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## Laying Hen Farming as Agribusiness Potential

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Submitted : 30<sup>th</sup> April 2024; Accepted : 21<sup>st</sup> June 2024

### Abstract

#### Keywords:

Layer chickens; characteristics; potential; QGIS; livestock business

This study examined the potential of Quantum GIS (QGIS) as a cutting-edge tool for analyzing and comprehending the spatial dynamics of the livestock industry, particularly in identifying ideal locations for layer chicken farms in Tabanan Regency's Penebel District. The objective of this study was to identify the characteristics of entrepreneurs who own layer-breeder chicken farms in the Penebel District and analyze the agribusiness prospects of such farms in the same district. Employing a descriptive qualitative analysis approach with an exploratory survey using the QGIS 3.34.5 application. The respondents were selected through purposive sampling. The results indicated that the majority of layer chicken farm owners in Penebel District are middle-aged men (56-65 years old) with high school education and have gathered substantial cash amounting to hundreds of millions. They typically own between 3,001 and 10,000 laying hens. Potential farm owners are concentrated in the villages of Babahan, Senganan, and Jatiluwih. This study aimed to facilitate collaboration between the Tabanan District Government and relevant companies to assist layer farmers in expanding their market share and identifying suitable financial options. Furthermore, this study has the potential to extend the application of GIS technology in the livestock business to other regions undergoing comparable development.

### How To Cite (APA 6th Style):

Dewi, A. A. I. A. P., & Saifulloh, M. (2024). Laying Hen Farming as Agribusiness Potential. *SOCA: Jurnal Sosial Ekonomi Pertanian*, 18(2), 182 - 198. <https://doi.org/https://doi.org/10.24843/SOCA.2024.v18.i02.p06>

## INTRODUCTION

The livestock sector offers promising development prospects, as evidenced by the growing demand for livestock production from the community each year, which is part of the farming sector (Pratopo, 2018; Primasworo dan Widyastuti, 2018). Engaging in the raising of laying hens is a common business activity pursued by individuals, especially those residing in Tabanan Regency. According to the report from the Bali Province Agriculture and Food Security Service for the 2021–2022 period, there has been a significant growth in the overall population of layer chickens in Tabanan Regency during the past two years. According to data from the Central Bureau of Statistics of Bali Province or Badan Pusat Statistik Provinsi Bali (2023), the total production of layer-breed poultry in Tabanan Regency increased from 413,919 kg in 2022 to 455,311 kg in 2023. The aforementioned data indicates that Tabanan Regency is experiencing growth in the field of poultry farming, particularly for layer breeds.

Penebel District, a district of Tabanan Regency, is recognized for its large population engaged in the farming of laying hens. This activity is particularly popular among the Tabanan community and the Balinese people as a whole. Prastyo and Kartika (2017) attribute this business's rise to the quick turnover of business capital and the presence of significant market opportunities. As a result, both the community and capital owners tend to participate in the laying hen farming business. According to a study conducted by Rozi *et al.* (2019), there are still plenty of possibilities and prospects for agricultural businesses, particularly in the field of processed food and related industries. In order to establish a solid foundation for an agribusiness agricultural system, it is crucial to gather information regarding the potential and attributes of livestock businesses.

The rise in poultry production in Tabanan District, particularly in Penebel District, has led to an increase in the number of entrepreneurs involved in layer chicken farming. This trend, observed during the research conducted on February 25, 2024, highlights the rapid expansion of the chicken farming industry in the area. This shift in the local agricultural landscape, characterized by a rise in the number of farms facing challenges, presents both experienced and inexperienced business owners with a critical task. With this growth, there is an urgent need to better understand the optimal locations for new farm developments. In these circumstances, it has become absolutely essential to accurately determine the location of layer farms to ensure the industry's long-term viability and economic efficiency. Identifying potential locations for future farm development can not only

reduce initial investment expenses but also enhance overall production by strategically placing and selecting suitable sites. This mapping process not only offers economic benefits but also holds significant implications for operational management.

Properly mapping the location of layer farms enables business owners to strategize and optimize resource allocation effectively. This situation encompasses enhanced feedstock management, meticulous monitoring of animal health and condition, and synchronized waste management. Rapid responsiveness to environmental changes and risk factors, such as climate change and disease outbreaks, is a crucial component of effective management in the chicken farming industry.

The significance of properly mapping the whereabouts of layer farms is intrinsically linked to the presence of an industrious, tenacious, resourceful, and innovative entrepreneur who is willing to face and conquer obstacles. These characteristics are critical for business owners to become successful entrepreneurs. Numerous studies have elucidated the impact of entrepreneurial traits on success. Research from Bhatt (2018) revealed that entrepreneurial traits exert a substantial impact on the performance and prosperity of Micro, Small, and Medium Enterprises (MSMEs) in India. According to Agung *et al.* (2022), the success of a business is primarily determined by the personal characteristics of the entrepreneur. Entrepreneurs' personal characteristics have an impact on business strategy prior to influencing business performance in this situation.

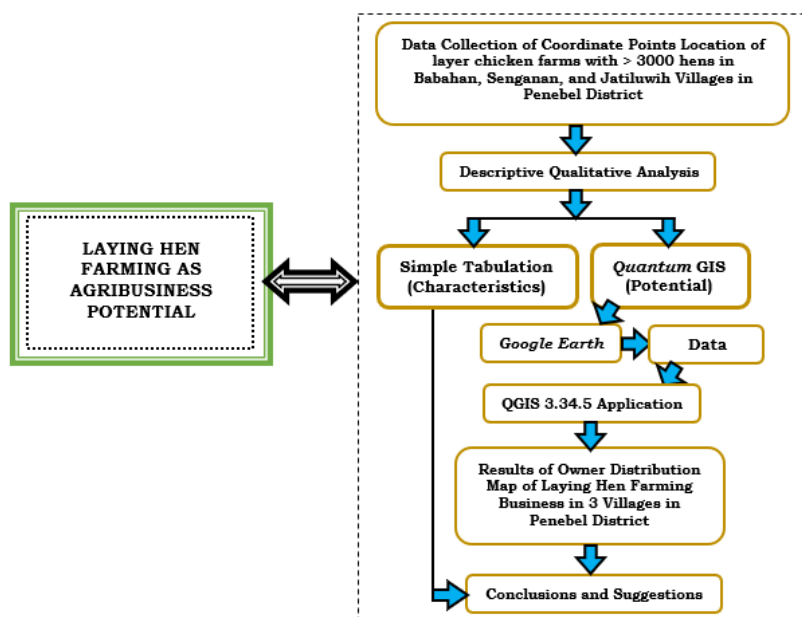
The present study aimed to investigate the possibilities of using Quantum GIS as a cutting-edge tool for analyzing the spatial dynamics of industries. Specifically, it focused on determining the best locations for mapping less-explored layer chicken farms in the Tabanan Regency area. This approach differs from previous studies that primarily aimed to gain a comprehensive understanding of health-related matters, as demonstrated by the studies conducted by Kim *et al.* (2022); Hoshi-numahata, Takakura, and Nakanishi-kimura (2023); Beardsley *et al.* (2023); Al-akori *et al.* (2023); Guzmán *et al.* (2023); Kinoshita *et al.* (2004); Campler *et al.* (2024). According to the studies conducted by Fenando (2021) and Ariyani *et al.* (2022), Quantum GIS is a web GIS technology that can effectively monitor advancements in technology. It is an open and community-based tool that serves as an excellent demonstration tool for evaluating spatial data related to satellite mapping. As a result, this study not only provides new insights on the process of identifying chicken farms' whereabouts, but also introduces the possibility of a broader application of GIS technology in the

livestock sector in other regions experiencing similar growth. The aims of this study were twofold: 1) to identify and understand the characteristics of individuals who own layer chicken farms in Penebel District, and 2) to analyze the agribusiness potential of layer chicken farms in Penebel District.

**RESEARCH METHODS**

The study took place in Penebel District, Tabanan Regency, which has the highest number of chicken farm owners in 2022, according to the Livestock Business Report (USPET) of the Tabanan Regency Agriculture Office. In this district, there were 99 total layer breeders. This study utilized the survey method to gather data. Out of the 18 villages in Penebel Subdistrict, only three villages, namely Babahan, Senganan, and Jatiluwih, were chosen based on specific criteria. These criteria required the villages to have a minimum of 3,000 laying hens. This research comprises multiple stages, including data collection on the coordinates of the location of business owners who maintain laying hens, gathering information on the characteristics of these business owners, inputting the location data into *Google Earth* for mapping purposes, processing the location coordinates using the QGIS 3.34.5 application, and resulting in a map illustrating the distribution of laying hen business owners across three villages in the Penebel District. Consistent with a study by Fahri (2020), the acquired data would be analyzed using the QGIS 3.34.5 application to generate the required coordinate points. Figure 1 below presents the research framework and provides additional information.

**Figure 1. Research Framework for Laying Hen Farming as Agribusiness Potential**



The selection of respondents was carried out using a deliberate purposive sampling method. The population for this study consists of layer chicken farmers in three villages, with the highest concentration of farmers in Penebel District, specifically Jatiluwih, Senganan, and Babahan Villages. According to field observation data, there were a total of 47 layer breeders in the three villages who met the specified criteria. Abdussamad (2021) defines the population as the object or subject of study in a research topic area that has fulfilled specific criteria connected to the unit of analysis, which can include individuals, groups, and organizations. The data in this research includes primary data collected through direct observation and field interviews with selected respondents. In line with Suamba *et al.* (2021), primary data collection involves using the survey method. This method entails directly meeting and interviewing respondents using a set of pre-prepared questions. On the other hand, secondary data was obtained from textbooks, articles, Livestock Business Reports (USPET) from the Tabanan Regency Agriculture Office, journals, and data from other relevant agencies.

The first objective of the study was to analyze data utilizing descriptive qualitative methods, specifically the simple tabulation method. The purpose of this method is to provide a representation of the data collected from the questionnaire, which highlights the characteristics of the people who own layer chicken farms in Penebel District. The study assessed the characteristics of owners in the layer chicken farm business based on factors such as the business owner's age, highest level of education, gender, length of the business, capital invested, primary occupation, and the total number of layer chickens owned. According to a study conducted by Widya (2021), the objective of this simple tabulation analysis is to identify the percentage of respondents who select specific groupings.

Objective two involves the utilization of appropriate analysis for potential, as determined by a study by Saily *et al.* (2021). This analysis involves the use of descriptive qualitative analysis, specifically through the application of an exploratory survey. This process involves the examination of measurement data collected in the field, with a focus on spatial, environmental, and territorial approaches. The analysis is conducted using the *Quantum Geographic Information System* (QGIS) application. QGIS is open-source software compatible with various data types, including raster data in GeoTIFF format and vector data such as *.kml*, *.shp*, *.gpx*, *.GeoJSON*, *.xls*, and *.csv*. Researchers have utilized this software for remote sensing data analysis and geospatial data for environmental monitoring (Sunarta and Saifulloh, 2022a; Sunarta and Saifulloh, 2022b), mapping disaster-prone areas (Trigunasih and

Saifulloh, 2022a; Diara *et al.*, 2023; Trigunasih *et al.*, 2023a; Trigunasih and Saifulloh, 2023), hydrological modelling (Suyarto *et al.*, 2023) and in the field of agricultural land resources (Trigunasih and Saifulloh, 2022b; Bhayunagiri and Saifulloh, 2022; Trigunasih *et al.*, 2023b; Kartini *et al.*, 2023).

According to Sholawati *et al.* (2023), the primary goal of using GIS (Geographic Information System) is to improve reader access to information and streamline data processing for determining the area of laying hens in the Penebel District. The digital mapping in this system utilizes QGIS Desktop 3.34.5 to enable the community to access information on the population of laying hen business owners with greater efficiency, effectiveness, and accuracy. According to the study conducted by Nurfaiza, Husaini, and Iskandar (2023), the QGIS application enables convenient and permanent storage of data in the database, ensuring its preservation and easy accessibility whenever required.

## RESULTS AND DISCUSSION

### Owner Characteristics of Laying Hen Farming in Penebel District

A business owner's characteristics play a significant role in their drive and success. Entrepreneurs require particular traits in order to achieve success as business individuals. According to Agung *et al.* (2022), the personal attributes of the business owner are the decisive factor in determining the success of a business. The unique characteristics of the owner of the layer farm will influence the business strategy employed prior to the business strategy influencing business performance. The demographic profile of laying hen farm business owners in Penebel District, Tabanan Regency, specifically in the villages of Babahan, Senganan, and Jatiluwih, is presented in detail in Table 1, Table 2, and Table 3.

**Table 1. Characteristics of the Level of Education of Owners of Laying Hen Farms in 3 Villages in Penebel District**

No	Education Level	Number of Respondents (persons)	Percentage (%)
1	Elementary School	4	8.51%
2	Junior High School	8	17.02%
3	Senior High School	21	44.68%
4	Associate Degree (Diploma 3)	3	6.38%
5	Bachelor Degree	11	23.04%
<b>Total</b>		<b>47</b>	<b>100%</b>

Source: Primary Data (processed) 2024

The majority of the owners of the layer hen farming business in the villages of Babahan, Senganan, and Jatiluwih in Penebel District have achieved a high school education, accounting for 44.68% of the total. This finding is in line with the research conducted by Sapienza et al. in Balboni (2014), which found that the educational level of a business owner has an impact on the amount of money they invest as capital to start a new business in laying hen farming. This capital will be used to establish the business in the Penebel District. Moreover, Table 2 displays the length of time for which laying hen farmers have been involved in the business.

**Table 2. Characteristics of Business Length of Owners of Laying Hens Farms in 3 Villages in Penebel District**

No	Length of Business (years)	Number of Respondents (persons)	Percentage (%)
1	<10	3	6.38%
2	11 – 15	11	23.40%
3	16 – 20	8	17.02%
4	21 – 25	9	19.14%
5	26 – 30	5	10.64%
6	31 – 35	4	8.51%
7	>35	7	14.89%
<b>Total</b>		<b>47</b>	<b>100%</b>

Source: Primary Data (processed) 2024

According to a survey conducted with 47 respondents in the sector, the typical business owner keeps laying hens for an average duration of 11 years. Most of these business owners continue their parents' previous enterprises, thereby sustaining the family business. This study reveals that the average age of business owners on layer chicken farms is between 56 and 65 years old. Among the 47 layer chicken farmers surveyed, 42.55% fall into the medium category. Out of these 47 business owners, 43 are male, accounting for 91.49% of the total. The remaining four business owners are female, representing 8.51% of the total. Out of the total respondents, 43 people, accounting for 86.36%, are male. According to the data presented in the table, men play a far more significant role than women in providing for the family in the context of employment and financial support. A study by Kismono (2014) reveals that in Indonesian society, there is an assumption that men and women have distinct responsibilities in both the workplace and the household. Moreover, men encounter distinct conflicts in both settings. Most business owners are male and are perceived to have a greater obligation than women to financially support their families through

their businesses. Table 3 displays the business capital that the owners of layer farms utilize.

**Table 3. Characteristics of Business Capital of Laying Hens Farms in 3 Villages in Penebel District**

No	Business Capital	Number of Respondents (persons)	Percentage (%)
1	Self-fund	4	8.51%
2	Self-fund and BRI Bank Loans	17	36.17%
3	Self-fund and Local Development Bank (BPD) Loans	6	12.76%
4	Self-fund and credit	7	14.89%
5	Self-fund, People's Business Credit (KUR), and feed mill	3	6.38%
<b>Total</b>		<b>47</b>	<b>100%</b>

Source: Primary Data (processed) 2024

The primary source of business capital for the owner of the laying hen farm business is typically their own funds and loans obtained from financial institutions, such as BRI Bank, which accounts for 36.17% of the total capital. In this case, the initial investment required for this laying hen farm ranges from IDR 120,000,000 to IDR 160,000,000 million. This investment is for a capacity of 1,000 hens, starting from Day Old Chicks (DOC) until they reach the age of 12–16 weeks (developer) and begin laying eggs.

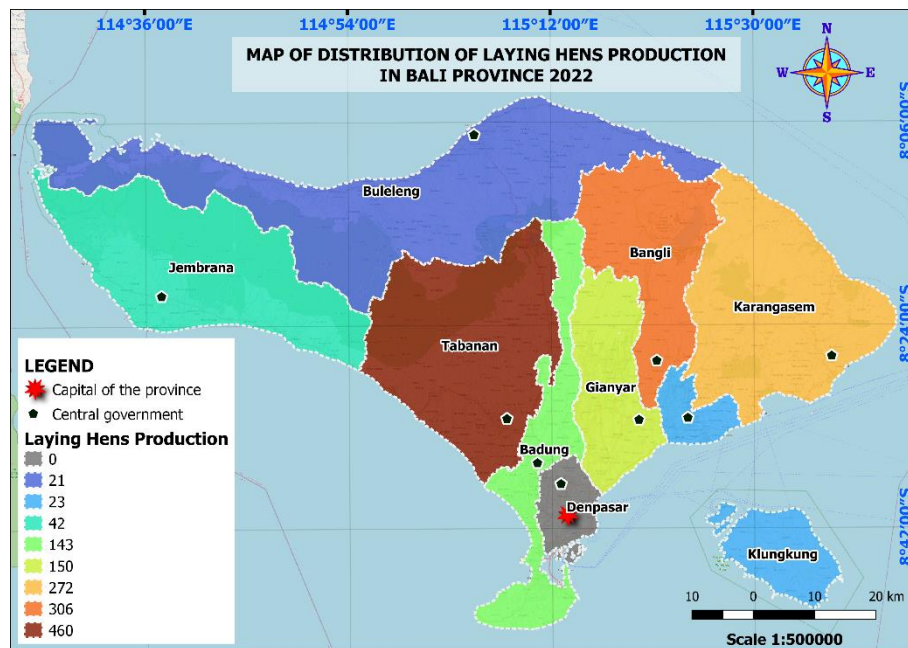
The main occupation of the owner of the laying hen farm business is primarily as a breeder, with a total of 40 individuals accounting for 85% of the workforce. The remaining 6 individuals (10%) are engaged as farmers and entrepreneurs, while 1 person is a farmer and responsible for managing grain slippage. In Jaitiluwih, Senganan, and Babahan villages, there are 33 laying hen business owners who have a livestock population of 3,001–10,000 heads. Meanwhile, 8 people have a livestock capacity of 10,001–17,000 heads, 2 people have a capacity of 17,002–24,000 heads, and 2 more people have a capacity of 24,001–31,000 heads. Additionally, there are 2 farmers who own a capacity of laying hens ranging from 59,001–66,000.

### **Agribusiness Potential of Laying Hens Farming in Penebel District**

A study conducted on the potential of laying hen farms in Bali Province in 2022 utilized data from the Bali Provincial Statistics Agency. The findings revealed that the areas with the highest production of superior commodities in the laying hen farms business are concentrated in Tabanan Regency. This information is visually presented in Figure 2.



**Figure 2. Map of Distribution of Laying Hens Production per regency in Bali Province in 2022**



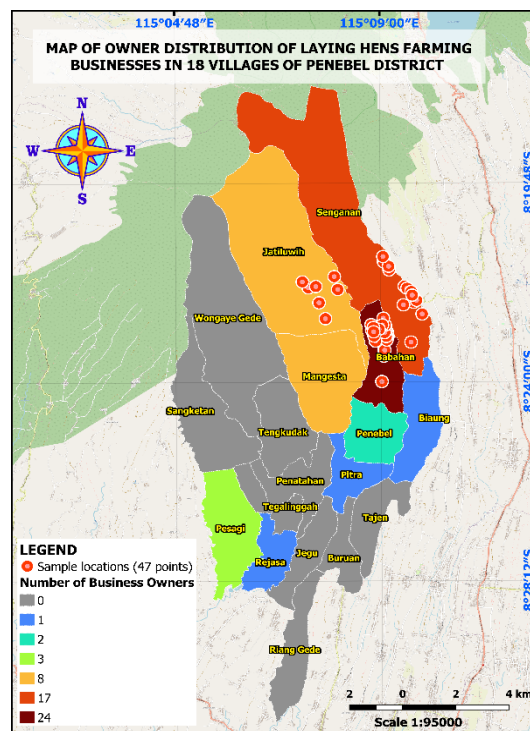
Source: Secondary Data (processed) 2024

The map displays the distribution of layer livestock production throughout different regencies, with each regency represented by a distinct color. Denpasar, represented by the grey color, indicates the absence of laying hen livestock production in 2022. The blue color represents Buleleng Regency and has a laying hen production capacity of 21,000. Klungkung Regency, represented by the light blue color, has a livestock production capacity of 23,000. Jembrana Regency, represented by greenish blue color, has a laying hen production capacity of 42,000. Badung Regency is green color and has a production capacity of 143,000. The yellow color represents Gianyar Regency and has a production capacity of 150,000. Karangasem Regency is represented by the light orange color and has a livestock capacity of 272,000. The dark orange color represents Bangli and has a livestock capacity of 306,000. The final one, distinguished by its maroon hue, is situated in Tabanan Regency. It has the highest quantity of layer chicken production compared to other regencies, notably 460,000 laying hens in 2022.

The abovementioned situation is a result of the topographical characteristics of the northern region of Tabanan Regency, which predominantly consists of flat terrain. These conditions are highly suitable for the practice of layer chicken farming. According to a study conducted by Nurlaili *et al.* (2019), flat topographical conditions are highly favorable for the practice of laying hen farming. The region's temperate climate, ample water supply, and favorable soil characteristics make it an ideal

location for the sustainable development of the laying hen farming sector. In contrast, the southern region of Tabanan Regency has high temperatures, making it less suitable for layer farming. Additionally, this region is characterized by its relatively even topography and proximity to the coastline, which makes it particularly suited to agricultural activities and the establishment of plantations owing to its rich and fertile soil. The topography of Tabanan Regency's eastern and western regions is diverse, consisting of a combination of plains and hills, but it is not as mountainous as the northern section. The eastern section, although suitable for livestock farming, lacks the ideal temperature and humidity needed for laying hens compared to the northern part. Specifically, out of the 18 villages in Penebel district, only 9 villages are engaged in taking care of laying hen farms, as depicted in Figure 3.

**Figure 3. Map of Owner Distribution of Laying Hens Farming Businesses based on UPSET Report and field observations in 18 Villages of Penebel District**



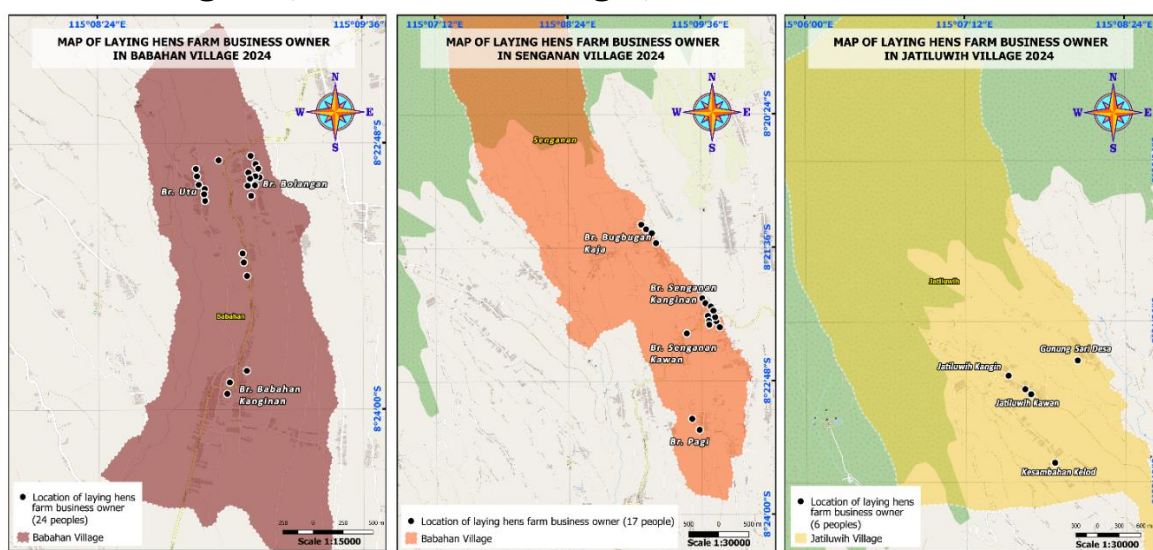
Source: Primary Data (processed) 2024

At the initial stage, the researcher conducted a survey of the laying hen farms conducted at the Tabanan District Agriculture Office. Out of the 18 villages in Penebel District, laying hen farms are only present in 9 main villages. According to Triyani *et al.* (2020), the planning phase commences by gathering data through a survey conducted with the Fisheries and Livestock Service Office to determine the estimated completion time of the study. The data obtained included information on laying hen farm owners' geographical coordinates, literature studies, and interview sessions.

A total of nine villages in the Penebel Subdistrict were selected as samples based on the research constraints of business owners with a hen population exceeding 3,000 hens and their geographical distribution across the district. The villages of Rejasa, Pitra, and Biaung each have one farmer, making a total of three farmers. The village of Pesagi, highlighted in green, has the capacity of two farmers. Following that, the villages of Jatiluwih and Mangesta, marked in dark yellow, have a total of eight farm business owners. The next hue is orange, which represents a total of 17 business owners in Senganan Village. Lastly, the vibrant red color indicates the location with the highest number of laying hen farms in Babahan Village, with a total of 24 business owners. The Quantum Geographic Information System (QGIS) application can be used to map the business areas of laying hen farms in Penebel District. These areas can be distinguished by their color and description, which are displayed in the legend on the left side of the map. The information is presented in Figure 3. The absence of a laying hen farming business in a location is shown by the gray color, followed by a progression of light hues ranging from blue, green, yellow, and orange to solid red, which represents the areas with the highest concentration of laying hen farming businesses.

On the map, there are red mapping round dots, which are markers for respondents from this study, with a total of 47 owners who operate layer farms with more than 3,000 hens, including those located in the villages of Babahan, Senganan, and Jatiluwih. For further details, refer to Figure 4.

**Figure 4. Distribution Map of Laying Hen Farm Business Owners in Babahan, Senganan, and Jatiluwih Villages, Penebel District in 2024**



Source: Primary Data (Processed) 2024

The data obtained from interviews, surveys, and observations of laying hen business owners was analyzed using the QGIS application to map the location of layer chicken farms. The Livestock Business Report (USPET) guidelines were derived from data collected through direct observation in Babahan, Senganan, and Jatiluwih Villages. The Tabanan District Agriculture and Livestock Service Office provided the guidelines, and the location points were determined by inputting the coordinates of the laying hen farm business owner's house area into Google Earth for each village. The mapping revealed that there are 24 business owners in Babahan Village, Penebel Subdistrict, who own layer chicken farms with more than 3,000 laying hens. Babahan Village comprises three *banjar* (hamlets), namely Banjar Babahan Kanginan, Banjar Utu, and Banjar Bolangan.

According to the interviews conducted with the owner of the laying hen farming business, it is evident that the late Mr. Bikin initiated the first business of this kind in Banjar Utu of Babahan Village. Following that, it gradually expanded to Banjar Bolangan and Banjar Babahan Kanginan. The expansion of the business owner's potential location extends beyond Babahan Village and now includes Senganan Village, with a total of 17 owners. In Senganan Village, the business owners are distributed among 4 Banjars: Bugbugan Kaja, Senganan Kanginan, Senganan Kawan, and Pagi. The third distribution is located in Jatiluwih Village, which includes Jatiluwih Kangin, Gunung Sari Village, Jatiluwih Kawan, and Kesambahan Kelod. In total, there are eight laying hen farm owners in these locations.

## **CONCLUSIONS**

The QGIS tool is used to create a geographic information system that simplifies the process of locating laying hen farm businesses. QGIS is a geospatial software that has the capability to handle both spatial and non-spatial data for mapping purposes. QGIS has its own database and programming language for manipulating both spatial and non-spatial data. QGIS is well-suited for mapping the production areas of laying hens and the distribution of laying hen business owners in Penebel District, Tabanan Regency. It allows for easy access, information display, and accurate data processing to determine the potential of specific locations where businesses are located in Penebel District, Tabanan Regency. The establishment of the production center area for laying hen farms in Penebel District is intended to have a beneficial impact on the growth of the livestock industry sector in Tabanan Regency.

## RECOMMENDATIONS

The Tabanan District Government and businesses in the layer farming industry are expected to collaborate in order to assist farmers in increasing their market share. Furthermore, farmers should exercise caution when selecting financial institutions and evaluating the available credit options to ensure that the loan aligns with the company's needs. Further studies are expected to contribute to exploring the possibilities for broader implementation of GIS technology in the livestock business, especially in other regions experiencing similar growth.

## AUTHOR CONTRIBUTIONS

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	Contributions	All stages of the work, starting from the survey process, prepared for data collection, conceived the analysis, and contributed the data. Data interpretation informed the preparatory stages for crafting published texts, including the inception of the first draft for publication.
	Homepage	<a href="https://pddikti.kemdikbud.go.id/data_mahasiswa/OTYxMzkzMTYtMDcyNC00MUQ1LTgxNEQtRkM5MENDQUNBMENG">https://pddikti.kemdikbud.go.id/data_mahasiswa/OTYxMzkzMTYtMDcyNC00MUQ1LTgxNEQtRkM5MENDQUNBMENG</a>
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	Contributions	Conducted, analyzed, interpreted the data, and wrote the final draft of the publication, geospatial data analyst and create layout map with QGIS open source
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