



# Cultural Values Transformation of Momosad in the Management of Wetland Rice Fields in the Buffer Zone of Bolaang-Mongondow National Park

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## ABSTRACT

Momosad is a *gotong royong* activity in which a group of farmers work together to maintain their land. Currently, Momosad is transitioning from a labor-based to a wage-based Momosad (commercial). The research aims are (1) to uncover Momosad's cultural values, which are still relevant today, (2) to describe the elements that influence changes in the values in land management, and (3) to examine patterns of changes in the values. This study employed a qualitative technique using the Miles and Huberman Model, involving interviews, observations, and documentation. Data was processed using the triangulation rule. The results suggest that there are three types of Momosad agricultural production activities in Dumoga. (1) Pure-Momosad has family values; (2) Semi-Momosad values unity and dependence. (3) Non-Momosad (commercial) values include agreement and dependency. There are three variables that influence Momosad's change: (1) pre-colonial, (2) colonial, (3) development, and (4) regional autonomy. Cultural contact, development period, and regional autonomy all have a significant impact on the pattern of change in the value. The pattern of change began with cultural contact between transmigration and local residents, evolved into the power to form villages during Momosad construction, and the autonomy of the region became a political commodity used to rally the masses.

**Keywords:** Cultural Values, Rice Field Management, Momosad Transformation

## INTRODUCTION

Developing countries often aim to transition from a traditional society with an underdeveloped economy to a contemporary agricultural economy, with modernization and transformation being one of the steps required to better the situation. Modernizing the agricultural sector takes time, and policies that assist this shift include an emphasis on providing fundamental needs and infrastructure in the agricultural sector to generate sustainable economic growth, eliminate poverty, and increase people's welfare. However, development in the agricultural sector has not been as expected, where there are many crop failures due to uncertain climate, low rice productivity in every place, inadequate production and non-production facilities, and most importantly at this time is the low participation of farmers in managing agricultural land, increasing farmer poverty resulting in a lack of farming capital, many young generations leaving agriculture because it is considered an old García-Frapolli *et al.* (2021).

To catch up, Indonesia must prioritize agricultural growth to achieve domestic food security, prevent famine, and minimize food imports (Choi *et al.* 2021, Crost *et al.* 2021). The development of the agricultural sector requires partners and cooperation between the government, private sector, and local communities to increase production and productivity in the form of investment in agriculture, provision of supporting services, market access, establishment of cooperatives, irrigation facilities as water providers throughout the planting season, processing facilities until post-harvest, and development of an efficient agricultural supply chain. These amenities in the research region include a large-scale Toraot irrigation dam and the availability of agricultural shops throughout the area to promote rice and plantation crop development (Tosiani *et al.* 2021). The availability of these facilities and infrastructure encourages the transformation of conventional agriculture into a modern technology-based agricultural system, which is consistent with the findings of McMilan 2023, Cui *et al.* 2021, Flemming 2021, and Eriksson 2021, who discovered that the use of technology transforms the entire traditional value chain into a modern, efficient, and maximal system. This progress has also altered local thinking toward Momosad (mutual cooperation in agricultural work). Momosad is a Bolaang Mongondow community culture that prioritizes cooperation in agricultural activity, both during the harvest season and

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on land. In the social sector, Momosad participates in marriage activities, mourning, circumcisions, and other thanksgiving celebrations. Currently, Momosad contributes to the development of the agricultural economy in this region and has undergone a transformation from traditional or voluntarism (working for labor without pay) to modern agriculture, which works by providing labor and is paid in the form of wages (commercialization) using the most up-to-date facilities and technologies to increase agricultural production quickly and efficiently. The transition from traditional to modern culture is a sort of rationalization caused by the flow of globalization and agricultural technology, which has changed this region into North Sulawesi's greatest rice cultivation center.

Previous researchers have conducted extensive research on cultural transformation in agricultural land management (Pranadji & Hastuti 2004, Kistanto 2018, Dakir 2017, Salam & Ahmad 2023, Kanianska *et al.* 2014, Ives & Kendal 2013, Hasa *et al.* 2020, Suamba *et al.* 2022, Kassa *et al.* 2017, Alexander *et al.* 2019, Yang *et al.* 2018). What distinguishes this study is that previous studies focused on cultural changes in land management in general, whereas this observation focuses on the transformation of values of togetherness and dependence into values of agreement and motivation based on current developments in wetland agricultural land management and harvest time.

This study was conducted in Bolaang Mongondow area of Dumoga District as a paddy production hub, using two subdistricts to represent the research objectives: Dumoga Tengah District and Dumoga Utara District as buffer areas for paddy fields. The area was chosen based on the high activity of paddy farmers who employ Momosad as a means of production in the form of farmer group labor, which allows them to work together to manage paddy fields till harvest. The research objectives are: (1) to determine the manifestation of Momosad cultural values that are applied to the management of plantation and rice field farming businesses; (2) to describe the factors that change the cultural values in the management of plantation and rice field farming; and (3) to analyze patterns of change in the cultural values in a contemporary manner.

## METHODS

This study employs a qualitative technique to analyze the Miles and Huberman model. Data collecting strategies included interviews, observations, and recording utilizing a triangulation model to ensure the accuracy of data or information gathered from diverse viewpoints on the cultural value of Momosad in rice cultivation. This study used a case study research design to gather data, providing a clear, in-depth, and

comprehensive picture of Momosad cultural shifts in paddy field management. In-depth studies were conducted on farmers, key informants, and traditional leaders to obtain valid and accurate information using participatory observation as a method of interacting and directly observing community groups that use and do not use momosad in agricultural land management, as well as attempting to explore changes in Momosad through events and facts over the last few years that have experienced changes in land management. Data analysis consisted of data reduction, data display, and conclusion drawing/verification. The degree of data validity was determined by the level of trust (credibility), transferability, dependability, and certainty (confirmability). The study lasted three months (September 2024–November 2024) in the Bolaang Mongondow Regency.

## RESULTS AND DISCUSSION

### Manifestation of Momosad in Plantation and Rice Field Farming Businesses

Momosad is a cooperation activity carried out by farmers in agricultural work such as land management, maintenance, and harvesting of agricultural products, which is carried out together by community groups with the goal of completing the work quickly. Momosad means "working together" in the Bolaang Mongondow language and is translated as "mutual cooperation" in Indonesian. For generations, local farmers in this area have engaged in Momosad activities, both agricultural and social in nature. In the agricultural sector, it takes the form of working together to finish land clearance, plowing rice fields, land upkeep, and harvesting agricultural products. While in the social arena, Momosad can be applied to both happy and sad events such as weddings, circumcisions, reading prayers, and mourning activities in the form of neighbors assisting one another to finish work together. In certain locations, the culture of mutual cooperation was recognized by different labels but has the same purpose, namely cooperation like the Minahasa area known as *Mapalus*, the Gorontalo area called *Huyula*. In Sundanese community it is known as *Sabilulungan*. *Rewang* is known in the Javanese community, while *Marsiadapari* and other terms refer to mutual collaboration in the Batak society.

Momosad culture for the Bolaang Mongondow community includes the values of cooperation, agreement, dependency, and motivation. Each of these four values has had a significant meaning for the Bolaang Mongondow community since its inception in the respective region, beginning with the spirit of Momosad values in fighting colonialism based on solidarity, a sense of togetherness, and an agreement to unite against the colonizers until a long time passed and the values of Momosad underwent a

transformation in seeking a living following the colonial period. Momosad ideals continue to evolve in the spirit of motivational values aimed at improving life after colonialism. If in the past, fighting the colonizers, working to open land, planting, and harvesting still used the value of togetherness in working together and taking turns using human power in returning work, it eventually shifted to commercial values of a daily wage system or contract in working and finishing work. Since the 1980s, it has become difficult to find Momosad culture in this area. According to the findings of a survey of researchers conducted in different communities, the culture still exists, although it has changed in terms of repayment. If labor was formerly utilized, wages are now used to compensate for someone's work in managing rice fields or plantations.

The following is a manifestation of Momosad cultural values, which include agreement, togetherness, dependence, and motivation values used in rice field management. The use of these values can be divided into three groups based on the type of work: pure-Momosad, semi-Momosad, and not-Momosad (Figure 1). The application of Momosad is determined by the type of work and the level of difficulty of the work; the more difficult the work, the more each farmer group's energy and professionalism are required to participate, indicating a higher level of commercialization based on the value of agreement and motivation; conversely, the lighter the work, the higher the value of pure-Momosad, which works on togetherness and interdependence between farmer groups.

- (1) Pure-Momosad promotes the notion of family and togetherness, hence assistance is provided voluntarily (without payment). The labor is not too difficult or time-consuming because it only helps for a short period of time, and it does not require a lot of energy from the workers that come to help. Because the level of difficulty is low, the type of work only employs family labor and neighbors in the rice fields who share the same interests, such as irrigating all rice fields, so that activities such as

repairing embankments, rice field bunds, repairing irrigation, and sowing rice are part of the pure-Momosad work. Agricultural machinery has not been used in pure-Momosad activities because farmers continue to use human labor for irrigation maintenance, embankment repairs, and other tasks. In pure-Momosad, the value of oneness takes precedence over the other three.

- (2) Semi-Momosad promotes the virtues of connection and dependency. Semi-mMmosad job is distinguished by the level of difficulty and lightness of the work supplied, as well as the fact that it does not require workers' time. Employment includes planting, plowing rice fields, fertilizing, and transportation. Family labor is still widely used in semi-Momosad since the work is light and easy to do. The work has been aided by technical instruments such as land management, plowing equipment, and transportation tools such as motorcycles and cars to carry agricultural products, making the task easier and reducing the amount of time workers spend performing it. Wages are not as expensive as in commercial-Momosad because they are determined based on the time and energy of workers who are bound by the importance of togetherness in the family or relatives. earnings are determined based on the type of work, time, and energy provided by workers, and apply equally to everyone who arrives, both men and women, to help with the work with the supply of daily earnings, which are lower than the commercial-Momosad wage of IDR 50,000–IDR 100,000. While the value of dependency stands out in this category since each participant in this society is motivated by the same goals, namely increasing agricultural output for landowners and raising salaries for workers. At this stage, technology tools have been utilized in rice field cultivation activities to loosen the soil, such as agricultural tools and machinery, as well as a sprayer. Unlike pure-Momosad, it does not employ agricultural machinery because the nature

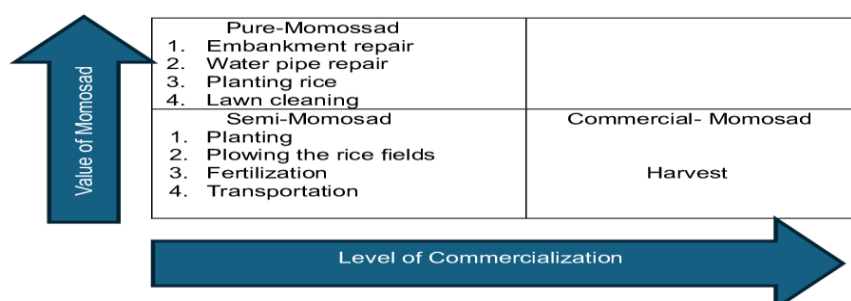


Figure 1 Manifestation of Momosad rice field management.

of job does not necessitate such machinery. Using agricultural machines is according to the type of work.

- (3) Commercial-Momosad (not-Momosad) can be identified in every harvest activity; throughout the harvest period, Togetherness in pure-Momosad is turned into agreement and motivational values. In this phase, commercial-Momosad workers are available to the public, both individuals and groups, with strong physical strength, productive age, and experience, and apply to both men and women without regard for wages, with the provision of timely work according to the initial agreement between the landowner and the worker. During the harvest season, there is a strong agreement on the necessity for Momosad in the form of labor since it concerns the timeliness of task completion, and if the harvest is postponed, the quality of the harvest would suffer. To bind the agreement, a daily wage of IDR 150,000/person is set according to the regional standard and is already included in the consumption prices of each worker. In this phase, the use of agricultural machinery for harvesting is rare due to the high rental costs, and all farmer groups use agricultural machinery that is difficult to obtain, except for rice threshers, which are widely used, so the use of human labor for harvesting is more practical, easy, and fast. The high wages offered during the harvest season encourage workers' motivation to be stronger in harvesting activities as a reward for services, whereas the value of the agreement in the form of implementation is in the form of deliberation and trust between both parties, which is binding between workers and landowners to agree on the time and accuracy of work completion.

### Factors of Change in Momosad Cultural Values

The factors that influence value change in Momosad can be classified into four periods: (1) Pre-Colonial, (2) Colonial, (3) Development, and (4) Regional Autonomy. Momosad ideals in the management of plantation land and rice fields evolved over time based on four phases. The values of togetherness, reliance, agreement, and motivation alter in each phase. In the Pre-Colonial phase, the values of togetherness and dependency were dominant because the Mongondow community had not yet had any influence on their life behavior. Life was far from technological advancements; people were still illiterate and had no knowledge of religion; and the way people gathered in groups was limited to looking for food in a nomadic manner to meet their group's needs, such as hunting, gathering wild leaves to make vegetables, and gathering old sago trees to be processed into staple foods. This practice was carried out by multiple heads of households in groups, after which the food is brought and shared among the group

and their families. At that time, agreement and motivational values were not geared toward personal goals, but rather toward collective interests in nomadic groups and assisting one another in finding food for their group's needs freely, truly, and without compensation.

Momosad underwent changes throughout the Colonial time; Pre-colonially, the value of togetherness was so high that people worked together to discover food sources, but during the Colonial period, the value of togetherness shifted to fighting the colonizers. During the Colonial period, local kings activated the value of unity by collaborating with the Colonial to create agricultural products to fulfill the demands of local leaders or the King. The type of work was working on coconut plantations, climbing coconut trees, processing coconuts, and clearing land, but the value of the agreement in this phase did not apply to workers because they felt disadvantaged and received no compensation from the landowner, so farmers did not want to work on the plantation. During this time, Momosad ideals were transformed into values of togetherness to fight the colonizers, and they were applied to workers with a strong sense of idealism. However, the values of dependency and motivation apply to workers who require government conveniences while prioritizing the values of motivation and dependency on their community to find and labor on plantation land that serves their group's needs.

Momosad values contribute to the development of regions producing agricultural products on a local and national scale, which are built together to support the increasing number of agricultural and plantation production. Dependency values and motivational values were very strong at this time, when the community is encouraged to build public facilities, rice production, and human resource development. During the Development era, the values are mobilized and managed by the government, ensuring that Momosad works in an organized manner to achieve each Repelita's aim, with rice production in the Dumoga regional development phase becoming the focus of rice self-sufficiency. During this period, pure-Momosad and semi-Momosad have been in effect, such as rotating work among members of the Momosad group, and motivational values have emerged because they are familiar with wages and a profit-sharing system, such as the 5-1 system (five sacks of grain to the landowner, one sack of grain to the worker), so that during the development period, the desire to work among Momosad members has increased in response to work needs.

### Changes in Momosad during the Regional Autonomy Period

The value of agreement was particularly high during the regional autonomy period and shifted from traditional to commercial after the reformation (Table 1). The agreement's worth in this phase is more

commercial (commercial-Momosad), or the orientation favors wage services above working truly and supporting one another among group members by taking turns in exchange for labor (pure-Momosad). The value of the regional autonomy agreement begins with a meeting between investors and workers to agree on wages, working hours, and time constraints. During the Autonomy Period, the value of togetherness shifted from producing agricultural products, including land management activities, maintenance, and harvesting of agricultural products, to a value of togetherness in public activities.

Now, the value of togetherness is being driven primarily by political measures aimed at building public interest in the political sphere. Political policies drive the development of public infrastructure and agricultural facilities such as schools, roads, and fertilizers for farmers. At this point, agricultural production is not a priority, resulting in lower output and higher pricing in local and national markets, leading to a growth in society's commercial lifestyle. This social transition has shifted from a traditional to a modern consumer society, in which all goods have economic value, so that meeting requirements (dependency value) necessitates employment with economic value in the form of income (motivational value). Thus, the value of agreement and togetherness are driven by the value of incentive and dependency to meet the wants of a modern consumer culture.

### Momosad Cultural Values Change Patterns

Momosad cultural values are developed based on the requirements of the community, and they are polarized based on those needs today. The pattern of change in Momosad cultural values based on closeness and dependence. These values begin to emerge following cultural encounters, such as transmigration. With the transmigration of a group of farmers from diverse tribes who have a strong work ethic, the Dumoga area has become an area of significant economic significance, with rice fields being cultivated as a focus for regional development. The following depicts the polarization of traditional-commercial Momosad values (Table 2).

Polarization patterns change of Momosad traditional to commercial shows the stages of life of the Mongondow community according to developments starting from the entry of transmigration (cultural contact), the development period (infrastructure development in the form of mutual cooperation to build villages, bridges, road repairs, and other public facilities), regional autonomy (political dynamics, where Momosad is used as a political commodity to gather the masses), and the consumerism period. In the image above, Momosad changes and is implemented in the field based on the conditions of each phase. Each period's growth conditions shift the value of momosad from voluntarism to consumerism/rationality (wages). These principles are developed and agreed upon based on the needs of landowners and working farmers. The form of change includes the value of the agreement, where it is agreed to carry out the work and the landowner will provide wages after all of the agreed-upon work is completed, while the value of cooperation changes into wages; previously, it was only repaid with labor if someone came to help with the work, but now it is paid for every laborer who comes to help with land management and harvesting. The daily compensation is IDR 150,000, and employees work from 8 a.m. to 4 p.m., providing their own supplies.

Thus, Momosad may adapt to any level of civilization or situation. This is evidenced by the existence of Momosad in the present, which is more reasonable than voluntarism. This suggests that Momosad's principles can still be seen in the lives of people today by establishing a polarization of change in response to the changing times. The findings are consistent with previous research that supports the transformation of rural communities' cultural values toward modernization, which has an impact and contributes to agricultural development by increasing the productivity of rural farming businesses using the Momosad culture of cooperation with a wage system that responds to and anticipates the demands of life in the globalization market. Thus, the transition of cultural values is a natural occurrence in the social system, sustainable rural economy (Pranadji & Hastuti 2004, Kistanto 2018, Dakir 2017, Salam & Ahmad 2023, Kanianska *et al.* 2014, Ives & Kendal 2013, Hasa *et al.*

Table 1 Factors of change in Momosad values

	Pre-Colonial	Colonial	Development	Regional Autonomy
Agreement	–	+	++	+++
Togetherness	+++	++	+++	+
Dependence	+++	++	+++	+
Motivation	–	+	+++	+++

Table 2 Polarization of changes in Momosad traditional to commercial values

Transmigration	Infrastructure development	Autonomy	Consumerism
Cultural contact	Economic development	Political dynamics	International regional/transformation

2020, Suamba *et al.* 2022, Kassa *et al.* 2017, Alexander *et al.* 2019, Yang *et al.* 2018).

## CONCLUSION

Based on the results and discussion given, three conclusions can be reached. Momosad is a local cultural practice in the Bolaang Mongondow community that involves farmers working together to manage agricultural land, including preparation, crop management, and harvesting. In its practice, three types of Momosad values may be identified: pure-Momosad, which promotes kinship and solidarity; semi-Momosad, which emphasizes togetherness and interdependence; and non-Momosad (commercial culture), which prioritizes agreements and motivational features. Momosad ideals have evolved over time, with each form having a unique historical significance. During the pre-Colonial period, Momosad was characterized by values of solidarity and dependency among members in obtaining food for life. During the Colonial era, local authorities or kings used these principles to rally farmers to work on plantations developed in collaboration with colonial powers. Momosad made significant contributions to food stability during the development era, beginning with strong consensus values that promoted regional development and agricultural output on both local and national scales, backed up by ideals of unity, interdependence, and motivation.

During this time, the government harnessed and managed Momosad values to achieve collective progress. During the era of Regional Autonomy, the values evolved into more commercial forms. Solidarity values were increasingly driven by political policies aimed at serving public interests, such as the development of public infrastructure and agricultural facilities, such as schools, roads, and fertilizer distribution to farmers, all of which were political in nature. Momosad cultural values have polarized in response to socio-historical trends. These transformations may be traced back to the period of transmigration, the developmental era characterized by large-scale infrastructure projects, and regional autonomy, all of which contributed to the commercialization and consumerist orientation of Momosad in farming areas. As a result, Momosad has undergone global alteration, influencing its practice and significance in rural agricultural life.

## REFERENCES

Adro F, Franco M. 2020. Rural and agri entrepreneurial networks: A qualitative case study. *Land Use Policy*.

99(1): 105117.  
<https://doi.org/10.1016/j.landusepol.2020.105117>

Alexander P, Reddy A, Brown C, Henry RC, Rounsevell MD. 2019. Transforming agricultural land use through marginal gains in the food system. *Global Environmental Change*. 57(101932): 1–26  
<https://doi.org/10.1016/j.gloenvcha.2019.101932>

Arifanti VB, Novita N, Tosiani A. 2021. Mangrove deforestation and CO<sub>2</sub> emissions in Indonesia. In IOP Conference Series: *Earth and Environmental Science*. 874(2021): 1–9 IOP Publishing.  
<https://doi.org/10.1088/1755-1315/874/1/012006>

Belay M, Mengiste M. 2023. The ex-post impact of agricultural technology adoption on poverty: Evidence from north Shewa zone of Amhara region, Ethiopia. *International Journal of Finance & Economics*. 28(2): 1327–1337. <https://doi.org/10.1002/ijfe.2479>

Cánovas MA, Canovas SA, García FE. 2021. City traditional agriculture dialogues: The Huerta de Murcia case study. *Land Use Policy*. 111(2021): 105780.  
<https://doi.org/10.1016/j.landusepol.2021.105780>

Choi CS, Ravi S, Siregar IZ, Dwiyantri FG, Macknick J, Elchinger M, Davatzes NC. 2021. Combined land use of solar infrastructure and agriculture for socioeconomic and environmental co benefits in the tropics. *Renewable and Sustainable Energy Reviews*. 151(c): 111610.  
<https://doi.org/10.1016/j.rser.2021.111610>

Cui Y, Khan SU, Deng Y, Zhao M, Hou M. 2021. Environmental improvement value of agricultural carbon reduction and its spatiotemporal dynamic evolution: Evidence from China. *Science of the Total Environment*. 754(142170).

Dakir D. 2017. Pengelolaan budaya inklusif berbasis nilai belum bahadat pada huma betang dan transformasi sosial masyarakat dayak Kalimantan Tengah. *Religió Jurnal Studi Agama*. 7(1): 28–54.  
<https://doi.org/10.15642/religio.v7i1.707>

Eriksson O. 2021. The importance of traditional agricultural landscapes for preventing species extinctions. *Biodiversity and Conservation*. 30(5): 1341–1357. <https://doi.org/10.1007/s10531-021-02145-3>

Fleming A, Jakku E, Fielke S, Taylor BM, Lacey J, Terhorst A, Stitzlein C. 2021. Foresighting Australian digital agricultural futures: Applying responsible innovation thinking to anticipate research and development impact under different scenarios. *Agricultural Systems*. 190(2021): 1–10.  
doi:10.1016/j.agry.2021.103120

- Gatti N, Baylis K, Crost B. 2021. Can irrigation infrastructure mitigate the effect of rainfall shocks on conflict? Evidence from Indonesia. *American Journal of Agricultural Economics*. 103(1): 211–231.
- Hasan SS, Zhen L, Miah MG, Ahamed T, Samie A. 2020. Impact of land use change on ecosystem services: A review. *Environmental Development*. 34(100527).  
<https://doi.org/10.1016/j.envdev.2020.100527>
- Ives CD, Kendal D. 2013. Values and attitudes of the urban public towards peri urban agricultural land. *Land Use Policy*. 34: 80–90  
<https://doi.org/10.1016/j.landusepol.2013.02.003>
- Janvry AD, Sadoule E. 2020. Using agriculture for development: Supply and demand side approaches. *World Development*. 133(105003).  
<https://doi.org/10.1016/j.worlddev.2020.105003>
- Kassa H, Dondeyne S, Poesen J, Frankl A, Nyssen J. 2017. Transition from forest-based to cereal-based agricultural systems: A review of the drivers of land use change and degradation in Southwest Ethiopia. *Land Degradation & Development*. 28(2): 431–449.  
<https://doi.org/10.1002/ldr.2575>
- Kanianska R, Kizeková M, Nováček J, Zeman M. 2014. Land-use and land-cover changes in rural areas during different political systems: A case study of Slovakia from 1782 to 2006. *Land Use Policy*. 36(1): 554–566.  
<https://doi.org/10.1016/j.landusepol.2013.09.018>
- Kistanto NH. 2018. Transformasi sosial budaya masyarakat Indonesia. Sabda: *Jurnal Kajian Kebudayaan*. 13(2): 169–178.  
<https://doi.org/10.14710/sabda.13.2.169-178>
- Knickel K, Ashkenazy A, Chebach TC, Parrot N. 2017. Agricultural modernization and sustainable agriculture: Contradictions and complementarities. *International Journal of Agricultural Sustainability*. 15(5): 575–592.  
<https://doi.org/10.1080/14735903.2017.1373464>
- Pachayappan M, Ganeshkumar C, Sugundan N. 2020. Technological implication and its impact in agricultural sector: An IoT-based collaboration framework. *Procedia Computer Science*. 171(2020): 1166–1173.  
<https://doi.org/10.1016/j.procs.2020.04.125>
- Pranadji T, Hastuti EL. 2004. Transformasi sosio budaya dalam pembangunan pedesaan. *Analisis Kebijakan Pertanian*. 2(1): 77–92.  
<https://doi.org/10.21082/akp.v2n1.2004.77-92>
- Purcell W, Neubauer T. 2023. Digital twins in agriculture: A state of the art review. *Smart Agricultural Technology*. 3(100094): 1–11.
- Salam S, Ahmad A. 2023. Transformasi teknologi panca usahatani dan dampaknya terhadap sistem sosial ekonomi dan budaya petani Bugis Makassar di Sulawesi Selatan. Tarjih: *Agribusiness Development Journal*. 3(01): 26–33.  
<https://doi.org/10.47030/tadj.v3i01.627>
- Shamdasani Y. 2021. Rural road infrastructure & agricultural production: Evidence from India. *Journal of Development Economics*. 152(102686).  
<https://doi.org/10.1016/j.jdeveco.2021.102686>
- Suamba IBS, Wiryasa NMA, Dwijendra NKA, Putra IDGAD. 2022. Characteristics and deviation patterns of agricultural land use in tourism area of Canggu, Bali, Indonesia. *Caspian Journal of Environmental Sciences*. 20(2): 423–430.
- Yang Y, Liu Y, Li Y, Li J. 2018. Measure of urban rural transformation in Beijing Tianjin Hebei region in the new millennium: Population land industry perspective. *Land Use Policy*. 79(2018):595–608.  
<https://doi.org/10.1016/j.landusepol.2018.08.005>