



Analysis of the agricultural development model and the transformation that occurred in Dagen Village, Jaten Subdistrict, Karanganyar Regency

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ABSTRACT

This research aims to explain the potential and problems in Dagen Village, structural and institutional transformation, technology transfer, as well as analysis of appropriate agricultural development models to be implemented in the village. **Methods:** Methodologically, this research consists of data collection and data analysis. Data collection was carried out by observation, interviews, recording and documentation. Meanwhile, the analysis was carried out using qualitative research methods. **Results:** The results of this research found several findings. First, the potential of Dagen Village lies in rice farming land, while the problem of Dagen Village is factory waste pollution due to industrial activities which can threaten the sustainability and productivity of the land. Second, the structural transformation that occurred was a gradual transition from agricultural activities to the non-agricultural sector, then from the industrial sector to the service sector. Third, institutional transformation occurs gradually, starting from habits, becoming culture, from the perspective of Poktan and Gapoktan it can be said to be empowered, described by the ownership of assets, mastery of science and technology, as well as freedom in making choices and decisions in agribusiness activities in rural areas. Fourth, technology transfer is channeled by various contributory parties. Fifth, the Agricultural Development model in Degan Village uses the Locational Mode model based on Von Thunen's theory that differences in transportation of each agricultural commodity from the place of production to the nearest market influence the type of land use in an area.

KEYWORDS: agriculture; Dagen Village; development; transformation

1. Introduction

The preamble underscores the significance of orchestrating, harmonizing, and optimizing pivotal and strategic sectors to bolster the national economic framework. It accentuates the pivotal role of economic development endeavors in augmenting both total and per capita income, while taking into account demographic growth, economic structural shifts, and income equalization (Haryanto et al., 2022). Indonesia's proactive involvement in a gradual and long-term economic development trajectory, particularly its emphasis on agricultural development prompted by rapid population expansion and land scarcity resulting from industrialization, emerges as a central theme (Yunas, 2019).

In the contemporary global landscape, industrialization stands out as a primary catalyst for economic expansion, steering the economic structure towards industrial

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domains owing to globalization and technological advancements (Kharisma et al., 2022). It becomes evident that industrialization bears the potential to address economic challenges such as inequality, unemployment, poverty, and agricultural issues, rendering it attractive for many nations. Notably, Indonesia's industrial sector serves as the backbone of its economy, significantly contributing 17.84% to the national GDP, amounting to Rp 4.92 quadrillion in the second quarter of 2022 according to BPS data.

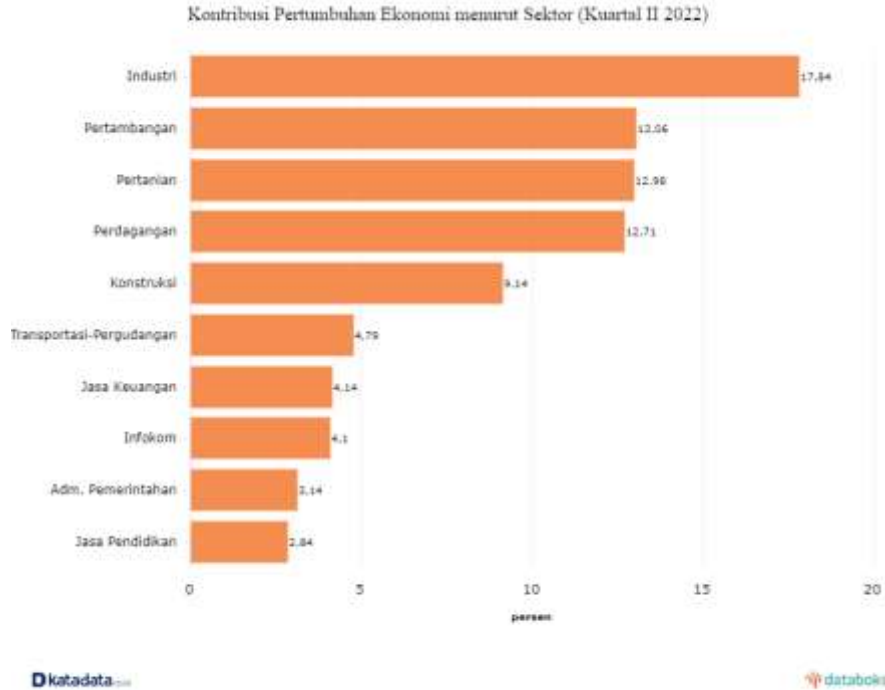


Fig. 1 Economic growth contribution by sector (Q2 2022) (katadata.com)

Amidst these economic dynamics, the imperative of rural agricultural development in Indonesia emerges as a focal point in the endeavor to fortify the national economy. The swift economic transformation from traditional agriculture to modern industry and complex service provision stands as an integral component of economic development (Fikriawan, 2017). Desa Dagen in Kecamatan Jaten, Kabupaten Karanganyar, serves as a compelling case study in this regard, shedding light on its potential, challenges, as well as structural, institutional, and technological transformations at the grassroots level (Setyawan et al., 2018).

In exploring Desa Dagen's economic landscape, it is essential to navigate through the intricacies of its potential and impediments, alongside its structural and institutional transformations, as well as technology transfer dynamics. These elements collectively form the crux of the inquiry, shaping the lens through which an apt agricultural development model can be discerned and applied within its context (Suranny, 2021). This comprehensive analysis not only offers insights into the specific challenges and opportunities faced by Desa Dagen but also provides a nuanced understanding of the broader economic development landscape in Indonesia.

Furthermore, the integration of Desa Dagen's experiences with the broader national economic development agenda serves as a valuable exercise in policy formulation and implementation. By contextualizing the local realities within the overarching economic goals of the nation, policymakers can tailor interventions and strategies to address the unique challenges and leverage the inherent opportunities present in rural areas (Churiyah, 2006). This approach fosters a synergistic relationship between grassroots

initiatives and national development objectives, thereby enhancing the efficacy and sustainability of economic development efforts.

Moreover, the examination of Desa Dagen's economic transformation offers valuable lessons for other rural communities grappling with similar challenges across Indonesia. By disseminating best practices, facilitating knowledge exchange, and fostering collaboration among stakeholders, the replication of successful models becomes feasible, thereby catalyzing broader economic development outcomes at the regional and national levels (Elizabeth & Rawung, 2017). This knowledge-sharing mechanism empowers local communities to harness their potential, address their constraints, and chart a course towards sustainable economic prosperity. The convergence of national economic development imperatives with localized efforts in rural agricultural development epitomizes Indonesia's multifaceted approach to fostering inclusive and sustainable growth. Through a judicious blend of policy interventions, institutional reforms, and technological innovations, the nation endeavors to unlock the latent potential of its rural hinterlands, thereby ushering in a new era of prosperity and progress for all its citizens (Chaerani et al., 2020).

2. Methods

2.1 Basic method

This study employs a qualitative research method, which will be described descriptively. Qualitative research method is a method to observe the condition of the object naturally, meaning that it is in accordance with its state, not manipulated by the researcher so that the condition of the object remains unchanged before, during, and after being investigated. In this study, the researcher acts as the key instrument. Therefore, the researcher must have broad theories and insights to be able to ask questions, analyze, describe, and construct the object of study more clearly and meaningfully.

The descriptive method itself means a problem-solving procedure that is traced by describing and depicting the condition of the subject or object of a study, whether it be an individual, institution, community, etc., studied at the present time, referring to the facts that are apparent or as they are. The analytical descriptive research method focuses on issues or facts as they are during the research, the processed research results analyzed to draw conclusions.

2.2 Method of determining research locations

The determination of research locations uses purposive sampling method (deliberate) where the researcher deliberately selects the research location based on specific criteria or characteristics and considerations. Based on this, the researcher selects Desa Dagen, Kecamatan Jaten, Kabupaten Karanganyar, Jawa Tengah because in Kecamatan Jaten it has the highest number of industries and a relatively small number of farmers compared to other districts in Kabupaten Karanganyar. This made the researcher interested in studying the potential and problems in the village.

2.3 Types and sources of data

Primary data is a type of data collected directly from its main sources such as through interviews, surveys, experiments, etc. Primary data in this study was obtained from surveys on the condition of Desa Dagen, Kecamatan Jaten and interviews with informants, namely the Secretary of Desa Dagen. Interviews in this study were conducted directly with relevant informants through direct visits to the Desa Dagen Office.

Secondary data is research data obtained indirectly by the researcher but through intermediaries or other media, such as websites, journal references, reports written by institutions related to this research, and other literature. Secondary data used in this study was obtained from the official website of Desa Dagen as well as from literature and other sources discussing similar research. The literature used includes journals and previous books discussing structural and institutional transformations, technology transfers, and agricultural development model analysis. Additionally, this research also utilizes direct field survey data in the form of monograph data and BPS data.

2.3 Data analysis method

The data collected in this study were analyzed using qualitative data analysis methods or techniques, which include transcription of interview results, data reduction, analysis, and interpretation of data. Conclusions can then be drawn from the results of the data analysis.

3. Results and Discussion

3.1 Potential and issues in Desa Dagen

Desa Dagen is one of the areas in the Jaten District, Karanganyar Regency, Central Java, which historically originated from beliefs in ancestors, namely the tomb of Eyang Pangeran Dagi. The name "Dagen" then emerged, considered as the first hamlet in Desa Dagen. The main potential of Desa Dagen lies in its abundant agricultural land, particularly in rice cultivation. The paddy fields covering 121 hectares produce a total of 600 tons of agricultural produce in one planting season. Moreover, Desa Dagen also has the potential of an urban sprawl, with the majority of its population working in the industrial, agricultural, and livestock sectors.

The issues in Desa Dagen include the contamination of agricultural irrigation by plastic factory waste. The plastic factories in Desa Dagen improperly dispose of their waste, affecting the water quality for agriculture. Additionally, the increasing problem of waste accumulation is a concern. Conventional waste management exacerbates this issue, but the Desa Dagen government has initiated efforts to create a waste-free environment through the Village-Owned Enterprises (Bumdes). The village government and the community collaborate in waste management to create a clean and comfortable environment.

3.2 Structural transformation in Desa Dagen

The transition process from a traditional economic system to a modern economic system, involving changes in every sector, is known as structural transformation. It is an economic change associated with labor absorption, production, trade, and other factors aimed at increasing income and social welfare. The gradual "shift" from agricultural activities to non-agricultural activities, as well as from the industrial sector to the service sector, is an integral part of structural transformation.



Fig. 2 Area plan of Dagen Village, Jaten Subdistrict, Karanganyar Regency

Based on the data obtained from the Dagen Village Office, the Dagen area consists of rice fields and company housing areas. The map indicates rice fields with green areas marked with the letter S, while blue areas marked with the letter P represent company housing areas. According to interviews with the secretary of Dagen Village, it was found that there are many facilities in Dagen Village, including pharmacies, meeting halls, banks, churches, industries, clinics, cooperatives, military posts, cemeteries, mosques, minimarkets, government offices, offices, shopping centers, train stations, and gas stations. Dagen Village can also be considered a suburban village due to its proximity to Sukoharjo Regency and Solo City. Despite having many industrial sectors, the government still regulates the entry of industries into the area through regulations.



Fig. 3 Total population of Dagen Village based on livelihoods

The image above illustrates the population data of Dagen Village based on their occupations. The livelihoods of Dagen Village residents are diverse, including civil servants, farmers, transportation drivers, entrepreneurs, military/police personnel, carpenters, service providers, private employees, farm laborers, entrepreneurs, retirees, and others. The data depicted in the chart shows that the majority of Dagen Village residents work as private employees, totaling 3,115 individuals employed in the industrial sector, followed by farm laborers and farmers, totaling 467 and 161 individuals respectively, working in the agricultural sector. The prevalence of employment in the

industrial sector is attributed to the numerous industries in Dagen Village, such as plastic factories, soy sauce factories, plywood factories, textile factories, and more.

From our interviews with several farmers, it was found that most farmers in Dagen Village lease their paddy fields from industries surrounding their landowners. Many farmers in Dagen Village consider farming as a secondary occupation after working as private employees in one of the factories near their homes. This is because, according to the farmers, farming yields are not always reliable each planting season. The presence of various dual-income farming households facilitates the process of transitioning away from the agricultural sector. This is because solely relying on farming may no longer sufficiently meet the economic needs of the household.

3.3 Institutional transformation in Dagen Village

The national economic condition can be measured through the economic activities of rural communities. The strength of the rural economy, particularly among farmers, is influenced by the stability of existing institutions. Institutional systems affect agricultural development and, consequently, rural development, so the fragility of institutions supporting community life has a significant impact on the socio-economic conditions in rural areas. If institutional systems remain stagnant, they can hinder the performance of village institutions and prevent the optimal functioning of institutions and their roles. Institutional transformation is needed for villages to adapt to globalization and modernization transfers. Likewise, Desa Dagen has undergone institutional transformation, both at the village and agricultural levels.

The aim of institutional transformation in Desa Dagen is to enhance individual assets and capabilities as well as those of farmer groups. This effort is motivated by incomplete institutional structures, reflected in the suboptimal performance of institution members, some of whom have overlapping duties, and even some members who are less responsible. Issues also arise with unclear job descriptions, ineffective coordination, and agricultural activities that have not yet followed agribusiness systems. However, Desa Dagen has developed some institutions, particularly in the agricultural sector, such as farmer groups and farmer cooperatives (Gapoktan). Institutional transformation is carried out to drive farmers towards a more advanced direction, making institutions more productive, and avoiding the possibility of discontinuation of institutional functions in the future.

In Desa Dagen, institutional transformation has shifted agricultural activities from traditional and semi-commercial to more advanced and mature. The results indicate that institutional transformation, particularly in Poktan and Gapoktan, has been successful, marked by asset ownership, technology mastery, and freedom in decision-making regarding agribusiness activities in the village.

3.4 Technology transfer in Dagen Village

The development of agriculture over time is closely linked to technological advancements that have occurred within society. The application of agricultural technology must be adapted to the agricultural context. Traditional characteristics of farmers who use simple tools are gradually shifting in Dagen Village, Jaten District. Farmers in Jaten Village now tend to utilize more modern equipment with the assistance of machinery in their farming activities. This change is due to the process of rural industrialization, which has spurred agricultural modernization in Dagen Village, Jaten District, thanks to technological advancements.

Therefore, technology transfer enables farmers to access agricultural technological advancements in Dagen Village. Technology transfer, also known as technology commercialization, is the process of transferring knowledge, resources, technology,

manufacturing methods, manufactured product samples, and facilities between governments, universities, and other institutions to ensure that technological advancements and scientific knowledge are accessible to many. The main components of technology transfer include technology resources, transfer actors, transfer media, transferred technologies, and receiving technologies. Technology transfer in agriculture is crucial to support sustainable increases in production, productivity, and income for farmers. The majority of farmers in Indonesia are small-scale farmers who often lack the resources needed to use advanced technology. Agricultural technology available to farmers in Dagen Village, Jaten District, through technology transfer is usually obtained or offered by agricultural companies such as PT Maxxi Tani Teknologi, students engaged in community service programs, and the government, such as extension workers. Here are some of the actors involved in technology transfer in Dagen Village, Jaten District.

1. PT Maxxi Tani Teknologi

PT Maxxi Tani Teknologi offers assistance to farmers in various agricultural technologies such as four-wheeled tractors, combine harvesters, and rice transplanting machines. This offering indicates that PT Maxxi is transferring agricultural technology to farmers in Dagen Village. This is because PT Maxxi Tani Teknologi is a company that accompanies farmers throughout the farming process, starting from providing seeds, pesticides, machinery, superior agricultural technology, to harvesting and market access. According to the interview results, using technology from PT Maxxi through a rental service system means that farmers incur a certain cost to utilize the technology. Operators of these technologies are usually accompanied by experts from the company to ensure optimal usage. A challenge in the successful technology transfer by PT Maxxi is the unsupportive land conditions for some technologies. For instance, the use of transplanters in Dagen Village is not yet optimal, as when using this machine, the seed age is typically short, around 15-17 days. Consequently, in such conditions, there are many snail pests in the fields, resulting in many plants not growing.

2. College students

Those involved in technology transfer in Dagen Village also include students, often engaged in Community Service Learning activities (KKN). One example of technology transfer carried out by students is the dissemination of information about Family Medicinal Plants (TOGA) conducted by students from Diponegoro University who are undergoing KKN in Dagen Village. In this activity, the KKN team explained the concept of TOGA, its benefits, the purpose of planting TOGA, and various planting tips. The event took place on July 18, 2022, at the Dagen Village Hall and was attended by 35 PKK members from across Dagen Village. This outreach aimed to encourage the community to cultivate TOGA as a preventive measure against diseases, especially in the context of the ongoing COVID-19 pandemic. Additionally, the activity aimed to enhance family health in Dagen Village. The event proceeded smoothly and successfully, evidenced by the participants' enthusiasm during the presentation of materials through online presentations and leaflets. Participants were also active during the discussion session, asking questions about plant care and suitable medicinal plants for hot climate conditions. Furthermore, UNS students have also conducted fertilizer testing using drones as an effort to address agricultural issues related to fertilizer, aiming to make agricultural cultivation more effective and efficient.

3. Government

The government also participates in technology transfer through extension activities conducted by extension workers. One such initiative is the introduction of a new program called IP 400 super fast growth, where farmers cultivate high-yielding rice plant varieties capable of being harvested up to four times a year. Some farmers in Dagen Village participated in this program, but field practices were unsuccessful due to delays or deviations in the rice cultivation process, resulting in prolonged growth periods for the rice plant varieties.

Based on interviews, Dagen Village is considered a semi-urban area, situated on the border of Surakarta City and Karanganyar Regency, with significant industrial zones impacting the village environment. These industrial zones have both positive effects, such as providing job opportunities, and negative impacts, such as pollution from factory waste contaminating rice field irrigation. Given these circumstances, the community of Dagen Village, particularly its farmers, is seen to be developing, if not approaching advancement, as they are open-minded and willing to experiment with and adopt technological advancements, especially in agriculture. The following outlines the agricultural technological advancements in Dagen Village resulting from technology transfer.

Firstly, the initial stage of technological development in Dagen Village (traditional): agricultural cultivation in Dagen Village initially relied on simple tools and direct human or animal labor. Using basic tools like hoes and sickles, farmers in Dagen Village were tasked with managing their farms and maximizing yields. Animal labor was mainly utilized for plowing the fields.

Secondly, the current technological developments in Dagen Village (modern): present-day farmers in Dagen Village predominantly employ modern agricultural technology. Simple tools like hoes or sickles are only used for light tasks such as constructing embankments for rice paddies. Hence, it is evident that modern technology has been adopted by most farmers in Dagen Village for their farming endeavors. The following are some agricultural technologies widely adopted by farmers in Dagen Village.

Tractor machines (hand tractors): The most widely used farming machinery among farmers in Dagen Village is the tractor machine, which is utilized for plowing fields. Farmers opt for tractor machines as they expedite the plowing process and save time. On average, farmers in Dagen Village typically rent these machines to cultivate their lands.

Rice transplanting machines: The utilization of rice transplanting machines in Dagen Village is not as effective or efficient. This is because, in field practice, these machines do not align with the agricultural conditions in Dagen Village. When using these machines, the rice seedlings, which are usually short-lived, approximately 15-17 days old, encounter numerous snail pests in the fields, leading to stunted growth. Therefore, solutions need to be devised to enable farmers to use these machines more effectively and efficiently for quicker and more efficient rice planting.

Combine harvester machines: Another form of machinery used in agriculture is the adoption of combine harvester machines by farmers during harvesting. This machine combines three different operations—harvesting, threshing, and winnowing—into one operation sequence. The combine harvester machine aids farmers in harvesting activities, reducing labor costs and streamlining farming efforts.

3.5 Agricultural development model analysis

Desa Dagen, with its ample agricultural land suitable for rice cultivation, has the potential to become a leading rice producer in Karanganyar Regency, yielding approximately 600 tons per planting season. Optimization of paddy farming in Dagen Village can also be achieved through technology transfer from urban areas due to its

proximity to industrial zones. The Agricultural Development Model in Dagen Village employs the Locational Model for rice commodities. Dagen Village exhibits geographical diversity, ranging from production lands to industrial areas, markets, malls, etc. The village integrates agricultural production intensively into its economic industrialization. This theory illustrates that varying transportation costs for agricultural commodities from production areas to the nearest markets influence land use types in a region. With paddy as its main commodity and proximity to markets, Dagen Village incurs minimal transportation costs.

Limitations of urban industrial development models in the agricultural sector in Dagen Village include the difficulty in achieving high economic growth rates to absorb increased labor. The predominant production of paddy in Dagen Village hinders economic growth acceleration there, as paddy cultivation has a relatively long planting season dependent on water availability, limiting it to specific planting seasons annually. Dagen Village also experiences a shift in labor from the agricultural sector to the industrial sector due to the emergence of factories in the vicinity, which require labor. Initially, Dagen Village residents engaged in farming opt to switch professions due to the clear income prospects in the industrial sector.

4. Conclusions

The conclusion drawn from the analysis of the agricultural development model and transformation occurring in Dagen Village is as follows. First, the potential of Dagen Village lies in its extensive rice farming land covering 121 hectares, capable of yielding a total of 600 tons per planting season, while the village's issues include pollution from factory waste, threatening land sustainability and productivity. Second, the structural transformation occurring in Dagen Village involves a gradual transition from agricultural activities to non-agricultural sectors, and subsequently from the industrial sector to the service sector. Third, institutional transformation occurs gradually, starting from habits to culture, as evidenced by asset ownership, mastery of technology, and freedom in decision-making in agricultural business activities in rural areas, especially in terms of Poktan and Gapoktan. Fourth, technology transfer is facilitated by various contributing parties. PT Maxxi Tani Teknologi provides agricultural technology counseling. Students conduct outreach in the form of counseling on Family Medicinal Plants (TOGA) and conduct fertilizer testing using drones. The government organizes outreach programs, such as launching the new IP 400 program, where farmers cultivate high-yield rice plant varieties, capable of yielding up to four times per year. Fifth, the Agricultural Development Model in Dagen Village uses the Locational Mode model based on Von Thunen's theory, which states that differences in transportation costs for each agricultural commodity from the place of production to the nearest market affect the types of land use in an area.

Based on the conclusions drawn from the discussion, the recommendations we provide for the agricultural development model and transformation occurring in Dagen Village are as follows. The government needs to provide appropriate training and guidance to farmers so that they can operate agricultural technology to its fullest extent. The government can involve farmers in agricultural development to mitigate the negative impacts of structural transformation.

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Conflicts of Interest

The authors declare no conflict of interest.

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