

## Assistance in Planning the Construction of Closed House Chicken Coops in Kedungrejo Village, Rembang Regency

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### Abstract:

*The high demand for poultry production has recently prompted members of the Mbesi Chicken Farmers Group in Kedungrejo Village, Rembang Regency, to focus on increasing productivity by optimizing the construction of their chicken coops. The closed-house system, suitable for the local environment and weather conditions, has been identified as the most appropriate type of poultry coop. However, the construction process is often outsourced, resulting in frequent design changes and price increases passed on to the breeders. To address this issue, the present Community Service (PkM) activity was carried out to assist farmers in creating design drawings for closed-house poultry coop buildings. The Participatory Action Research (PAR) method, involving direct mentoring, was employed to facilitate farmers in the process. The outcome of this community service was the submission of detailed design drawings for closed-house poultry coop buildings. An evaluation was conducted using pre-test and post-test assessments, revealing that 80% of participants could read and comprehend the design drawings for planning a closed-house chicken coop system. Accordingly, the findings indicated an improvement in the partner's competence in interpreting design drawings.*

**Keywords:** *chicken farmer; closed house; construction; design drawings*

### Introduction

The livestock sector has gained significant attention as a business field due to its high demand and market value. Consequently, it has led many individuals to venture into livestock farming, particularly in the

poultry industry, where selling prices have significantly increased. Post-pandemic circumstances present a promising business opportunity for chicken farmers aiming to restore economic conditions. In this regard, chicken farming, especially on an industrial-scale, holds prospects for meeting the growing demand (Widiansyah & Rahayu, 2019).

However, in 2020, Aceh Province still relied on egg imports from Medan City due to suboptimal production and internal business (Fradinata, Yaman, & Dasrul, 2022). Hence, educational efforts have been made to promote laying hen farming with an open-house coop system to meet internal egg demands. Nevertheless, out of the 20 open-house coops established, only seven were active, indicating a need for further improvement and support.

An emerging trend among chicken farmers is the desire for representative coops with large capacities that occupy minimal land area while prioritizing livestock health. This demand can be met through the concept of a closed-house chicken coop. It involves closed coops that ensure biological safety and incorporate suitable ventilation arrangements to reduce livestock stress. These coops are typically designed with permanent walls and effective air ventilation to mitigate the effects of humidity (Nuryati, 2019).

It is essential to note that increasing livestock populations without proper and efficient management can lead to fundamental problems affecting productivity, health, ecosystems, and human well-being (Repi, Ervandi, & Fahrulah, 2020). In the livestock business, adequate electrical energy is crucial for lighting and temperature control, which can result in high production costs (Putri, Fauziah, Rifa'i, Adhisuwigno, & Yulianto, 2021). Therefore, alternative approaches are necessary to optimize productivity and reduce operational expenses. Efforts to support optimal productivity in livestock farming include the implementation of native chicken coop schemes to minimize mortality rates, as observed in Sungai Batang Village, Banjar Regency (Gunawan, Djaya, & Samudera, 2018). These initiatives have been carried out on a small scale, focusing on optimizing local farming communities.

However, considering the limited scope of small-scale livestock farming, there is a need to expand such efforts.

Furthermore, the intensification program for native chicken farmers has gained community attention due to the high demand for a particular type. To improve productivity measures such as semi-intensive management, training, and assistance in hatchery management, disease prevention, housing, and brooding management should be implemented (Suwarta, Suryani, & Amien, 2021). Moreover, it should be noted that the coop layout plays a vital role in livestock productivity, as inefficient construction and layout can lead to decreased egg production and negatively impact livestock health (Syahrudin, et al., 2022).

Determining the type of chicken coop building is the primary consideration when starting a chicken livestock business. It requires careful preparation in terms of costs and robust building specifications to create a safe and comfortable design. The comfort of the coop directly impacts livestock productivity, making it essential for farmers to pay close attention to this aspect (Hasrullah, Ananda, & Qurniawan, 2022).

Considering the geographical conditions in Rembang Regency, Central Java Province, particularly in Mbesi Hamlet, Kedungrejo Village, which experiences dry weather, the choice of coop type becomes crucial for initiating a chicken farming business. Based on the site's weather conditions, the closed-house chicken coop type is the most suitable option for this area. In this regard, it is considered more secure against external weather disturbances, diseases, physical disruptions, and air pollution (Susanti, Dahlan, & Wahyuning, 2016). In addition, this type of coop can enhance animal feed efficiency for farmers.

The Chicken Farmers Group-Mbesi, Rembang, confronted the problem of relying on third parties to construct chicken coops through a wholesale system. In this context, the contractors determined wholesale prices, which could be volatile in practice, unilaterally.

Consequently, if the contractor decided to increase the prices based on the rise in material or building costs during the construction process, the breeders could not evaluate and control the bid price initially set. Moreover, constructing a closed-house system chicken coop requires higher costs than an open house (Wulansari, Sukanata, & Suasta, 2018).

To achieve efficiency during the planning and implementation stages of the closed-house system chicken coop, meticulous planning is crucial. However, the Chicken Farmers Group-Mbesi, Rembang Regency, encountered challenges due to limited expertise in planning chicken coop buildings. The lack of residents with a relevant background posed obstacles during the planning and implementation phases. Thus, the involvement of building experts becomes essential to ensure the safety and cost-effectiveness of the designed structures (Onibala, Inkiriwang, & Sibi, 2018).

Therefore, the present community service activity aimed to provide technical assistance to the Chicken Farmers Group-Mbesi, Rembang, in planning a closed-house system chicken coop building. In addition, it was anticipated to establish effective communication between universities and the community, strengthening the presence and promoting the Faculty of Engineering at Universitas Semarang, especially in Rembang Regency.

## **Method**

This community service activity was conducted in Jl. Rel, Mbesi Hamlet, Kedungrejo Village, Rembang District, Rembang Regency, Central Java Province by the team of Faculty of Engineering at Universitas Semarang. The implementation of community service activities to address partner problems involved providing assistance through understanding design drawings and planning a closed-house system for chicken coop building employing the Participatory Action Research (PAR) method. This method was chosen due to the background of the farmers in Rembang District. It involves the participation and leadership of individuals experiencing issues who take

action to bring about emancipatory social change through systematic research to generate new knowledge (Flora Cornish, 2023).

PAR is an action-based method rooted in scientific studies utilized to change, direct, and improve the state of affairs within specific groups (Nofiyanti, 2020). It seeks to contribute to knowledge construction and actualize social change and transformation (Nelson, 2014). Based on this explanation, the PAR method was applied to the farmers in Rembang District as a fundamental need to address the problem of planning design drawings for a closed-house system of chicken coop building.

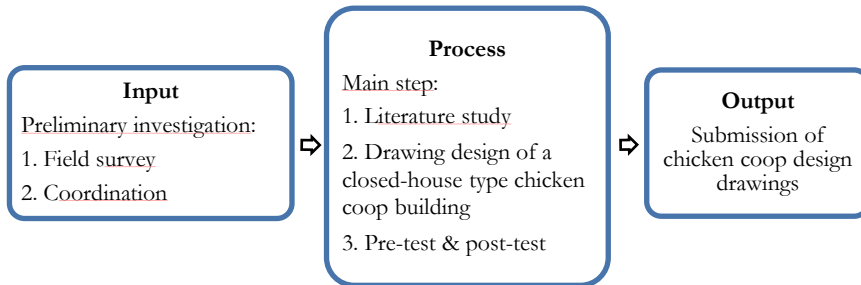
Previous studies on the PAR method demonstrated that it could create opportunities for building local capacity and enhancing the continuity of interventions. The approach engaged stakeholders, making them more responsive to systemic challenges and potential local solutions to strengthen district-level capacity in Eastern Uganda (Moses Tetui, 2017). The identical method, including lectures, workshops, reviews, action plans, and seminars, was also utilized by (Kholiq, 2022) for mentoring programs on conducting research and writing scientific papers for civil servant teachers.

Furthermore, according to (Afandi, 2020), the rationale for incorporating the PAR approach was to bring about expected changes to improve the quality of management in Islamic boarding schools, particularly in terms of professionalism, effectiveness, efficiency, transparency, and accountability in financial management (Akhmad Nurasikin, 2022). The PAR approach was also chosen for conducting Islamic Boarding School Activity and Budget, as demonstrated in another study (Zaenuri, 2020), which aimed to resolve student issues at the university by creating textbooks and assisting learners in understanding classical educational texts.

Drawing from these previous experiences with the PAR method, the detailed steps of this community service activities can be seen in Figure 1.

**Figure 1.**

*Methodology*



## **Result**

The present community service started with the initial coordination stage with the Chicken Farmers Group-Mbesi partners to communicate and comprehend the process of designing a chicken coop building. The coordination took place in November 2022, accompanied by residents who owned the land where the closed-house system would be built. The community service team obtained permits and coordinated the land measurement to align the development plan of the landowner with the design of the closed-house chicken coop system, ensuring that it met the needs of the farmers. This step strived to minimize differences in perceptions regarding the size, material specifications, and criteria of the closed-house system between the breeders and the community service implementation team.

Subsequently, on December 5, 2022, the land measurement was completed as the primary stage of this community service activity. It occurred in a rice field area where other closed-house system chicken coops owned by residents from the farmer group were already constructed. This stage facilitated the sharing and coordination process of designing the chicken coop building for the Chicken Farmers Group-Mbesi.

After the location measurement, the next step involved further coordination with the Chicken Farmers Group-Mbesi to determine the details of the land area and the design of the coop building. The

community service team subsequently used the information to create the design drawings for the construction plan, meeting the partner's expectations. It was agreed that the closed-house chicken coop system with a 12 x 30 m building would be built on the land of the Chicken Farmers Group-Mbesi.

After the coordination activities and field surveys, the community service team proceeded to the literature review stage. It marked the beginning of drawing the design for the closed-house chicken coop system. It included structural and 3D representations, subsequently proposed to the Chicken Farmers Group-Mbesi. The team discussed with the partners whether the design met their needs and whether any changes were necessary.

The design drawing for the closed-house system chicken coop building plan was created using *AutoCAD* and *SketchUp* software. The specifications of the planned building structure were designed to withstand the load and support the function using steel construction. Additionally, the building followed a two-floor concept. For the lower structure of the coop, a footplate foundation with dimensions of 50 x 50 cm and a depth of 1.00 m below the ground level was used. The foundation was made of concrete with a quality of K-225 MPa and BJTP steel with 24 MPa. A reinforcement sloof measuring 15 x 20 cm was added to support the structure. In the upper part, columns and beams made of CNP steel with dimensions of 150 x 50 x 20 x 3.2 mm and CNP steel measuring 100 x 50 x 20 x 3.2 mm were used. The second-floor plate structure was constructed using sengon, bangkirai, or teak wood, measuring 5 x 7 cm and 2 x 3 cm. The roof frame was constructed with CNP steel measuring 150 x 50 x 20 x 3.2 mm and covered with a 3.5 mm plain galvalume.

The first floor of the coop was designed to include a livestock area, serving as the central area of the building. Additionally, well and ground tank placement spaces were incorporated to meet the water consumption needs of the chickens. Two stairs were included to access the second floor, inside and outside the coop building. A warehouse for

storing animal feedstocks was also included, along with the placement of generators on the first floor. Four blowers were also installed on the back side of the coop on the first floor to provide proper air circulation.

The design of the second floor of the closed-house chicken coop system building primarily focused on the livestock area. Air filters, measuring 6 meters each, were installed on the right and left sides of the coop at the back to facilitate air circulation. These filters helped control humidity on the second floor and optimized the function of the blowers on the first floor. The livestock area on the second floor featured a wooden floor covered with tarpaulin and sprinkled with rice husks to maintain room temperature and facilitate chicken manure disposal. A worker rest area and a stopover area for workers to operate the closed-house chicken coop were also included.

The specifications of the planned building structure are displayed in Table 1, which details the technical specifications of the materials and dimensions required for constructing the closed-house chicken coop building. Design drawings of the first-floor and second-floor plans are presented in Figure 2 and Figure 3, respectively.

**Table 1.**

*The specifications of structure*

No	Structure	Type & Dimension (cm)	Total	Compressive Strength	Tensile Strength
1	Footplate	K1 50 x 50	19	K-225	BJTP 24
		K2 50 x 50	12	K-225	BJTP 24
		K3 50 x 50	2	K-225	BJTP 24
2	Sloof/ Tie Beam	S1 15 x 20		K-225	BJTP 24
3	Steel Column	CNP 150 x 50 x 20 x 3,2 x 6 m	38		
		CNP 100 x 50 x 20 x 3,2 x 6 m	24		
		KP 15 x 15	6	K-225	BJTP 24
4	Beam	CNP 100 x 50 x 20 x 3,2 x 6 m			
5	Plate	Sengon/ Bangkirai/ Teak wood 5 x 7			
		Sengon/ Bangkirai/ Teak wood 2 x 3			
6	Rafter	CNP 100 x 50 x 20 x 3,2 x 6 m			
7	Roof	Galvalume 0,35 mm			



Figure 2.

The first floor

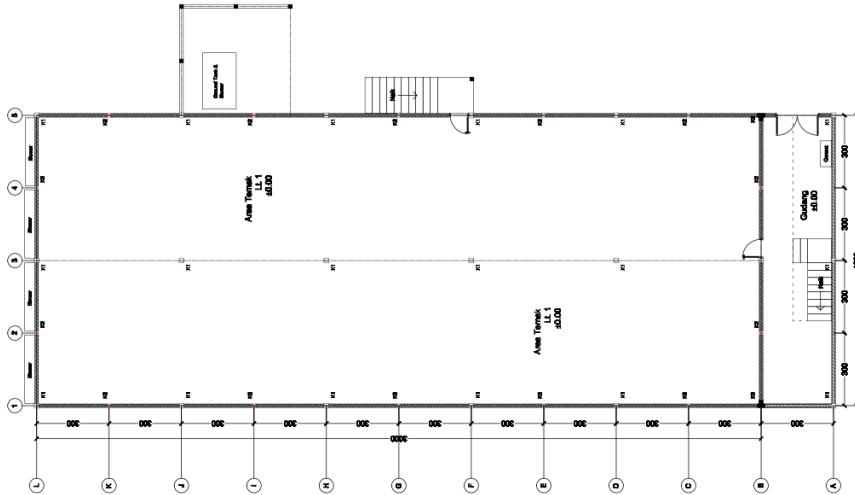
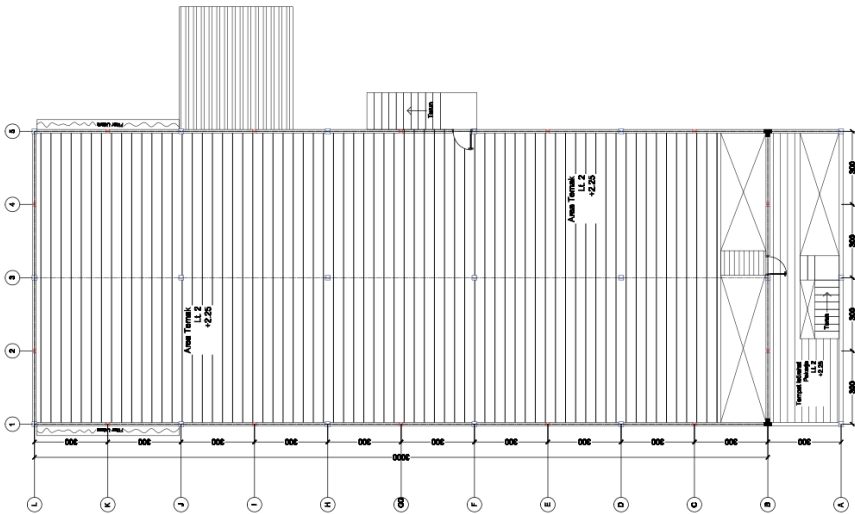


Figure 3.

The second floor



### Discussion

The community service team created 3D drawing designs based on the room requirements and farmer's requests. In order to

accommodate approximately 10,000 chickens and considering the available land owned by partners, a closed-house system chicken coop design consisting of two floors with dimensions of 12 x 30 meters was proposed. The design incorporated four blowers and two air filters to regulate air circulation and humidity within the coop, essential for maintaining optimal conditions for chicken rearing. The closed-house coop design, utilizing blowers, ensures controlled air humidity and even lighting, creating a conducive and comfortable environment for maximizing chicken growth.

One notable feature of this design is its automated feeding and watering system and well-designed ventilation, resulting in high efficiency. This coop type also enhances chickens' biological safety by minimizing their contact with external organisms. Moreover, it is environmentally friendly and suitable for farmers. The selection of materials was based on the specific needs and concept of the closed-house coop, ensuring that the specifications and criteria aligned with the intended concept. The 3D design of the present closed-house coop construction plan is presented in Figure 4 and Figure 5.

**Figure 4.**

*Site plan 3D view*



**Figure 5.**

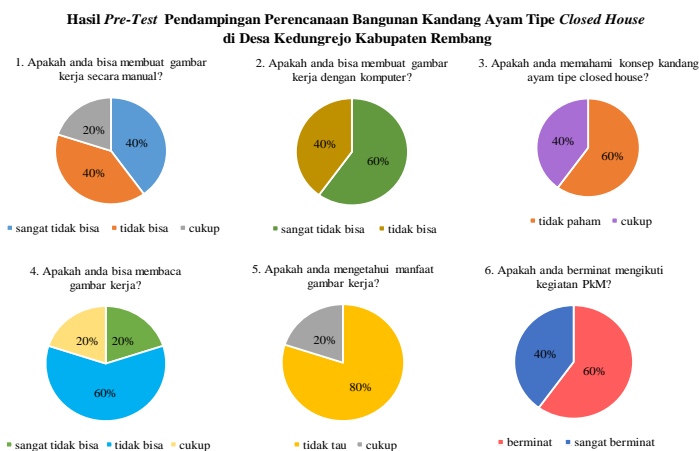
*Isometric 3D view*



The evaluation of community service activities encompassed the distribution of pre-test and post-test. The pre-test involved administering a questionnaire that utilized a Likert scale, ranging from 1 to 5, and reflected the criteria of "highly unable," "unable," "moderately able," "able," and "highly able." The responses obtained from the pre-test were subsequently analyzed to determine the next steps, particularly in deciding the appropriate form of technical assistance. The evaluation stage entailed completing pre-test and post-test questionnaires, which were filled out by five partners. The pre-test results are presented in Figure 6.

**Figure 6.**

*Pre-test result*



Based on the pre-test results, it is evident that many participants struggled with creating design drawings for the construction plan of the closed-house coop. In this regard, approximately 40% of them reported their inability to produce manual design drawings. This limitation was attributed to partners' lack of familiarity with using computers for design purposes, as they fell under the criteria of being "highly unable" or "unable." Furthermore, it was observed that 60% of the partners encountered challenges in interpreting design drawings, as they could not read them. Despite these limitations, 60% expressed interest in participating in the community service activity. Hence, the present project was conducted to assist the participants in planning the construction of a closed-house system chicken coop. The activities commenced on January 10, 2023, and employed the lecture method. Five chicken farmers actively participated. Furthermore, this community service's culmination involved submitting design drawings and collaborative documentation, as illustrated in Figure 7.

**Figure 7.**

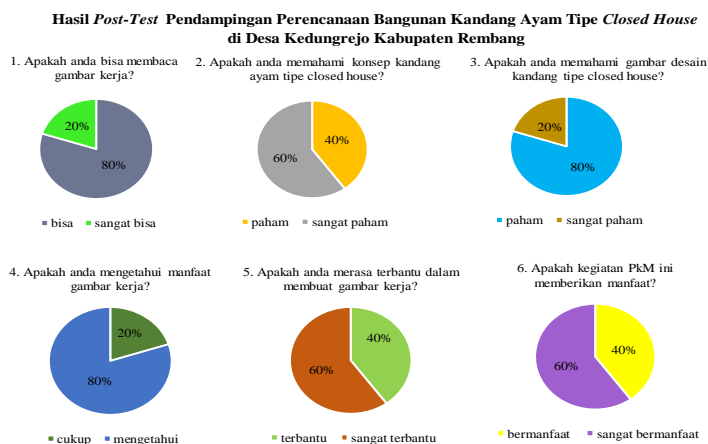
*Documentation of of the Community Service Activity*



Upon completion of the material delivery, participants were provided with a post-test evaluation questionnaire, which employed a Likert scale ranging from 1 to 5, reflecting the criteria used in the pre-test. The objective of the post-test was to assess participants' comprehension of the design drawings for the closed-house type of chicken coop building and to gauge the effectiveness of the assistance provided in addressing their concerns. A summary of the post-test results is presented in Figure 8.

**Figure 8.**

*Post-test result*



According to the data presented in Figure 8, 80% of the participants acknowledged the benefits of community service. They expressed that the activities enabled them to read and comprehend the design drawings in planning a closed-house system for the chicken coop building. This finding demonstrated a marked improvement in the participants' competence, as the pre-test results indicated that 60% were initially unable to read design drawings. The post-test results revealed that 60% of the participants felt assisted and benefited from the activity, enhancing their understanding.

### Conclusion and Suggestion

The community service activities, aimed at providing technical assistance to the Chicken Farmers Group-Mbesi in Rembang for planning the construction of a closed-house system for poultry, were successfully completed. Through the evaluation stage, from the pre-test to the post-test, notable improvements were observed in the farmers' ability to comprehend the design drawings for planning a closed-house system for chicken coop building. Initially, 60% of the farmers could not read design drawings, but 80% now understood such drawings due to this activity. It indicates that the community service activity effectively

aided partners in familiarizing themselves with and comprehending the design drawings for closed-house-type poultry coop buildings. The outcome of this community service was the submission of a two-floor building plan for the poultry closed-house system to the Chicken Farmers Group-Mbesi in Rembang. This plan would serve as a comprehensive guide for implementing coop construction in the field.

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