      | **5,34**    |

Source: UPTD Balai Ternak Non Ruminansia, Blang Bintang (2018)

3.4 Identification of Delivery

One other important element in supply chain management is marketing. Marketing is a place or distribution that is an intermediary for producers to send their products to consumers. If there is no marketing distribution, consumers will find it difficult to get the goods that will be needed and the industry will face difficulties in delivering their products to consumers [13].

**Local people.** Local people are people who are in an area close to the UPTD of the Non-Ruminant Animal Husbandry Office usually buy eggs directly for daily life or household industry needs.

**Agents.** Agents are consumers who buy eggs directly from the laying hens' industry and then sell them back to consumers. Usually, the eggs that are bought are only a few. Sales are also usually in the village or in the city of the industrial location of laying hens. For agents at the UPTD of the Non-Ruminalyzed Animal Husbandry Center, they come from the areas of Aceh Besar and Banda Aceh.
**Distributors.** Distributors are those who buy eggs directly from the laying hens' industry and sell them back to the retail/shop. Distributors buy in large quantities, and also sell it out of the area. The distributor of the Non-Ruminant Animal Husbandry Office come from nearby areas to the Aceh Besar, such as West Aceh, Central Aceh Regency, and others

4. **Conclusions**

The flowchart of supply chain activity mapping that occurs in the laying hens industry consists of 14 main processes which are divided into 3 parts, namely source identification consisting of 4 parts, make identification consists of 5 parts, identification of delivering consists of 5 parts. The level of productivity of the supply chain (supply chain) in the laying chicken industry Blang Bintang, Aceh Besar Regency in one year is pretty good that is 73.33 percent and eggs are damaged by 0.44 percent.

New knowledge and innovations regarding laying hens farms that need to be pursued because they play an important role in the development of livestock, not only seeing the experience of farming so that it is too based on old knowledge while the development of science is increasingly rapid. With new knowledge and innovations regarding laying hens breeding plus new technology can increase productivity in the laying hens' industry

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