Research Article

Indian Journal of Extension Education
Vol. 62, No. 2 (April–June), 2026, (20-25)

ISSN 0537-1996 (Print)
ISSN 2454-552X (Online)

Selective Complementarity of Indigenous Leadership: Ninik Mamak's Role in Livestock Development in Minangkabau, Indonesia

Riza Andesca Putra[1,2], Sunarru Samsi Hariadi[1]* and Mujtahidah Anggriani Ummul Muzayyanah[1]

[1]Doctoral Program in Extension and Development Communication, Graduate School, Universitas Gadjah Mada, Yogyakarta, Indonesia
[2]Department of Development and Livestock Business, Faculty of Animal Husbandry, Andalas University, Padang, Indonesia
*Corresponding author email id: sunarru_sh@ugm.ac.id

HIGHLIGHTS

- Ninik Mamak's decision-making role demonstrates a significant positive influence across all livestock development dimensions.
- Cooperation facilitation exhibits paradoxical negative effects on the technical and economic aspects of livestock development.
- The selective complementarity concept extends institutional theory by demonstrating function-specific rather than universal complementarity patterns.

ARTICLE INFO

Keywords: Informal institutions, Social capital, Institutional theory, Livestock groups, Matrilineal system.

https://doi.org/10.48165/IJEE.2026.62204

Citation: Putra, R. A., Hariadi, S. S., & Muzayyanah, M. A. U. (2026). Selective Complementarity of Indigenous Leadership: Ninik Mamak's Role in Livestock Development in Minangkabau, Indonesia. *Indian Journal of Extension Education*, *62*(2), 20-25. https://doi.org/10.48165/IJEE.2026.62204

ABSTRACT

Indigenous leadership plays an important role in rural development, but Ninik Mamak's specific contribution as an indigenous leader of the Minangkabau people to livestock development has not been empirically documented. Present research analyzes the influence of Ninik Mamak's role on livestock development from technical, social, and economic aspects. A quantitative method was used in this study to collect data from 210 respondents from 42 livestock groups in West Sumatra Province. A validated and reliable Likert-scale questionnaire was employed for data collection, and multiple linear regression was used for data analysis. The results show that all regression models are statistically significant. Ninik Mamak's decision-making role shows a strong positive effect on all aspects. However, the role of information dissemination does not show a significant impact, whereas the role of cooperation facilitation has significant negative effects on the technical and economic aspects. This study confirms that Ninik Mamak has a significant role in the development of farms with complex patterns. These findings introduce the concept of "selective complementarity" in institutional theory and recommend selective engagement strategies to optimize the role of indigenous leadership.

INTRODUCTION

Livestock development has been vital for economic establishment in developing countries, particularly in providing food supply, income sources, livelihood security, and employment (Banda & Tanganyika, 2021; Herrero et al., 2013; Verma et al., 2025). However, overcoming the challenges of livestock development requires more than technical interventions alone, as socio-cultural and institutional factors fundamentally shape the adoption of agricultural innovations and the sustainability of development outcomes in rural communities (Curry et al., 2021; Makate, 2020). Social capital theory shows the fundamental role of informal institutions and local leadership to encourage innovations, build community trust, and improve the sustainability of agricultural development (Liu et al., 2025; Yang et al., 2024).

Indigenous leadership, as culturally rooted informal institutions, has shown considerable importance in facilitating rural development (Bansal et al., 2024; Olaopa et al., 2023). Research shows that indigenous institutions play essential roles in farmers' decision-making regarding agricultural innovations and access to

Received 09-02-2026; Accepted 23-02-2026

heritage land, financial institutions, and production inputs (Makate, 2020; Yami & van Asten, 2018). The Minangkabau people in West Sumatra, Indonesia, display uniqueness with their matrilineal kinship system, which gave birth to a customary leadership structure called Tungku Tigo Sajarangan, where Ninik Mamak (tribal traditional leader) occupies a central position with authority over the socio-economic life of the community (Azwar et al., 2018; Elfia et al., 2024; Hakim et al., 2025). In a theoretical framework, Ninik Mamak, in his position as an institutional entrepreneur, plays a role in bridging traditional values with the needs of today's development. Institutional theory posits that the interaction of formal and informal institutions can give birth to patterns of complementary, substitutive, accommodating, or competitive adaptation (Helmke & Levitsky, 2004), a framework that continues to be applied and extended in contemporary development research (Dau et al., 2022; Mbalyohere & Lawton, 2022).

West Sumatra has strategic potential in livestock development (Indrayani et al., 2022). However, development activities through farmer groups face obstacles, including stagnant livestock populations, poor management, and low sustainability (Madarisa et al., 2024; Putra et al., 2023). Given that almost 90% of West Sumatra's population is Minangkabau people with strong Ninik Mamak leadership structures, a critical question arises regarding the indigenous leadership's role in livestock development. Previous studies on Ninik Mamak have focused primarily on customs, culture, and ulayat land management (Ahmad & Zulfidar, 2023; Dewi et al., 2024). Studies that examine the special role of Ninik Mamak in the development of the productive sector are still very minimal. This creates a theoretical and empirical gap: there is no conceptual framework that outlines the functions of indigenous leadership in the context of livestock modernization, and its real economic impact has not been systematically documented.

This study analyzes Ninik Mamak's role influence on livestock development across technical, social, and economic aspects. It examines the hypothesis that the three roles of Ninik Mamak (decision-making, information dissemination, and facilitation of collaboration) simultaneously have a significant impact on livestock development, based on the proposition that traditional leadership with high social legitimacy can be a catalyst for the adoption of innovation and economic development (Beaman et al., 2021; Yami & Asten, 2018). This research contributes by enriching the understanding of the mechanisms by which informal institutions operate in modern economic development and by identifying optimal interaction patterns between formal and informal institutions. In practice, it provides evidence-based recommendations for policymakers to optimize the roles of indigenous institutions in livestock development programs.

METHODOLOGY

This quantitative research was conducted in West Sumatra Province during January-March 2025, which covers three districts, namely: Pesisir Selatan, Sijunjung, and Lima Puluh Kota. The districts were selected based on the largest livestock group population, geographical representation, and active Minangkabau customary institutional presence.

The study population consisted of all livestock farmer groups, i.e., 84, which received government assistance during the period 2014-2024. Forty-two groups (14 per district) were selected using stratified random sampling method, and further five members per group were selected, for a total of 210 respondents (Hariadi, 2011). Respondents were members of the Minangkabau ethnicity selected purposively based on active group involvement.

Independent variables measure three roles of Ninik Mamak: (1) Decision making: strategic involvement in livestock group activities including discussions, business management, activity planning, customary land utilization, and decision-making support; (2) Information dissemination: the distribution of livestock information includes communal resources, technical aspects, government assistance, and nagari policies (3) Cooperation facilitation: facilitating internal-external group cooperation through stakeholder dialogue, government coordination, financial institution access, and conflict mediation. Dependent variables assess the development of livestock through: (1) Technical aspects: adoption of modern technology with 15 indicators which include seed selection, maintenance, feed management, health control, and marketing; (2) Social aspects: group cohesiveness with 12 indicators that measure social services, use of community halls, planning, and group spirit; (3) Economic aspects: business achievement with 12 indicators including productivity, capital access, marketing expansion, and revenue.

Primary data collected through a Likert scale validated questionnaire (1=never to 5=very often) and analyzed using the summated rating method (Azwar, 2015). The validity test used the Pearson Product-Moment correlation ($r>0.30$), which has shown adequate validity for all variables ($r=0.206$ to 0.835). Reliability testing using Cronbach's Alpha has demonstrated excellent reliability ($\alpha=0.850$ to 0.894) for all constructs (Bujang et al., 2018).

Data analysis included descriptive statistics with five-level categorization (Cohen et al., 2017; Salkind, 2007), classical assumption tests (normality, multicollinearity, heteroscedasticity, and linearity), and multiple linear regression using SPSS 26. The regression models were:

$$Y_1 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon_1$$
$$Y_2 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon_2$$
$$Y_3 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon_3$$

Where $Y_1/Y_2/Y_3$ represents technical/social/economic aspects; X_1, X_2, X_3 represent decision-making, information dissemination, and cooperation facilitation; β_0 is the constant; β_1, β_2, β_3 are partial regression coefficients; and ε is the error term. Hypothesis testing employed the F-test for simultaneous effects and the t-test for partial effects at $\alpha = 0.05$ significance level, with R^2 quantifying the proportion of variance explained.

RESULTS

Descriptive analysis of research variables

The results of the descriptive analysis show a consistent pattern in the role of *Ninik Mamak* in livestock development, as shown in Table 1.

Table 1. Descriptive Statistics of Research Variables

Variable	Average Score	Percentage Achievement	Category
Decision Making (X_1)	0.597	24.37	Low
Information Dissemination (X_2)	0.645	29.32	Low
Cooperation Facilitation (X_3)	0.527	17.50	Very Low
Technical Aspects (Y_1)	1.518	36.21	Low
Social Aspects (Y_2)	1.630	47.51	Moderate
Economic Aspects (Y_3)	1.395	38.24	Low

Source: Research Results, 2025

Note: The varying percentage of achievement is categorized into five levels based on the same interval classification: Very Low (0–20%), Low (21–40%), Moderate (41–60%), High (61–80%), and Very High (81–100%), adapted from Cohen et al. (2017) and Salkind (2007).

Achievement of Ninik Mamak's role variables

The achievement of the decision-making variable was in the low category (24.37%) of the five indicators measured; the highest achievement was the involvement of *Ninik Mamak* as a determinant of the use of ulayat land for group business (42.14%), while involvement in the discussion of livestock group activity plans only reached 15.56%. These findings indicate that although the *Ninik Mamak* still retain traditional authority in communal resource management, their involvement in the operational planning of livestock groups is still minimal.

The achievement of information dissemination variables is also in the low category (29.32%). The highest achievement in this variable was providing information on the management of resources such as land and water sources (44.52%), while the delivery of technical information on livestock farming was only 12.38%. This shows that *Ninik Mamak* still plays a role in traditional resource management. Still, it has not yet become an effective channel for disseminating technical knowledge about modern animal husbandry.

The achievement of the cooperation facilitation variable was very low (17.50%). This variable had the lowest achievement among the three roles of *Ninik Mamak*, with the majority of respondents (68.57%) stating that *Ninik Mamak* "never" facilitated cooperation. The highest achievement was the facilitation of the use of resources (21.79%), while the facilitation of cooperation with financial institutions was only 10.79%.

Achievements of livestock development variables

The achievement of the technical aspect variable is in the low category (36.21%). Of the 15 indicators measured, the highest achievement was to sanitize the cage (53.65%) and contact the veterinarian when the livestock was sick (52.06%). However, marketing shows very low achievements, such as selling cattle at the animal market (13.10%) and using digital platforms for promotion (13.65%).

The achievement of the social aspect variable was relatively better, namely in the moderate category (47.51%). This aspect shows the highest achievement among the three aspects of livestock development. The indicators with the best achievements were mutual aid between members (57.74%) and providing encouragement and support (57.02%). This reflects the still strong social cohesion in the Minangkabau livestock group.

Meanwhile, the variable of economic aspects is in the low category (38.24%). The highest achievement was to carry out planned cattle marriage (55.24%), while the lowest achievement was to obtain subsidized capital from the government (20.95%). These figures illustrate that the achievement of livestock development in the economic aspect is still not in accordance with what it should be.

Regression analysis results

The results of the regression analysis for the three aspects of livestock development, presented in Table 2.

Table 2. Recap of Multiple Linear Regression Analysis Results

Variable	Technical Aspects (Y_1) β (Sig.)	Social Aspects (Y_2) β (Sig.)	Economic Aspects (Y_3) β (Sig.)
Decision-making (X_1)	0.309*	0.222*	0.492*
Information dissemination (X_2)	0.150	0.157	-0.080
Cooperation Facilitation (X_3)	-0.323*	-0.193	-0.310*
R^2	0.097	0.064	0.141
Adjusted R^2	0.084	0.051	0.129
F-statistic	7.370*	4.727*	11.280*

Note: *$p < 0.05$

According to the findings of multiple linear regression analysis, the research hypothesis states that "the three roles of *Ninik Mamak* (decision-making, information dissemination, and facilitation of cooperation) simultaneously have a significant effect on livestock development in technical, social, and economic aspects", so that the hypothesis is accepted.

Statistical evidence shows that all three regression models show significant simultaneous influences on 99% confidence levels: technical aspects ($F = 7.370$; $p = 0.000$), social aspects ($F = 4.727$; $p = 0.003$), and economic aspects ($F = 11.280$; $p = 0.000$). Although the direction of influence of each independent variable varies, the overall role system of *Ninik Mamak* has been proven to influence livestock development significantly.

The analysis showed that the economic aspect had the highest explanatory power ($R^2 = 0.141$), followed by the technical aspect ($R^2 = 0.097$) and the social aspect ($R^2 = 0.064$). This relatively low R^2 value is consistent with the nature of research on informal institutions in the context of social and agricultural development, where the phenomena studied are inherently complex and influenced by a variety of factors (Helmke & Levitsky, 2004). Livestock development outcomes are influenced by a variety of factors outside of local leadership, including individual farmer characteristics, access to inputs and markets, biophysical conditions, and macroeconomic environment all of which were not included in the scope of this study. Low R^2 values in these kinds of studies do not signal model failure; rather, they reflect the limited but tangible contribution of specific institutional variables in complex systems (Cohen et al., 2017). The consistent statistical significance of all three F tests confirms that the role of Ninik Mamak is an authentic and replicable determinant in livestock development, especially through mechanisms of social legitimacy and strategic resource governance.

DISCUSSION

The role in decision making: Indigenous leadership legitimacy

The significant positive influence of Ninik Mamak's decisions on all aspects of livestock development, as shown in Table 2, confirms the institutional theory proposition that informal institutions can function complementarily with formal institutions in the development process (Helmke & Levitsky, 2004). The legitimacy of *Ninik Mamak* in decision-making in farmer groups, although with relatively low achievement (24.37%), still has a substantial impact when activated, especially in the context of using communal resources such as ulayat land.

These findings are in line with studies showing that indigenous leadership plays an important role in agricultural development through collective decision-making based on traditional values and local wisdom (Makate, 2020), including the management of communal resources such as ulayat land (Widianingsih et al., 2023). In the Minangkabau context, the authority of *Ninik Mamak* in the management of heritage and strategic decision-making in the tribe provides the foundation of trust necessary for the development of productive businesses, including livestock businesses (Elfia et al., 2024).

The most substantial effect was seen in the economic aspect ($\beta = 0.492$), indicate that the support of *Ninik Mamak* in strategic decision-making gave confidence to group members to carry out activities and develop livestock businesses. This is consistent with findings that social legitimacy and support from indigenous leaders significantly shape community trust and collaborative success (Liu et al., 2025; Olaopa et al., 2023). Other findings also confirm that traditional leadership with authority in natural resource management can increase the effectiveness of development programs through decision-making mechanisms already understood and accepted by the community (Yami & Asten, 2018). Recent research in India further confirms that the economic security of rural households is meaningfully influenced by livelihood strategies and decision-making processes at the community level (Jatav, 2024).

Role in the dissemination of information: Insignificant

Table 2 explains that the role of information dissemination does not show a significant effect on the three aspects. The absence of a significant influence on the dissemination of Ninik Mamak information across all aspects of livestock development is a finding that can be explained by a multifactor analysis. The low achievement of this variable (29.32%) indicates that *Ninik Mamak* has not functioned as an agent for disseminating technical information on livestock or government programs, which may be due to limited technical capacity and access to information. Data shows that *Ninik Mamak* still plays a role in delivering information about resource management (44.52%), but is very low in providing technical information on livestock farming (12.38%). This reflects the gap in capacity between the need for disseminating modern technical knowledge and the traditional competence of *Ninik Mamak*. These findings are in line with studies showing that traditional leadership often faces obstacles in bridging local knowledge with the needs of modern technology in agricultural development (Pali et al., 2023). Technical information is more effectively conveyed via social networks grounded in technical expertise and social learning, rather than through symbolic or traditional figures (Beaman et al., 2021). Previous literature has shown that the success of dissemination of information depends on the availability of adequate training programs and the strengthening of technical capabilities for both leaders and breeders (Sharma & Singh, 2023).

Facilitating cooperation: Significant negative, a paradox of indigenous leadership

The discovery of a significant negative influence of Ninik Mamak's role in facilitating cooperation on livestock development is a paradoxical result and provides valuable theoretical insights. Three interacting factors explain this counterproductive outcome.

First, the mismatch of capacity with the demands of the sector. Although Ninik Mamak has legitimacy in indigenous resource management and conflict resolution, the modern livestock sector requires technical knowledge of breeding, feed, market access, and financial networks competencies that lie outside traditional authority (Adisa, 2015; Webster, 2013). When leaders' skills do not match the needs of implementation, they risk hindering the acceleration of development (Curry et al., 2021; Kiptot & Franzel, 2014).

Second, political contamination. Field findings suggest that Ninik Mamak is often involved in practical politics as candidates or supporters in nagari, district, and legislative elections which undermines their roles and causes social envy and community conflicts (Hakim et al., 2025; Rahmat et al., 2023). This is further complicated because cattle assistance programs are often funded from legislators' discretionary funds (POKIR), creating complex political-economic linkages (Anas et al., 2024) dynamics consistent with findings in Zimbabwe, where the political involvement of traditional leaders undermines public trust (Zhou, 2023).

Third, the gap between expectations and reality. The cooperation facilitation variable recorded the lowest achievement among the three roles (17.50%), with 68.57% of respondents stating that Ninik Mamak had never facilitated group cooperation. This absence creates an institutional vacuum: members of the group culturally expect support from figures with high social legitimacy, but those expectations are not met in practice. This gap between cultural expectations and empirical reality is known to erode community trust and institutional beliefs (Chili & Ngxongo, 2017; Matsiliza, 2024).

The convergence of these three factors results in a paradox: a figure with high social capital produces negative development outcomes when placed in an operational facilitation role. These findings have important implications for institutional theory. Contrary to the assumption that traditional authority comprehensively complements formal institutions, this study suggests that complementarity is function-specific. The role of Ninik Mamak operates as complementary at the strategic level where social legitimacy supports decision-making and management of communal resources but shifts to competitive adaptation at the operational level, where technical capacity and political neutrality are required. The pattern introduces the concept of "selective complementarity," expanding on the institutional interaction framework of Helmke and Levitsky (2004) by showing that formal-

informal institutional relationships can vary across multiple dimensions of the same leadership function, not just between different institutions.

CONCLUSION

The research proves that the role of indigenous leadership in livestock development displays complex patterns through selective complementarity. Ninik Mamak's decision-making function has shown a significant positive impact on all aspects of development, confirming that social legitimacy in managing communal resources provides an essential foundation of trust for collaboration and adoption of innovation. Information dissemination shows no significant impact, reflecting traditional leaders' limitations in conveying modern technical knowledge. The most significant finding is the significant negative influence of cooperation facilitation on technical and economic aspects, explained by capacity mismatches with modern sector demands, political contamination, and minimal involvement, thus creating a gap between expectations and reality. Results confirm that not all forms of traditional authority benefit contemporary development, requiring a strategy of selective engagement to optimize the role of indigenous leadership. The concept of selective complementarity provides practical guidance for integrating traditional values with the need for modernization without giving rise to institutional conflicts.

DECLARATIONS

Ethics approval and informed consent: Informed consent was sought from the farmer respondents of the study during the course of the research.

Acknowledgements: We would like to thank: (1) Indonesian Education Scholarship, (2) Center of Higher Education Funding and Assessment, Ministry of Higher Education, Science, and Technology of the Republic of Indonesia, (3) Indonesian Endowment Fund for Education, for the financing assistance provided so that this research could be held. We also express our gratitude to LPPM of Andalas University, the Animal Husbandry Service throughout West Sumatra, and livestock groups who have assisted in the implementation of this research.

Conflict of interest: The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. The authors declare that during the preparation of the work, they thoroughly reviewed, revised, and edited the content as needed. The authors take full responsibility for the final content of this publication.

Publisher's note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publishers, the editors, and the reviewers. Any product/process or technology that may be evaluated in this article or a claim that may be made by its manufacturer is not guaranteed or endorsed by the publisher.

REFERENCES

Adisa, R. S. (2015). Livestock extension practice and competency among agricultural extension agents in north-central Nigeria. *South African Journal of Agricultural Extension*, *43*(1), 12–21.

Ahmad, K. B., & Zulfidar, F. (2023). Understanding the concept of merantau, tau jo nan ampek and ninik mamak in Minangkabau culture in West Sumatra, Indonesia. *Asian Journal of Arts and Culture*, *23*(2), Article 2. https://doi.org/10.48048/ajac.2023.256669

Anas, A., Ediset, E., & Alianta, A. A. (2024). Evaluation of government grant program (Case Study: "Dana Pokok Pikiran (POKIR)" or Principal Grant by Legislator in Farmers Groups in Padang City, West Sumatra, Indonesia). *IOP Conference Seminar Earth Environmental Science*, *1292*(1). https://doi.org/10.1088/1755-1315/1292/1/012028

Azwar, S. (2015). *Fundamentals of Psychometrics* (2nd ed.). Pustaka Pelajar.

Azwar, W., Yunus, Y., Muliono, M., & Permatasari, Y. (2018). Nagari Minangkabau: The study of indigenous institutions in West Sumatra, Indonesia. *Jurnal Bina Praja*, *10*(2), 231–239. https://doi.org/10.21787/jbp.10.2018.231-239

Banda, L. J., & Tanganyika, J. (2021). Livestock provide more than food in smallholder production systems of developing countries. *Animal Frontiers*, *11*(2), 7–14. https://doi.org/10.1093/af/vfab001

Bansal, S., Sarker, T., Yadav, A., Garg, I., Gupta, M., & Sarvaiya, H. (2024). Indigenous communities and sustainable development: A review and research agenda. *Global Business and Organizational Excellence*, *43*(4), 65–87. https://doi.org/10.1002/joe.22237

Beaman, L., BenYishay, A., Magruder, J., & Mobarak, A. M. (2021). Can network theory-based targeting increase technology adoption? *American Economic Review*, *111*(6), 1918–1943. https://doi.org/10.1257/aer.20200295

Bujang, M. A., Omar, E. D., & Baharum, N. A. (2018). A review on sample size determination for cronbach's alpha test: A simple guide for researchers. *Malaysian Journal of Medical Sciences*, *25*(6), 85–99. https://doi.org/10.21315/mjms2018.25.6.9

Chili, N. S., & Ngxongo, N. A. (2017). The role of community leadership in fostering an agenda of active community participation in rural regional tourism development: perspectives from Umhlwazini. *African Journal of Hospitality, Tourism and Leisure*, *Volume 6*(4). https://www.ajhtl.com/2017.html

Cohen, L., Manion, L., & Morrison, K. (2017). *Research Methods in Education* (8th ed.). Routledge. https://doi.org/10.4324/9781315456539

Curry, G. N., Nake, S., Koczberski, G., Oswald, M., Rafflegeau, S., Lummani, J., Peter, E., & Nailina, R. (2021). Disruptive innovation in agriculture: Socio-cultural factors in technology adoption in the developing world. *Journal of Rural Studies*, *88*, 422–431. https://doi.org/10.1016/j.jrurstud.2021.07.022

Dau, L. A., Li, J., Lyles, M. A., & Chacar, A. S. (2022). Informal institutions and the international strategy of MNEs: Effects of institutional effectiveness, convergence, and distance. *Journal of International Business Studies*, *53*(6), 1257–1281. https://doi.org/10.1057/s41267-022-00543-5

Dewi, S. F., Syafril, R., Hasmira, M. H., Bakhtiar, Y., Salleh, K. M., Yulika, F., Evelynd, E., & Sulaiman, N. L. (2024). Strengthening social cohesion through the Manyanda tradition in Minangkabau customary society: A cultural insight from West Sumatera, Indonesia. *Journal of Infrastructure, Policy and Development*, *8*(13), Article 13. https://doi.org/10.24294/jipd9344

Elfia, E., Shalihin, N., Surwati, S., Fajri, Y., & Rahmat, A. (2024). Institutionalizing maqasid hifz al-nasl within the Minangkabau inheritance framework. *Ijtihad: Jurnal Wacana Hukum Islam Dan Kemanusiaan*, *24*(2), Article 2. https://doi.org/10.18326/ijtihad.v24i2.193-222

Hakim, L., Hadi, R. T., & Ahmad. (2025). Minangkabau leadership philosophy: Synthesizing Religion, adat, and intellectuals in the history of islamic political thought. *Miqot: Jurnal Ilmu-Ilmu Keislaman*, *49*(1), 117–140. https://doi.org/10.30821/miqot.v49i1.1357

Hariadi, S. S. (2011). *Group dynamics: Theory and application for analyzing the success of farmer groups as units of learning, cooperation, production, and business*. Sekolah Pascasarjana, Universitas Gadjah Mada. https://scholar.google.com/scholar?cluster=10725603891806810336&hl=en&oi=scholarr

Helmke, G., & Levitsky, S. (2004). Informal institutions and comparative politics: A research agenda. *Perspectives on Politics*, *2*(4), 725–740. https://doi.org/10.1017/S1537592704040472

Herrero, M., Grace, D., Njuki, J., Johnson, N., Enahoro, D., Silvestri, S., & Rufino, M. C. (2013). The roles of livestock in developing countries. *Animal*, *7*(s1), 3–18. https://doi.org/10.1017/S1751731112001954

Indrayani, I., Andri, A., & Boyon, B. (2022). Analysis of the role of beef cattle in the economic development of the livestock sub-sector in West Sumatra Province. *Jurnal Ekonomi Pertanian dan Agribisnis*, *6*(4), Article 4. https://doi.org/10.21776/ub.jepa.2022.006.04.18

Jatav, S. S. (2024). Livelihood diversification and rural household economic security in Uttar Pradesh, India. *Indian Journal of Extension Education*, *60*(3), 7–11. https://doi.org/10.48165/IJEE.2024.60302

Kiptot, E., & Franzel, S. (2014). Voluntarism as an investment in human, social and financial capital: Evidence from a farmer-to-farmer extension program in Kenya. *Agriculture and Human Values*, *31*(2), 231–243. https://doi.org/10.1007/s10460-013-9463-5

Liu, P., Han, A., & Yuan, Y. (2025). Community leadership and its contribution to rural revitalization under the context of population hollowing-out: Evidence from Shanghai, China. *Population, Space and Place*, *31*(1), e2880. https://doi.org/10.1002/psp.2880

Madarisa, F., Putra, R. A., & Novarista, N. (2024). The influence of the performance of livestock farming groups on the development of government-assisted livestock populations in Lima Puluh Kota District. *IOP Conference Series: Earth and Environmental Science*, *1341*(1), 012103. https://doi.org/10.1088/1755-1315/1341/1/012103

Makate, C. (2020). Local institutions and indigenous knowledge in adoption and scaling of climate-smart agricultural innovations among sub-Saharan smallholder farmers. *International Journal of Climate Change Strategies and Management*, *12*(2), 270–287. (world). https://doi.org/10.1108/IJCCSM-07-2018-0055

Matsiliza, N. S. (2024). The strategic role of traditional leadership in promoting good governance. *Africa's Public Service Delivery & Performance Review*, *12*(1), 10. https://doi.org/10.4102/apsdpr.v12i1.825

Mbalyohere, C., & Lawton, T. C. (2022). Engaging informal institutions through corporate political activity: Capabilities for subnational embeddedness in emerging economies. *International Business Review*, *31*(2), 101927. https://doi.org/10.1016/j.ibusrev.2021.101927

Olaopa, O. R., Ogundare, S., Olaopa, O. R., & Ogundare, S. (2023). Traditional leadership, indigenous knowledge, and local governance: implications for good governance and sustainable development agenda. In *Indigenous People—Traditional Practices and Modern Development*. IntechOpen. https://doi.org/10.5772/intechopen.1003144

Pali, P. N., Tebeka, Y. A., Schut, M., Mangheni, M. N., Wairegi, L. W., Manyong, V. M., & van Asten, P. J. A. (2023). Elaborating institutional arrangements to better enhance sustainable crop intensification in Uganda: A farmers' perspective. *Journal of Rural Studies*, *98*, 68–79. https://doi.org/10.1016/j.jrurstud.2023.02.002

Putra, R. A., Novarista, N., Anas, A., & Madarisa, F. (2023). Identification of capacity grade improvement of livestock farmer groups receiving government assistance in Padang Pariaman District, West Sumatera. *Jurnal Peternakan Indonesia (Indonesian Journal of Animal Science)*, *25*(2), 136. https://doi.org/10.25077/jpi.25.2.136-149.2023

Rahmat, A., Warassih, E., & Syamsudin, M. (2023). The existence of Nagari in West Sumatra on state policy hegemony. *Malaysian Journal of Syariah and Law*, *11*(2), 310–329. https://doi.org/10.33102/mjsl.vol11no2.452

Salkind, N. (2007). *Encyclopedia of Measurement and Statistics*. Sage Publications, Inc. https://doi.org/10.4135/9781412952644

Sharma, S., & Singh, R. (2023). Knowledge enhancement of landless and marginal farmers through entrepreneurship training on goat farming. *Indian Journal of Extension Education*, *59*(4), 58–61. https://doi.org/10.48165/IJEE.2023.59412

Verma, H., Singh, M., Shruti, & Meena, H. R. (2025). Farmers' livelihood security through sheep farming in Bareilly District of Uttar Pradesh. *Indian Journal of Extension Education*, *61*(4), 31–37. https://doi.org/10.48165/IJEE.2025.61406

Webster, J. (2013). *Animal Husbandry Regained: The Place of Farm Animals in Sustainable Agriculture*. Routledge.

Widianingsih, I., McIntyre, J. J., Rakasiwi, U. S., Iskandar, G. H., & Wirawan, R. (2023). Indigenous sundanese leadership: Eco-Systemic lessons on zero emissions. *Systemic Practice and Action Research*, *36*(2), 321–353. https://doi.org/10.1007/s11213-022-09606-y

Yami, M., & van Asten, P. (2018). Relevance of informal institutions for achieving sustainable crop intensification in Uganda. *Food Security*, *10*(1), 141–150. https://doi.org/10.1007/s12571-017-0754-3

Yang, Y., Huang, Y., Huang, J., & Nie, F. (2024). The role of social capital in the impact of multiple shocks on households' coping strategies in underdeveloped rural areas. *Scientific Reports*, *14*(1), 14218. https://doi.org/10.1038/s41598-024-65206-x

Zhou, T. M. (2023). The Role of Traditional Leaders and Culture in Zimbabwean Elections. In E. Mavengano & S. Chirongoma (Eds.), *Electoral Politics in Zimbabwe, Vol II: The 2023 Election and Beyond* (Vol. 2, pp. 331–350). Springer Nature. https://doi.org/10.1007/978-3-031-33796-3_18