INNOVATION FOR SUSTAINABLE PRODUCTIVITY IN AGRICULTURAL LAND CONVERSION POLICY EVALUATION (EX-ANTE)

AGUS MUFARIQ[1], SINTANINGRUM[2], IRA IRAWATI[3] and IDA WIDIANINGSIH[4]

[1, 2, 3, 4] Department of Public Administration, Padjadjaran University, Bandung, Indonesia.
[1] agoesmoef710@gmail.com

Abstract

The conversion of agricultural land for the construction of toll roads is a necessity. The change requires support for the adoption of agricultural technology and innovation along with the decline in agricultural productive lands. The research objective is to analyze Innovation for Sustainable Productivity in Agricultural land conversion Policy Evaluation (Ex-ante). The research method uses case studies of farming communities affected by land conversion. Source of data for community research and farmer groups with interactive data analysis. The finding shows Productivity has not been fully directed to sustainability and it's getting down. Agricultural innovation is limited to the adoption of agricultural machines causing problems for both labor and the environment. Farmers use conventional methods. The adoption of agricultural technology is based on changes in attitudes, subjective norms, belief control, and strengthening of the existing community structure, both state agency or nonstate role. Both actors make the process of adopting technology with a cultural approach easier. Persuasive efforts to Agricultural technology adoption as outlined in the form of innovative regional policies for sustainability productivity. Innovative policies will facilitate the technology adoption process of communities to increase agricultural sustainability

Keyword: Adoption of innovation, Agricultural productivity, Ex-Ante Evaluation, farmers, sustainability,

INTRODUCTION

The study of innovation in policy has attracted the attention of both academics and practitioners, including in the field of innovation in agriculture. Martin suggests that the definition of science policy and innovation studies (SPIS) is quite broad but the essential element is material which is characterized by the terms innovation, technology, R&D, and science using various social science disciplines such as economics and policy studies, management science, organizational studies, sociology. Martin confirms the term 'innovation studies' is relatively new, whereas the term 'science policy' dates back four decades or more (Martin, 2012). Martin conveyed the challenges of studying innovation along with the shift from manufacturing to services and the growing need for sustainability and increased welfare rather than just pursuing economic growth life (Martin, 2016). In the realm of policy, politicians are also concerned with innovation, how to design policies that stimulate innovation has become a hot topic at various levels of government (Fagerberg & Verspagen, 2009).

Innovation in various fields is a necessity, including agriculture in developing countries. Developed agriculture has supported economic and social life. On the other hand, agriculture is accused of being one of the factors causing sustainability problems. The overuse of chemicals, clearing of forests and the use of technologies that make the soil harder are common agricultural phenomena in developing countries. Agriculture in developing countries tends to be more mechanized than concerned with sustainability. This can be seen from the massive use

of machine technology and the use of chemicals for productivity. Furthermore, Amiri et al., stated that the demands on the agricultural system are not only related to productivity, sustainability is an orientation in agricultural development (Amiri et al., 2019).

In general, the existing agricultural system has not paid attention to the sustainability aspect. Attention to agricultural sustainability is still lacking. Whereas sustainable agriculture is an option that shows an ethical responsibility for sustainability. This choice is stronger when agricultural land is getting narrower due to the construction of toll roads. Farmers are faced with the choice to remain productive with increasingly narrow land conditions. For farmers, change demands a change in the agricultural system.

For road construction and land-use change to provide optimal benefits, it is necessary to change the agricultural system adopted. The decrease in the amount of land that results in decreased productivity can be corrected by the adoption of sustainable innovations. Many studies on innovation have been carried out. Related to land-use change and orientation to adopt sustainable agricultural systems are still rarely done. The results of the research can be used as a basis for formulating policies in the conversion of agricultural land for the development of sustainable agricultural systems. Chavas and Nauges stated that innovation has become an important part of the economic development process (Chavas & Nauges, 2020). Each group has different variables that affect innovation adoption. The acceptance of new ideas and the rejection of these ideas are based on various factors. Brown et al., suggest that profitability does not appear to be the main driver in implementing innovative practices (P. Brown & Roper, 2017). Adoption of innovation requires an understanding of the social changes that occur. The change in conventional agricultural culture to a sustainable system is a complex process, even rejection based on social norms and perceptions, social environmental pressures influence a person's behavior to reject innovation as stated in (Ajzen, 2011). (Läpple & Rensburg, 2011) explain based on the concept put forward by (Rogers et al., 2003) that the use of information, age, environmental attitudes, profit motives, and attitudes are related to innovation adoption. (Pathak et al., 2019) stated that the factors that influence the diffusion of innovation are 1). Innovation (the characteristics of the innovation itself); 2). Communication and the influence of the availability of information and communication channels; 3). External context, namely external socio-economic factors such as environmental regulations); 4). Adopters (individuals who use the innovation); 5). System antecedents for innovation (business features); 6). Readiness of the system for innovation (features of the structure and process of business adoption/ not adopting innovation); 7). Linkage (relationship between businesses adopting/not adopting innovations and other parties related to innovation); 8). Assimilation (the unit of adoption is a team rather than an individual); 9). The implementation process (the nature of the activities and the environment in which the assessment, adaptation, and improvement involved in the adoption of the innovation take place). (Issa & Hamm, 2017) explain the process of accepting innovation adoption based on a rational choice perspective. The adoption of innovation in the TPB perspective is based on the expectancy-value model. 7). Linkage (relationship between businesses adopting/not adopting innovations and other parties related to innovation); 8). Assimilation (the unit of adoption is a team rather than an individual); 9). The implementation process (the nature of the activities and the environment in which the

assessment, adaptation, and improvement involved in the adoption of the innovation take place).

In line with (Pathak et al., 2019), Issa and Hamm explain the process of accepting innovation adoption based on a rational choice perspective. The adoption of innovation in the TPB perspective is based on the expectancy-value model. Issa and Hamm explain the process of accepting innovation adoption based on a rational choice perspective. The adoption of innovation in the TPB perspective is based on the expectancy-value model. Issa and Hamm explain the process of accepting innovation adoption based on a rational choice perspective. The adoption of innovation in the TPB perspective is based on the expectancy-value model (Issa & Hamm, 2017).

Various models or theories have been proposed to explain and provide an understanding of innovation adoption. However, (Clarke et al., 2018) asserted that innovation adoption is a complex process. (P. Brown & Roper, 2017) added that the findings of the studies discussed regarding the adoption of innovations above are often inconsistent.

Therefore, a study on the adoption of innovations in communities affected by land-use change needs to be carried out to obtain study findings that can be used as a basis for developing sustainability-oriented policies in the agricultural sector. (Bentley et al., 2021) describe promoting innovation in an essentially complex agricultural value chain. Innovation studies shed light on the complexities of innovation adoption at the individual level providing rich insight into the key drivers, barriers, and elements for innovation in rural communities that serve as the basis for developing policies to support sustainable innovation adoption. (Jara & Schokkaert, 2017) suggest that evaluation of ex-ante policies at the individual level is still rarely carried out. (Švarc et al., 2020) argue about the role of public science and research-based innovation that is increasingly needed. The results of the research can be used as a basis for formulating policies in the conversion of agricultural land for the development of a sustainable agricultural system. The adoption of innovation requires research support as a basis for strengthening arguments in policies to ensure sustainable productivity. Ex-ante evaluation as a challenge to the assumptions built in the policy and clarify the main questions that serve as the basis for determining the requirements of policy planning. The research objective is Innovation for Sustainable Productivity in Agricultural land conversion Policy Evaluation (Ex-ante).

LITERATURE REVIEW

Ex Ante Evaluation

The policy evaluation stage is a process to measure success in the policy. However, these stages are generally carried out at the end after the policy is implemented. (Kraft & Furlong, 2021) argue that policy evaluation is a process that aims to inform the public and policymakers for better decisions. Legitimacy or necessity becomes an important indicator for the success of the program. Evaluation is a claim of policy consequences, namely facts and values (Dunn, 2018). Policy evaluations involving value premises can be prospective and occur before action is taken (ex-ante) (Dunn, 2018). (Samset & Christensen, 2017) describe ex-ante evaluation as involving assessments using specific criteria and actions against expected standards or values such as knowledge and relative effects on strategic plans. (Samset & Volden, 2016) add that ex-ante

viability evaluation applies a long-term perspective and planners need to consider several possible future scenarios.

Adopt innovation

Innovation has become an important part of the economic development process. The concept of innovation adoption was put forward by (Rogers et al., 2003) as a process in which an individual or an adoption unit called an adopter goes through the stages since knowing the innovation was first introduced, followed by the implementation of new ideas and ensuring the decision to accept or reject the innovation. Diffusion is the process by which (1) an innovation (2) is communicated through channels (3) over time (4) among members of a social system. Agricultural innovation as a technological 'package' to increase the productivity of agricultural businesses (Ogundari & Bolarinwa, 2018; Weyori et al., 2018). Regarding the adoption of innovation (Abdullah et al., 2020) stated that innovation was created to facilitate, simplify the farming process and increase production. The adoption of technology in agriculture is evolving along with the demands of productivity and growth. Innovation platforms improve agricultural output such as new technologies, practices, and business models (Totin et al., 2020).

Sustainable productivity

In general, productivity is related to the input and output capacity of a process. The basic concept of productivity is simply a measurement of the output (how much can be produced as output) of the resources (inputs) used in a production process. (Asadollahpour et al., 2019) stated that the achievement of economies of scale and the structure of agricultural production (agricultural size and production methods) has been the cause of agricultural production efficiency, which means that input productivity is higher than output. (Jiang et al., 2017) suggest that the problem in agricultural productivity is land consolidation and policy. (Omotilewa et al., 2021) suggested that agricultural productivity is determined by various aspects, not only land area as evidenced in the non-linear U-shaped relationship between farm size and productivity. Continuously evolving inputs and processes determine sustainable productivity in agricultural systems.

METHODOLOGY

The qualitative approach in research on agricultural innovation to achieve sustainable productivity involves a value premise, is prospective, and occurs before actions that have been taken (ex-ante). Researchers Focus on interactive processes events (focusing on the process of interpretation and events) related to the adoption of agricultural innovations due to land conversion policies.

Sources of data are farmers affected by land conversion, local officials, and agricultural extension workers who were interviewed both online and offline. The farmers who were interviewed were 17 farmers including agricultural landowners, 6 farm laborers. Interviews with farmers were aimed at obtaining an overview of productivity and activities after land conversion was carried out. The total land converted from 17 landowners is 23 ha.

The officials interviewed were the head of the toll road construction project, the head of the local government spatial planning office. The purpose of the interview with the project leader is related to the development of toll road construction.

Interviews for religious leaders and observers of socio-economic issues were conducted for complementary data and to clarify the point of view of toll road construction on community agricultural productivity. Unstructured interviews with religious/community leaders and observers of socio-economic issues, namely academics from local state universities.

Interviews were conducted with questions according to the research objectives with a focus on the process during which the toll road development policy was being implemented and planned for the next stage. The impact of toll road construction on the sustainability of agricultural community activities around the construction site is of concern. Preliminary data show that there is a decrease in productivity after land conversion. The decline in productivity is a negative trend that will have an impact on the overall productivity of the community. For 6 months the researchers conducted in-depth interviews with related parties. It can be seen that the community's agricultural productivity towards changes that will occur after the completion of the toll road construction is very weak due to the lack of community response and local government policies to anticipate a decline in productivity through agricultural agro-industrial policies or the adoption of innovations that are by public acceptance.

Observations were made on the location of the hardening of rice farming areas for toll roads and agricultural activities after the land conversion plan. Observation of agricultural land that is being worked on by farmers, harvesting activities, as well as activities to send agricultural products to local rice barns.
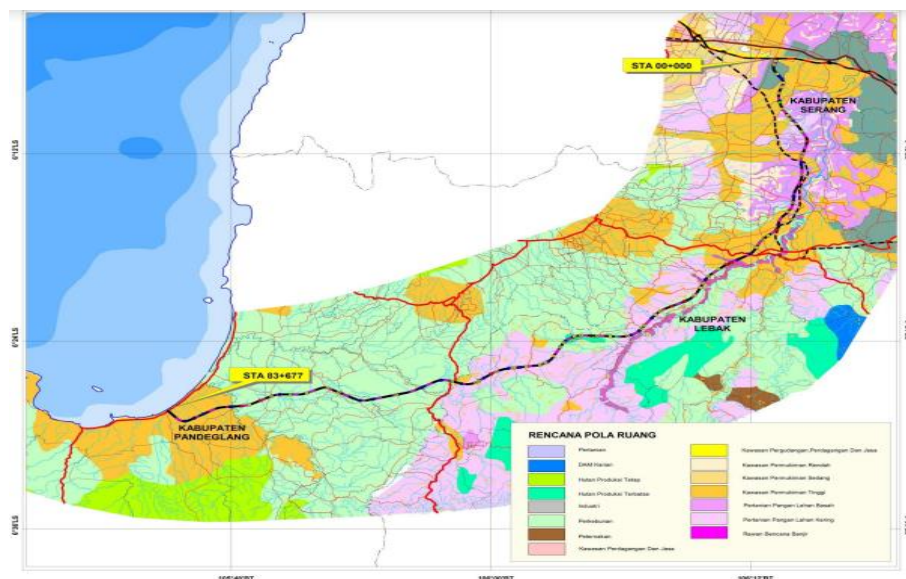
Analytical analysis

Data analysis techniques using interactive procedures start data reduction, data display as well as verification and conclusion. The data analysis stage is at the reduction stage, the researcher focuses on selecting the data from interviews and observations as well as documents that are under the research objectives, displaying data assisted by research assistants in the field, verifying data for 2 weeks, and drawing conclusions based on valid data through data triangulation. Based on interview data sources and data collection techniques.

RESEARCH FINDINGS AND DISCUSSION

The change in the function of agricultural land to toll roads that occurred in Serang Banten is the impact of toll road construction. Approximately 8000 hectares in 3 districts have shifted from rice fields, fields have changed functions. The changes caused 26 families who were the source of data for farmers' livelihoods to turn into traders or temporarily not carry out agricultural activities.

Image: Construction of the Serang Panimbang toll road 2021

Agricultural activities of the community affected by land conversion are reduced. This can be seen from the total productivity of farmers. There was a significant decline in productivity in the 2 existing sub-districts, namely Pagelaran and Bojong sub-district. In general, the productivity of rice and secondary crops has decreased significantly. Total productivity decreased significantly. Agricultural land, both paddy fields affected by the development, is 3,012 ha and not paddy fields 1440. The impact of land change is the decline in agricultural productivity in 2020 from the normal capacity for Bojong and Pagelaran sub-districts. The productivity of rice plants in Pandeglang Regency in the area of land conversion per ha is sharp in the 2 Bojong and Pagelaran areas to an average of 4.2/ha from 5. 7 /Ha for rice and 9.8/ha for secondary crops from 9.2 /Ha. These conditions have an impact on food security, which is currently a government priority.

Observation results show that land conversion for the construction of toll roads is fast and most of them do not focus on efforts to encourage agricultural innovation. The farmers who became the source of the data began to leave their agricultural land and shift their livelihoods by becoming traders or temporarily looking for new agricultural land as a substitute. The results of interviews with data sources obtained the conclusion. The construction of the Serang-Panimbang Interchange/Exit Toll Road has not been followed by the community's readiness to face the social changes. The changes in the agricultural areas are not followed by community readiness to optimize productivity through the support of the adoption of agricultural technology. People turned into laborers, traded, and left the world of agriculture. Even though changes in the function of agricultural areas will have an impact on reducing the utilization of local agricultural products and the sustainability of agricultural land and food availability.

People who work as farmers and are the source of research data stated that at this time they have not been directed in groups to adapt agricultural systems so that they remain productive with the available land. People prefer to wait and see the direction of the toll road construction. Most expect that the construction of toll roads will have a positive impact on people's lives,

such as easy access to education and health as well as other public services, including increasing agricultural production and facilitating the distribution of agricultural products. It is recognized that with the construction of roads, farmers will find it easier to sell agricultural products and have higher bargaining power. So far, agricultural products such as rice are mostly sold on the spot (production location) to middlemen at lower prices. This is due to the reluctance of farmers to incur transportation costs to sell them to markets such as Serang and Tangerang which are generally accepted at higher prices.

Road construction is considered positive and is believed to provide benefits for farmers. But on the other hand, the farming community lacks confidence that they can benefit from the construction of toll roads related to their work as farmers. The community has difficulty obtaining benefits from the construction of toll roads by their work as farmers, especially with the condition of reduced agricultural land.

The adoption of agricultural innovations cannot be left to farmers. As stated by Ogundari & Bolarinwa 2018 that technology adoption as a complex process is related to technology packages and agricultural systems that are not yet known or familiar to farmers (Weyori et al., 2018).

The attitude of farmers towards the adoption of agricultural innovations is very weak. Attitudes hinder the adoption of innovations. People tend to have a negative attitude, do not believe in existing innovations, and do not have direct experience in adopting technological innovations in agriculture. The results of confirmation to agricultural extension workers and village officials in charge of development economics show that farmers rarely adopt modern agricultural systems such as the use of pesticides, the use of machine technology is very limited for the rice production process. Various innovations in agriculture have not been accessed. Data sources stated that they had never accessed information about agricultural innovations except for information obtained from extension workers. The extension workers themselves have limitations both in terms of personnel and programs, especially during a pandemic. Practically, agricultural extension activities are very limited. The results of interviews and observations show that the attitude of rejecting the adoption of innovations is based on the level of community knowledge of innovations in agriculture.

Conventional values in cultivating land are still the reference for most people in performances and Bojong. Farmers in the Bojong and Pagan areas are farming the conventional way and have been using it for decades. Agricultural innovations are still very rarely chosen, such as the use of water-saving agricultural methods or agriculture that uses quality seeds and organic fertilizers as a way to maintain soil fertility. Fertilization of rice by farmers relies more on chemical fertilizers with less well-controlled quantities and doses. Support for the use of innovative agricultural systems to support productivity from both the community and village officials is still lacking. Not infrequently found the implementation of rice planting that is not in unison to reduce pests such as birds and field rats. The use of organic materials for fertilizers is still rare due to the high cost and the evidence obtained is still weak. The farmers admit that they have not received much support from colleagues, family, and local officials to use the agricultural system as stated, namely environmentally friendly agriculture.

Farmers claim to have little control over the innovative and productive rice cultivation system. The lack of experience and knowledge is one of the inhibiting factors. Farmers' confidence in the agricultural innovation system is still weak. Even though in terms of productivity and cost calculations, the use of the rice cultivation system is quite reasonable, the lack of support has led to pessimistic farmers choosing to use the "normal" method. Although the opportunity to access good information from available information technology is quite high, the lack of confidence in their ability to implement agricultural innovation systems causes farmers to be reluctant to adopt these innovations.

This fact becomes the basis for policymakers and policy implementers to formulate programs related to the adoption of agricultural innovations to increase productivity and sustainable food security. Productivity is not only influenced by the existence of agricultural land. In line with (Martin, 2016) who stated about the challenges regarding science policy and innovation studies (SPIS), to increase the acceptance of innovation adoption by farmers in Bojong and Pagelaran sub-districts, a paradigm shift from the existing regional policy concept is needed. The actors in the field are required to better understand the construction of the farmers' thinking. Attitude, the subjective norm as well as the ability of farmers to control agricultural innovation and take a more active approach with a culture-based approach. Policies to encourage agricultural innovation that describe policy change as a service and sustainable growth are lacking.

The actors in the field are required to broaden the attitudes of farmers towards the adoption of productive and sustainable agricultural innovations. as stated by (P. Brown & Roper, 2017) profitability does not seem to be the main driver in the application of innovative practices, (Läpple & Rensburg, 2011) previously explained based on (Rogers et al., 2003) about the importance of understanding the environment, attitudes, profit motives and attitudes in innovation adoption. In line with (Bentley et al., 2021) who argued that promoting innovation in the agricultural value chain is inherently complex. However, the communication process between state and non-state actors with farmers through a cultural approach will facilitate changes in attitudes and behavior of farmers in adopting agricultural innovations. As stated by (Weyori et al., 2018) that there is an opportunity to increase the social role of the network of change agents in innovation systems which will increase the diffusion and adoption of agricultural technology and focus farmers to be trained on modern innovations of agricultural systems and technology and act as a reservoir of knowledge that guaranteed for the community.

In line with (Pathak et al., 2019) who stated the importance of communication in the innovation adoption process, state and non-state actors are required to be able to include communicating values according to expectations by adopting innovative and productive agricultural systems. In contrast to (Issa & Hamm, 2017) who argue that acceptance based on rationality, acceptance of agricultural technology adoption in Pandeglang cannot be explained from the perspective of rational choice or the expectancy-value model. Acceptance of technology adoption is influenced by the position of state and non-state actors, culture, and even beliefs, as well as the government policy process itself.

In line with (Amiri et al., 2019), (Brown et al., 2021) agricultural productivity need to emphasize the sustainability aspect as a whole. Through innovation, farmers in the performance area and Bojong who experience a decline in productivity will be able to increase their

productivity through the adoption of agricultural innovations. As stated by (Abdullah et al., 2020) innovation is created to facilitate, simplify the farming process and increase production, (Asadollahpour et al., 2019) innovation enable the achievement of economies of scale. Agricultural innovation requires innovative policy support. In line with (Švarc et al., 2020) who argued about the importance of research to enrich the study of innovation and public science. The development of an agropolitan area after the construction of a toll road with the main function as a center for developing rural agricultural potential in Pandeglang Regency requires an innovative policy framework based on an understanding of attitudes and public acceptance of the adoption of agricultural innovations. In line with (Ajzen, 2011) who argues about behavioral changes based on attitudes, subjective norms, and belief in control, changes in the behavior of farmers to adopt agricultural innovations begin with their attitude to change and various other factors from a very complex environment. The theory proposed by (Ajzen, 2011) with TPB can provide an understanding of the behavior of farmers in adopting innovations. However, changing attitudes and adopting innovations are complex issues.

In line with (Jiang et al., 2017), policies that encourage sustainability productivity are needed with a paradigm shift from the policy itself which is more on service construction and the need for sustainability. Policy as a system to support innovation adoption as stated by (Pathak et al., 2019). Therefore, the policies are formulated based on the knowledge obtained in the field. (Jacob, 2006) suggests that community involvement as a source of knowledge as well as recipients of innovative policies increases the possibility of using policies for sustainable agricultural productivity.

Ex-ante evaluation that is prospective and occurs before action is taken (ex-ante). has provided information for policy improvement and supporting policies. The evaluation carried out can provide strategic information about the main options for the government and the community in responding to changes in land use at the early stages of the policy as well as influencing the course of road construction policies as the biggest effort in solving problems of declining agricultural productivity and can have an impact on food security. . Ex-ante evaluation is useful for studying different scenarios and the effects of changes in certain parameters during policy implementation as well as new phases in the policy to achieve the strategic objectives of the policy.

CONCLUSION AND IMPLICATION

The adoption of agricultural innovations is a process that requires both structural and cultural support. The role of change agents from both state and non-state actors in persuasive efforts to adopt agricultural technology using cultural means to determine attitudes, subjective norms, and belief in control of farmers in agricultural adoption. Agricultural adoption which is limited to agricultural mechanization creates social and environmental problems. The adoption of agricultural technology requires strengthening local policies that are oriented towards sustainable productivity. Innovative policies that facilitate the technology adoption process for communities affected by land conversion to increase agricultural productivity sustainably. Further research is needed on ex-ante policy evaluation that shows the interface between innovation, policy, and sustainability. The policy implications are that first, policymakers and non-state actors build partnerships to strengthen learning interactions among farmers and

expand information networks among farmers. Second, expanding access to information about extension and innovation results to encourage late adopters to switch to mid or even early adopters and to increase the role of farmers as innovators of agricultural technology that is appropriate to the context. Through the dissemination of information, the adoption of innovation will be wider in scope with a relatively faster time. Farmers can adapt to the demands of development that push the area into an industrial area. Policies need to be formulated to accelerate the innovation adoption process in line with the industrialization-oriented toll road construction process.

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