Edunity

Volume 3 Number 1, January, 2024
p- ISSN 2963-3648- e-ISSN 2964-8653
Doi: 10.57096/edunity.v3i1.214
https://edunity.publikasikupublisher.com/index.php/Edunity/index

THE IMPACT OF AGRICULTURAL LAND USE ON PERI-URBAN SETTLEMENT FORMATION DRIVERS IN HIGHLAND LANDSCAPES: A CASE STUDY OF KAYUMAS VILLAGE

Jehan Fakhirah[1], Renny Nurhasana[2]
Universitas Indonesia, Indonesia
E-mail**:** jehan.fakhirah@ui.ac.id

ABSTRACT

The Peri-Urban as part of the urban spatial structure, plays a crucial role in creating urban space. In Situbondo, the characteristics of the Peri-Urban consist of mixed urban and peri-urban land use areas, with agriculture dominating the land use. One of the livelihoods in the Peri-Urban is agriculture. Variables in this study involve elements of settlement morphology, factors influencing the formation of morphology and agriculture, and various other indicators related to these variables. This paper aims to examine the characteristics of agriculture areas and identify factors influencing the formation of peri-urban settlements. This research can provide references to optimize land use in peri-urban settlements. In this study, the researcher employs both qualitative and quantitative methods. The data collection involves questionnaires to obtain accurate and reliable research results. The data will be processed using SPSS and ArcGIS 10.8.2 to obtain relevant, supportive, accurate, and comprehensive results. From the findings of this research, it is expected that peri-urban settlements require more attention to enhance the environment and public services. In response to the consumption-oriented needs of urban communities, Peri-Urban farmers have intensified the use of multifunctional land activities. However, not all multifunctional opportunities are fully developed, considering the farming activities conducted near the city. This can be an innovative characteristic of land use in the Situbondo Peri-Urban area, indicating that agriculture is a priority land use in the region by improving the quality of harmonious relationships between urban and peri-urban areas through agriculture activities
Keywords: Peri-Urban; Agriculture; Peri-Urban Settlements; Morphology

Introduction

Urban morphology is the study of the formation of human settlements and the processes involved in their formation and transformation. This field of study aims to understand the spatial structure and character by examining the patterns of its components. Camagni et al. (2002) reached a consensus that the spatial morphology of an urban landscape determines the environmental and social impacts of a city. For instance, in the spatial morphology of Situbondo, the Peri-Urban community there generally uses their residences to establish businesses, which largely become their livelihoods. Therefore, as residential areas increase, it also leads to changes in land use from open or agricultural land to residential, and vice versa. Agriculture in the Peri-Urban areas of Situbondo becomes crucial as it impacts the formation of settlements.

(Qiu et al., 2017) classified various types of urban roads such as urban expressways, arterial roads, collector roads, and local roads. (Lu et al., 2020) mentioned that peri-urban settlements reflect patterns of production and social culture in the territorial system of peri-urban areas. The Peri-Urban system in the Situbondo region reflects the interaction process between the activities of the Situbondo community and its geographic environment. Conversely, peri-urban settlements near the city of Situbondo are experiencing rapid expansion because they can provide land for housing and industries that are not available in the city center. The inevitable increase in land occupied by peri-urban settlements and industries results in the loss of agricultural land.

In current literature, economic factors are considered one of the primary drivers of the distribution of peri-urban settlements. Growth poles, or central place theory are often used to interpret the influence of economic factors or markets on the location of settlements and land-use patterns (Powe & Shaw, 2004). Agriculture in the Peri-Urban area of Situbondo represents a growth phase following agricultural development but precedes a transformation into resistance against industrial development. The land in peri-urban Situbondo is typically used not only as a residential area for the Peri-Urban community but also for agricultural purposes to support reproductive economic activities by utilizing the extensive land area. The literature above indicates that research reporting is scarce on the effects of agriculture on the formation of settlements in peri-urban areas.

Therefore, the objective of this study is to explore the morphological elements in the study area and the impact of the presence of agriculture on settlement patterns in that region. The researchers chose Situbondo Regency for this study, considering the potential spatial layout of peri-urban settlements. Peri-urban settlements within a specific agricultural radius mutually influence each other, necessitating the proposal of dynamic correction methods and retention methods. The goal is twofold: to examine housing characteristics and identify factors influencing the formation of peri-urban settlements in Situbondo. The results are expected to provide essential information for the development of both urban and peri-urban areas.

Research Method

This research utilizes quantitative methods, aiming to produce more focused investigations by integrating data collection methods with data analysis. This integration is expected to provide a richer understanding of the research study. The selection of subjects involves sampling between 25% depending on the size of the larger population. For instance, from a total of 800 people, a 10% sample is drawn, amounting to 89 people. Data collection is conducted through interviews, observations, and questionnaires. Subsequently, SPSS and ArcGIS 10.8.2 are employed to obtain the necessary results, aiming for an integrated outcome

Result and Discussion

Elements of Settlement Morphology

There are three components or elements that reflect a region, namely: Land Use, Road Network Patterns, and Building Density Patterns, where all three are interconnected or related to each other.

Figure 1. Land Use Map of Kayumas Village, Arjasa District, Situbondo Regency 2023

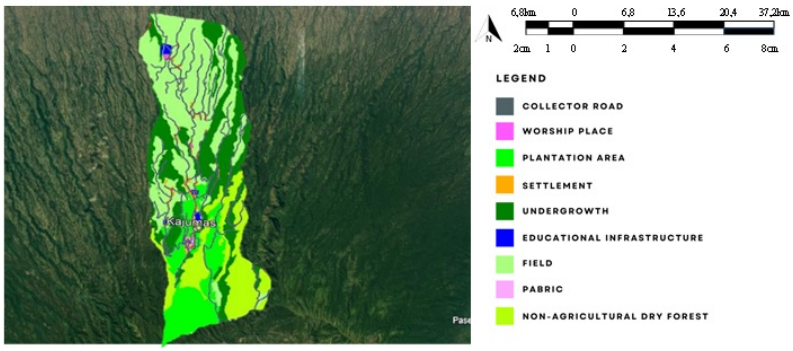

Figure 1 presents the predominant land use in the study area, primarily characterized by agricultural fields. Concurrent with agriculture activities, there is a dispersion of settlements, including the Kelompok Tani Sejahtera, Kelompok Tani Delima, and others. Moreover, land use in this locality encompasses educational facilities such as TK Tunas Mekar, SD Negeri 2 Kayumas, and religious institutions, aligning with the existing pattern of collector road networks. As a consequence, the initiation of agriculture activities has led to a transformation in the function of land along Jalan Alun-Alun, converting it into commercial land.

This transformation is a result of the presence of peri-urban industrial agglomeration centers such as Pabrik Kopi Nusantara XII Kayumas, Unit Pengolahan Hasil Kayumas II, PTPN XII Kayumas, Kafe Mas Bro Kayumas. This significant shift, triggered by agriculture activities, notably impacts the configuration of settlements in Kayumas Village, positioning it as a strategically important economic agropolitan development area as outlined in the RDTR Kabupaten Situbondo Tahun 2023.

Road Network Pattern

The Road Network Pattern refers to the systematic layout of roads in a specific geographical area. In the studied region, the Road Network Pattern exhibits extensive and varied dimensions. According to classification, road networks can be categorized into three segments: Arterial Roads, Collector Roads, and Local Roads. In the Tanah Merah area, Collector Roads, and Local Roads, characterized by narrower local streets, can be distinguished. That the road network in the Alun-Alun and Tanah Merah areas follows a linear pattern, facilitating accessibility for various types of vehicles and serving

as a connection between residential zones. Consequently, the linear road network pattern plays a key role in significantly enhancing settlement configurations.

Building Density

The concentration of building density is focalized within the vicinity of sub-villages Kelompok Tani Mulya Jaya, characterized by a longitudinal or linear settlement configuration where residential structures extend along the primary Tanah Merah road, with corresponding agricultural land situated in front of the residences. The building pattern within the suburban area of Desa Kayumas exhibits a heterogeneous arrangement. The distinct building patterns are discernible in the structural shapes, predominantly square in form. The observed building density along Jalan Alun Alun not only facilitates ease of commercial activities but also lends itself to specific ventures, such as the cultivation of ornamental plants within the agriculture sector.

Factors Affecting the Formation of Settlement Morphology

Livelihood

Table 1. Sum of Livelihood Variable Indicators in Kayumas Village

		L1	L2	L3	L4	L5	L6	L7
N	Valid	89	89	89	89	89	89	89
	Missing	0	0	0	0	0	0	0
Sum		785	1136	1164	991	884	1029	1071

Source: The data is processed by the researcher (2023)

Table 2. Percentage Distribution of Livelihood Variable Indicators

	Sum	Table N%
The road access plays a role in the subsectors of food crops, horticulture, agricultures, and livestock (L1)	785	11.1%
Agriculture is a livelihood aimed at sustaining life (L2)	1136	16.1%
Agriculture plays a significant role in the income of the population (L3)	1164	16.5%
Agriculture land holds appeal for buyers (L4)	991	14.0%
Soil conditions influence agricultural growth (L5)	884	12.5%
The quantity of crop production influences income (L6)	1029	14.6%
Agriculture is a livelihood that provides promising prospects (L7)	1071	15.2%

Source: The data is processed by the researcher (2023)

Based on the findings presented in Table 1 and Table 2 of the study focusing on Livelihood variables, it is observed that among the 89 respondents, questionnaire item (L 3) exerts the most substantial impact on settlement formation, accumulating a total score of 1,164 or 16.5% of the overall 7,060. This corresponds to the assertion regarding

the pivotal role of agricultural in the income generation of the population. This is further validated by on-site data indicating that 963 farmers in Kayumas Village derive their primary livelihood from agriculture.

Table 3. Results of the Kolmogorov-Smirnov Statistical Test

		Indicator 1	Indicator2	Indicator3	Indicator 4	Indicator5	Indicator 6	Indicator7
N		89	89	89	89	89	89	89
Normal Parameters [a,b]	Mean	8.82	12.76	13.08	11.13	9.93	11.56	12.03
	Std. Deviation	2.314	2.440	3.231	2.312	2.109	2.445	2.456
Most Extreme Differences	Absolute	.121	.109	.133	.118	.121	.144	.123
	Positive	.121	.095	.105	.107	.086	.092	.069
	Negative	-.108	-.109	-.133	-.118	-.121	-.144	-.123
Test Statistic		.121	.109	.133	.118	.121	.144	.123
Asymp. Sig. (2-tailed)		.249[c]	.103[c]	.497[c]	.389[c]	.276[c]	.097[c]	.190[c]

a. Test distribution is Normal
b. Calculated from data
c. Lilliefors Significance Correction

Source: The data is processed by the researcher (2023)

The Kolmogorov-Smirnov test was conducted to assess the normality of residual values. The obtained *p-value* for each indicator are as follows: 0.249 for L1, 0.103 for L2, 0.497 for L3, 0.389 for L4, 0.276 for L5, 0.097 for L6, and 0.190 for L7. Based on these results, it can be concluded that the residual values adhere to a normal distribution as the p-values are (>0.05).

Table 4. Percentage Distribution of Agriculture Enterprises

Long-term respondents with experience in agriculture over the years	Respondent	Percent%
0-5	3	3.4
6-10	19	21.3
>10	67	75.3

Source: The data is processed by the researcher (2023)

Table 4 presents a depiction of the influence of agricultural on the livelihoods of the residents of Kayumas Village. The data reveals that, among the respondents, 67 individuals have actively participated in agriculture for over ten years, while 19 people have been engaged in businesses for a duration of 6-10 years. Furthermore, three individuals have been involved in the agricultural sector for less than five years. The distribution of agricultural livelihoods can be elucidated as follows.

Population

The population size is a crucial factor that plays a key role in shaping the morphological development and evolution of settlements in Kayumas Village. According to the population registration data provided by the Office of the Head of Kayumas Village, the

total population of Kayumas Village is recorded as 5,806 individuals with a gender ratio of 1.03. The population of Kayumas Village constitutes 13.69% of the entire villages in Arjasa Sub-district, as indicated in the table below.

Table 5. Population Statistics for Kayumas Village in 2019

No	Dusun	Criteria				Gender	
		Using Technology			Not Using Technology and Age 19-39 Years	Male	Female
		Age <19 Years	Age 19-39 Years	Age >39 Years			
1	Tanah Merah	48	220	98	501	439	428
2	Tunggul Gunung	23	218	83	452	393	383
3	Pelleh	21	233	57	442	381	372
4	Krajan	28	208	55	423	361	353
5	Kayumas	12	171	39	418	324	316
6	Alun-alun	17	228	46	394	347	338
7	Cottok	27	235	58	391	360	351
8	Sokmailang	10	218	67	365	334	326
Total		186	1970	503	3386	2939	2867
Gender Ratio		1,03					
Population Percentage		13,69%					
Population Density (km²)		136					

Source: Kecamatan Dalam Angka (2023)

Table 5 indicates that the population of Kayumas Village was 5,806 individuals, distributed across 8 hamlets. Notably, within the study area, there are around 800 agriculture entrepreneurs, signifying that approximately 83.2% of the population is involved in agriculture.

Income

Revenue stands out as a pivotal factor influencing the configuration of settlements in Kayumas Village through the Agriculture system. Findings from interviews conducted during the study reveal that the collective income of all agriculture entrepreneurs in Kayumas Village amounts to Rp. 150 million per year. This figure is derived from a group of active farmers, each generating daily income ranging from Rp. 600,000 to Rp.

1,200,000. The expenditures constitute 30% of the total revenues, while gross profits range between 70% of the income.

The outcomes suggest that income derived from ornamental plant agriculture is a significant factor shaping the morphology of settlements in Kayumas Village. This income not only demonstrates the economic value of agriculture but also contributes to the community's well-being. Consequently, there is a notable shift in the population towards becoming agricultureal entrepreneurs.

Agriculture

The outcomes suggest that income derived from ornamental plant agriculture is a significant factor shaping the morphology of settlements in Kayumas Village. This income not only demonstrates the economic value of agriculture but also contributes to the community's well-being. Consequently, there is a notable shift in the population towards becoming agricultureal entrepreneurs.

The settlement pattern emerged in Hamlet Tanah Merah, marked by the inception and development of agriculture during the monetary crisis. At this time, Kayumas village underwent division into Kelompok Tani Sejahtera's Settlement and Kelompok Tani Sejahtera's Settlement. The majority of the population is involved in cultivating oranges, Arabica coffee, ginger, and golden bananas. The increasing settlement pattern, notably in the Tanah Merah road area, where 70-80% of the population now engages in agriculture, indicating promising prospects.

Conclusion

The morphological components of settlements, encompassing land use, road network configurations, and building density, play a crucial role in delineating settlement structures in Kayumas Village, particularly along Tanah Merah Road. The utilization of agro-agricultural land along this thoroughfare contributes to the establishment of longitudinal settlement patterns. The presence of agricultural enterprises and associated access roads creates corridors, inducing alterations in the village's land use configurations.

Moreover, morphological aspects such as livelihoods, population dynamics, and revenue exert a substantial impact on the formation of settlements in Kayumas Village. The introduction of agricultural livelihoods has significantly elevated the income levels of the population, making agriculture a fundamental source of sustenance. The historical trajectory of agricultural development in Kayumas Village has witnessed notable expansion, influencing settlement configurations along Tanah Merah Road to evolve beyond mere residences and encompass both residential and agricultural domains.

The impact of agriculture on the genesis of settlements in Kayumas is noteworthy, contributing to the establishment of linear settlement patterns. This influence proves advantageous by enhancing the spatial dynamics conducive to agricultural practices. In summation, the interplay of morphological and settlement elements, coupled with the historical evolution of agriculture, has precipitated noteworthy transformations in the landscape and settlement patterns within Kayumas Village.

Bibliography

Alemneh, T., Ambelu, A., Bahrndorff, S., Mereta, S. T., Pertoldi, C., & Zaitchik, B. F. (2017). Modeling the impact of highland settlements on ecological disturbance of streams in choke mountain catchment: Macroinvertebrate assemblages and water quality. *Ecological Indicators, 73*, 452-459. https://doi.org/10.1016/j.ecolind.2016.10.019

Camagni, R., Gibelli, M. C., & Rigamonti, P. (2002). Urban mobility and urban form: The social and environmental costs of different patterns of urban expansion. *Ecological Economics, 40*(2), 199-216. https://doi.org/10.1016/S0921-8009(01)00254-3

Carballo, D. M., & Pluckhahn, T. (2007). Transportation corridors and political evolution in highland mesoamerica: Settlement analyses incorporating GIS for northern tlaxcala, mexico. *Journal of Anthropological Archaeology, 26*(4), 607-629. https://doi.org/10.1016/j.jaa.2007.05.001

Chen, R. (2005). Research methodology: Quantitative approaches. In CRISTINA SANZ (Ed.), *Mind and context in adult second language acquisition* (pp. 21-68). Georgetown University Press.

Eckert, S. L., & Welch, D. R. (2013). A commanding view of the pacific: Highland land use as viewed from vainu'u, a multi-component site on tutuila island, american samoa. *Archaeology in Oceania, 48*(1), 13-25. https://doi.org/10.1002/arco.5001

Fahey, C. (2017). Agricultural settlement in victoria's last frontier: The mallee, 1890–1951. *Agricultural History, 91*(2), 187-214. https://doi.org/10.3098/ah.2017.091.2.187

Fiannacca, P., Ortolano, G., Pagano, M., Visalli, R., Cirrincione, R., & Zappalà, L. (2017). IG-mapper: A new ArcGIS® toolbox for the geostatistics-based automated geochemical mapping of igneous rocks. *Chemical Geology, 470*, 75-92. https://doi.org/10.1016/j.chemgeo.2017.08.024

Hall, Peter. *Cities and the Wealth of Nations: Principles of Economic Life.* vol. 75, Association of American Geographers, 1985.

Katz-Oz, A. (2017). Agricultural settlement: Up to the present and into the future. *Jewish Political Studies Review, 28*(3/4), 60-65.

Lu, Mengqiu, et al. "Spatial Optimization of Peri-urban Settlements Based on the Perspective of appropriateness–domination: A Case of Xinyi City." *Habitat International*, vol. 98, 2020, pp. 102148.

Lynch, Kevin. ""The Image of the environment"and "the City Image and its Elements": From the Image of the City (1960)." *The Urban Design Reader.* , 2013.

McLaughlin, John. *P.R. Berke D.R. Godschalk E.J. Kaiser D.A. Rodriguez Urban Land use Planning 5th Ed. 2006 University of Illinois Press Champaign, IL 9780252030796 US$ 75.00, Hardback.* vol. 26, Elsevier Ltd, 2009.

Morgan, W. T. W. (1969). Urbanization in kenya: Origins and trends. *Transactions - Institute of British Geographers (1965),* (46), 167-178. https://doi.org/10.2307/621415

Nyambe, S., Agestika, L., & Yamauchi, T. (2020). The improved and the unimproved: Factors influencing sanitation and diarrhoea in a peri-urban settlement of lusaka, zambia. *PloS One, 15*(5), e0232763-e0232763. https://doi.org/10.1371/journal.pone.0232763

Smith, Robert B. *New Technologies and Settlement Patterns in Peri-urban Areas: The Highlands and Islands of Scotland*, ProQuest Dissertations Publishing, 1992.

Swainson, B. M. (1935). Rural settlement in north west devon, england. *Economic Geography, 11*(1), 77-90. https://doi.org/10.2307/140651

Tan, Minghong, M. R. Guy, and Xiubin Li. "Urban Spatial Development and Land use in Beijing: Implications from London's Experiences." *Journal of Geographical Sciences*, vol. 21, no. 1, 2011, pp. 49-64.

Qiu, Zhaowen, et al. "Pedestrian Exposure to Traffic PM on Different Types of Urban Roads: A Case Study of Xi'an, China." *Sustainable Cities and Society*, vol. 32, 2017, pp. 475-485.