

Conference

Innovation for Sustainable Productivity in Agricultural Land Conversion

Agus Mufariq*, Sinta Ningrum, Ira Irawati and Ida Widianingsih

Program Studi Administrasi Publik, Fakultas Ilmu Sosial dan Ilmu Politik, Universitas Padjadjaran, Bandung, Indonesia

ORCID

Agus Mufariq: 0000-0002-0010-848X

Abstract. The conversion of agricultural land for the construction of toll roads is a necessity. The change requires supporting agricultural technology and innovation to combat the decline in agricultural productive lands. The research objective was to analyze the Innovation for Sustainable Productivity in Agricultural Land Conversion policy. Case studies of farming communities affected by land conversion were used. The sources of the data were community research and farmer groups with interactive data analysis. The findings showed that productivity was not fully directed to sustainability and productivity decreased. Agricultural innovation was limited to the adoption of agricultural machines causing problems for both labor and the environment. Farmers used conventional methods. The adoption of agricultural technology was based on changes in attitudes, subjective norms and beliefs, and strengthening of the existing community structure and both state and non-state agency roles. Involving all relevant actors made the process of adopting technology with a cultural approach easier. Efforts to persuade adoption of agricultural technologies were outlined in the form of innovative regional policies for sustainability. Innovative policies can facilitate the technology adoption process of communities to increase agricultural sustainability.

Keywords: adoption of innovation, productivity, sustainability, farmers, toll road construction

Corresponding Author: Agus Mufariq; email: agoesmoef710@gmail.com

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1. 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, confirms the term 'innovation studies' is relatively new, whereas the term 'science policy' dates back four decades or more. Martin (1) 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. In the realm of policy, politicians are

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also concerned with innovation, how to design policies that stimulate innovation has become a hot topic at various levels of government (2).

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., (3) stated that the demands on the agricultural system are not only related to productivity, sustainability is an orientation in agricultural development.

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 actually 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.

In order 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 (4) stated that innovation has become an important part of the economic development process. 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., (5) suggest that profitability does not appear to be the main driver in implementing innovative practices. 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 (6). Lapple and Van Resnburg (7) explain based on the concept put forward by Rogers (8) that the use of information, age, environmental attitudes, profit motives and attitudes are related to innovation adoption.

Pathak et al., (9) 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 and Hamm (10) 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). Issa and Hamm (10) 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 to Pathak et al., (9), Issa and Hamm (10) 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 (10) 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 (10) 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.

Various models or theories have been proposed to explain and provide an understanding of innovation adoption. However, Clarke et al., (11) asserted that innovation

adoption is a complex process. Brown et al., (5) 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., (12) 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 and Schokkaert (13) suggest that evaluation of ex-ante policies at the individual level is still rarely carried out. Švarc et al., (14) argue about the role of public science and research-based innovation that is increasingly needed.

Public policy innovation can substantively reinforce solving problems that occur in the community. Although policy innovations are carried out not following trends or seasonally, policy innovations can be an alternative decision in the dimensions of public policy in the present and the future. Innovation policies and innovations in public sector activities are oriented to address market failures and in particular. Innovation in the public sector can also overall affect productivity growth, increase product value through organizational improvements, the need for policies that are in line with economic developments in the global era (15).

Innovation has become an important part of the economic development process. The concept of innovation adoption was put forward by Rogers (8) 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. Regarding the adoption of innovation Abdullah et al., (16) 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.

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., (17) 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., (18) suggest that the problem in agricultural productivity is land consolidation and policy, Omotilewa et al., (19).

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. The research objective is Innovation for Sustainable Productivity In Agricultural land conversion Policy Evaluation (Ex-ante).

2. Methods

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 whom affected by land conversion, local officials and agricultural extension workers who were interviewed online. Observations were made on the location of hardening of rice farming areas for toll roads and agricultural activities after the land conversion plan.

Data analysis techniques using interactive procedures start data reduction, data display as well as verification and conclusion.

3. Results 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.

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

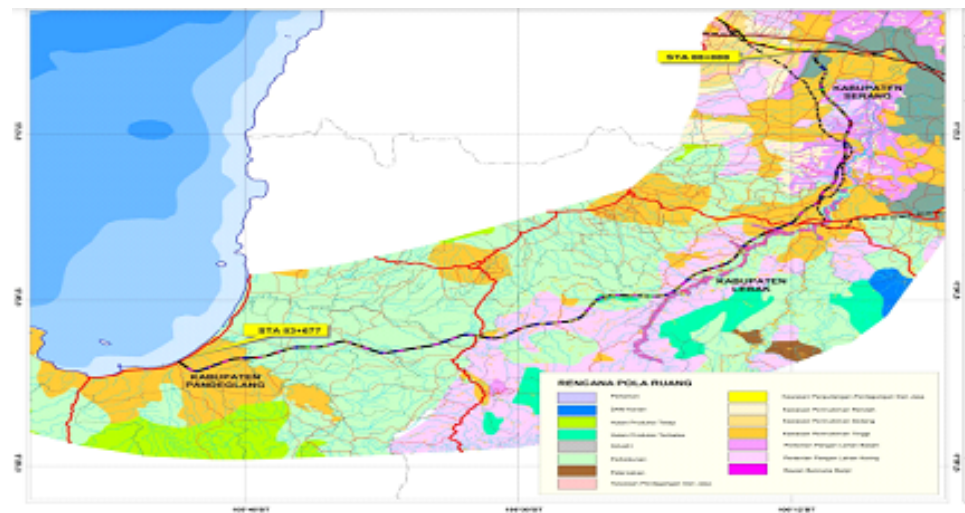


Figure 1: Construction of the Serang Panimbang toll road. (Source: Biro Bina Infrastruktur & Sumberdaya Alam, Banten Province, 2021)

is the decline in agricultural productivity in 2020 from 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 agricultural area are not followed by community readiness to optimize productivity through the support of 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 adopt 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 production such as rice is 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 positively 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 in accordance with their work as farmers, especially with the condition of reduced agricultural land.

The adoption of agricultural innovations cannot be left to farmers. 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, but 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 policy makers and policy implementers to formulate programs related to the adoption of agricultural innovations in order to increase productivity and sustainable food security. Productivity is not only influenced by the existence of agricultural land. In line with Martin (1) who stated about the challenges regarding science policy and innovation studies (SPIS), in an effort 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, 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 Brown et al., (5) that profitability does not seem to be the main driver in the application of innovative practices, Lapple and Van Resnburg (7) previously explained based on Rogers (8) about the importance of understanding the environment, attitudes, profit motives and attitudes in innovation adoption. In line with Bentley et al., (12) 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.

In line with Pathak et al., (9) 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 and Hamm (10) 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., (3), Brown et al., (20) agricultural productivity needs 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., (16) that in fact innovation is created to facilitate, simplify the farming process and increase production, Asadollahpour et al., (17) innovation enables the achievement of economies of scale. Agricultural innovation requires innovative policy support. In line with Svarc et al., (14) 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 (6) 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 (6) 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., (18), 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., (9). Therefore, the policies are formulated based on the knowledge obtained in the field. Jacob (21) 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.

4. Conclusion

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 in a sustainable manner. Further research is needed on ex-ante policy evaluation that shows the interface between innovation, policy and sustainability.

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