

Empowering Rural Futures: A Penta Helix Approach to Agricultural Development and Village Autonomy in Tana Tidung

Nia Kurniasih Suryana*, Syahran, Daud Nawir, Riska Ananda Sintia,
Nizhamuddin
Universitas Borneo Tarakan
nia@borneo.ac.id*

Abstrak. Komunitas pedesaan di berbagai belahan dunia menghadapi tantangan multidimensi dalam mewujudkan kemandirian berkelanjutan, meliputi aspek ekonomi, sosial, dan kelembagaan. Penelitian ini secara kritis mengkaji potensi pertanian, ketangguhan kelembagaan, serta modal sosial di Kabupaten Tana Tidung, Indonesia, dan merumuskan kerangka strategi berbasis Pentahelix untuk mengoptimalkan aset-aset tersebut. Dengan menggunakan metode deskriptif-analitis, penelitian ini menemukan bahwa desa-desa di Tana Tidung memiliki sumber daya ekonomi yang signifikan, meliputi sektor pertanian, peternakan, dan Perkebunan, didukung oleh kualitas sumber daya manusia yang memadai, kelembagaan yang tangguh, jejaring sosial yang dinamis, serta layanan kesehatan yang relatif terjangkau. Untuk mempercepat terwujudnya kemandirian desa, penelitian ini merekomendasikan diversifikasi jalur ekonomi, program pendidikan dan pelatihan vokasional yang kontekstual, serta peningkatan infrastruktur secara komprehensif mencakup transportasi, elektrifikasi, telekomunikasi, dan konektivitas pasar. Pendekatan ini juga menekankan pentingnya membangun kemitraan sinergis antara entitas desa dan aktor eksternal, termasuk sektor swasta dan organisasi non-pemerintah. Strategi lanjutan mencakup pelaksanaan pendidikan nonformal, perluasan inklusivitas digital, pemberdayaan ekonomi perempuan, serta penguatan kapasitas aparatur desa dalam tata kelola, manajemen fiskal, kepemimpinan, dan implementasi kebijakan. Selain itu, transparansi keuangan, pengembangan organisasi masyarakat yang beragam, fasilitasi kegiatan sosial-budaya secara berkala, serta penguatan infrastruktur dan layanan kesehatan juga merupakan aspek krusial. Model yang holistik dan integratif ini menawarkan

cetak biru yang dapat direplikasi untuk pembangunan pedesaan berkelanjutan sekaligus penguatan otonomi desa.

Kata Kunci: *Desa Mandiri, Potensi, Modal Sosial*

Abstract. Rural communities across the globe confront multifaceted challenges in attaining sustainable autonomy, encompassing economic, social, and institutional dimensions. This study critically examines the agricultural potential, institutional robustness, and social capital within Tana Tidung Regency, Indonesia, and devises a Pentahelix-based strategic framework to harness these assets optimally. Employing a descriptive analytical methodology, the research reveals that villages in Tana Tidung are endowed with substantial economic resources, spanning agriculture, livestock, and plantation sectors, complemented by competent human capital, resilient institutions, vibrant social networks, and accessible health services. To expedite the realization of village self-reliance, the study advocates for diversified economic pathways, customized educational and vocational training programs, alongside comprehensive infrastructural enhancements encompassing transportation, electrification, telecommunications, and market connectivity. Integral to this approach is the cultivation of synergistic partnerships between village entities and external actors, including private enterprises and non-governmental organizations. Further strategic imperatives entail the implementation of non-formal educational initiatives, expansion of digital inclusivity, women's economic empowerment, and capacity building of village officials in governance, fiscal stewardship, leadership, and policy execution. Reinforcing financial transparency, nurturing heterogeneous community organizations, facilitating periodic socio-cultural engagements, and augmenting healthcare infrastructure and outreach are equally pivotal. This holistic and integrative model proffers a scalable blueprint conducive to sustainable rural development and fortified village autonomy.

Kata Kunci: *Independence Village, Potential, Social Capital*

INTRODUCTION

Villages are the cornerstone of economic and social development in many countries, including Indonesia, where more than 40% of the

population resides in rural areas (World Bank 2022). These rural communities are vital not only as centers of agricultural production but also as custodians of cultural traditions and social cohesion that underpin national stability. Despite having abundant natural and social resources, villages in developing countries continue to face significant challenges in achieving sustainable independence and autonomy. Key obstacles include limited infrastructure, low institutional capacity, and the underutilization of social capital, which collectively impede effective rural development and limit opportunities for poverty alleviation and economic diversification (Li, Westlund, and Liu 2021; Wang and Zhu 2020).

In Indonesia, Tana Tidung Regency in North Kalimantan serves as a tangible example of a region with substantial agricultural and institutional potential, yet hindered in optimizing these resources. Covering an administrative area of 4,828.58 km² and comprising five districts—Sesayap, Sesayap Hilir, Tana Lia, Betayau, and Muruk Rian—and 32 villages/urban wards, Tana Tidung presents a microcosm of the challenges and opportunities facing many rural areas in Indonesia. Data from 2023 indicate that only 7 of these villages have achieved independent status, while the majority remain in the developing or advanced stages, highlighting the uneven pace of rural development in the region (BPS RI 2023). This disparity signals systemic issues, including infrastructural gaps, institutional weaknesses, and socio-economic limitations, that require comprehensive, multi-sectoral interventions.

Several challenges impede agricultural potential development in Tana Tidung Regency. Limited access to modern farming technologies restricts productivity improvements and innovation adoption. Furthermore, inadequate agricultural infrastructure, such as irrigation networks and roads, constrains farmers' ability to optimize yields and access markets efficiently. Compounding these issues is the low quality of human resources in the agricultural sector, manifested in limited knowledge, skills, and capacity to implement sustainable farming practices. Weak coordination among stakeholders—including farmers, local government, academia, industry, and community organizations—further hampers agricultural advancement. Collectively, these factors stifle the agricultural sector's potential to act as the leading engine of rural economic growth and community well-being (Samsul et al. 2023).

Village institutions play an equally important role in the development and management of local resources and in implementing programs designed to improve community welfare. These institutions range from village governments to consultative bodies such as the Village Consultative Council (BPD), and economic entities like Village-Owned Enterprises (BUMDes) and cooperatives. However, many face constraints in administrative, managerial, and technical capacities, limiting their effectiveness. Corruption and lack of transparency in financial and administrative management further erode public trust in village institutions, undermining their legitimacy and capacity to foster participatory development (Endah 2018; Anggraheni, Nurjaman, and Kamil 2022). Addressing these institutional deficiencies is therefore critical for enhancing governance quality and achieving sustainable rural development outcomes.

Social capital is also vital for strengthening village independence. It comprises the social networks, norms, and trust that facilitate collective action and cooperation among community members (Putnam et al. 1993; Westlund 2006). Social capital contributes to social cohesion and resilience, enabling communities to mobilize resources and respond adaptively to socio-economic and environmental challenges. However, prior research in Indonesia has revealed limitations in leveraging social capital effectively, with many villages failing to integrate social networks with institutional and agricultural development efforts optimally (Amalia and Syawie 2016; Sidik 2015). This gap underscores the need for innovative frameworks that holistically combine agriculture, institutions, and social capital to enhance village development.

One promising approach is the Penta Helix model, which facilitates collaboration among five key sectors: government, academia, industry, community, and media. This multi-stakeholder framework has been proven effective in promoting innovation and sustainable development in rural areas by harnessing the complementary strengths of diverse actors (Kolehmainen et al. 2016; Calzada 2023). The Penta Helix approach encourages the sharing of knowledge, resources, and expertise, fostering synergies that can overcome the complex, interrelated challenges faced by villages like those in Tana Tidung.

The development of agricultural potential, institutional capacity, and social capital through the Penta Helix strategy is highly relevant to achieving

village independence. By engaging the five key sectors, the strategy creates strong synergies that enhance productivity, foster innovation, and promote sustainability in agriculture (Pradhipta, Pusparani, and Nofiyanti 2021). Strengthening institutional frameworks and social capital, combined with the adoption of appropriate technological advancements, is expected to address the multifaceted challenges confronting Indonesia's agricultural sector. This integrated method improves farmers' welfare and ensures environmental sustainability. Evidence suggests that the Penta Helix approach enhances collaboration among stakeholders and accelerates economic growth across various industries, including agriculture (Sjögren Forss, Kottorp, and Rämgård 2021; Budhi, Lestari, and Suasih 2022; Azwar et al. 2023).

Therefore, it is essential to thoroughly examine the agricultural potential, institutional capacity, and social capital of villages in Tana Tidung Regency. Such an assessment will inform the formulation of contextually relevant, evidence-based strategies leveraging the Penta Helix model to foster village independence. Specifically, this study aims to (i) map the agricultural potential, institutional capacity, and social capital of villages in Tana Tidung Regency, and (ii) formulate strategies to strengthen village independence through the application of a Penta Helix framework supported by SWOT and Analytical Hierarchy Process (AHP) analyses. The primary contribution of this research lies in presenting a hybrid strategic framework grounded in empirical evidence, which can be replicated to support sustainable rural development at both national and international levels.

METHOD

This study employed a mixed methods approach with an explanatory sequential design, which, according to (Creswell and Guetterman 2024), effectively combines the strengths of quantitative analysis with the depth of qualitative insights through gradual integration. The initial survey results guided the qualitative phase, including interviews and Focus Group Discussions (FGDs), enabling the exploration of dimensions not captured by numerical data. The research was conducted in Tana Tidung Regency, North Kalimantan, from January to August 2025, covering five districts and 32 villages selected for their agricultural potential, diversity of village institutions, and significant but underutilized social capital.

Data were collected through participatory observation; a quantitative survey of 320 households using a validated and reliable questionnaire; in-

depth interviews with 25 key informants; FGDs involving five main stakeholders based on the Penta Helix concept; and secondary data from the Central Bureau of Statistics (BPS), the Department of Agriculture, and academic publications.

Quantitative analysis was conducted descriptively to map agricultural potential, institutional capacity, and social capital, forming the basis for a SWOT-TOWS analysis in formulating strategies (Tuan and Canh 2022). Strategic priorities were determined using the Analytical Hierarchy Process (AHP) through expert weighting. Qualitative data were analyzed thematically using NVivo to identify themes supporting quantitative findings. The validity of findings was ensured through cross-method and cross-source triangulation to guarantee consistency and credibility (Guetterman, Clark, and Molina-Azorin 2023).

RESULTS AND DISCUSSION

Agricultural Potential, Institutional Capacity, and Social Capital in Tana Tidung Regency

The agricultural potential of villages in Tana Tidung Regency is highly diverse, shaped by an interplay of natural and socio-economic factors. The region's tropical climate, with relatively stable rainfall, supports the cultivation of various high-value commodities, while soil characteristics allow for diversified farming systems. The utilization of this potential largely depends on the availability of agricultural infrastructure—including irrigation systems, farm access roads, and post-harvest storage facilities—which remain unevenly distributed, as well as on farmers' knowledge and skills in adopting sustainable innovations.

Geographically, Tana Tidung enjoys strategic access to regional markets; however, logistical constraints and underdeveloped supply chains continue to pose significant barriers. Within the framework of rural development, agricultural potential is not solely assessed by land productivity but also by its role as a driver of the local economy, a source of employment, a pillar of food security, and a catalyst for social transformation.

Therefore, managing this potential requires a holistic approach that integrates natural resource mapping, human capital enhancement, and the strengthening of village institutions. Such an approach would enable the region to address existing challenges while maximizing emerging

opportunities. The types and distribution of agricultural potentials in the villages of Tana Tidung Regency are presented in Table 1.

Table 1. Agricultural Potential of Villages in Tana Tidung Regency

No.	Village	Regency	Potential Commodity Agriculture
1	Tideng Pale	Sesayap	Rubber, Rice Rice fields, chilies
2	Limbu Sedulun	Sesayap	Paddy Ricefield
3	Sebidai	Sesayap	Paddy Fields, Horticulture Seasonal
4	Sedulun	Sesayap	Corn, Rice fields, rice
5	Tideng Pale Timur	Sesayap	Field
6	Gunawan	Sesayap	Chili, Horticulture Seasonal
7	Sebawang	Sesayap	Paddy Field, Corn
8	Sesayap	Sesayap Hilir	Paddy Field
9	Sengkong	Sesayap Hilir	Cassava, Horticulture Seasonal
10	Bebatu	Sesayap Hilir	Horticulture Annual and
11	Badan Bikis	Sesayap Hilir	Seasonal
12	Sepala Dalung	Sesayap Hilir	Chili, Horticulture Annuals and Seasonals
13	Seludau	Sesayap Hilir	Paddy Rice fields, chilies
14	Menjelutung	Sesayap Hilir	Horticulture Annuals and Seasonals
15	Sesayap Selor	Sesayap Hilir	Sugarcane, Pepper, Corn, Chili, Rice Ricefield
16	Mendupo	Betayau	Paddy Ricefield
17	Kujau	Betayau	Horticulture Annuals and Seasonals
18	Bebakung	Betayau	Coconut Palm oil
19	Buong Baru	Betayau	Head Palm oil, corn, chili
20	Maning	Betayau	Head Palm oil
21	Periuk	Betayau	Head Palm oil
22	Seputuk	Muruk Rian	Head Palm oil
23	Rian	Muruk Rian	Paddy Field
24	Rian Rayo	Muruk Rian	Corn
25	Kapuak	Muruk Rian	Head Palm oil, rice Field

26	Belaian Ari	Muruk Rian	Paddy Field
27	Sapari	Muruk Rian	Chilli
28	Tanah Merah	Tana Lia	Head Palm oil
29	Tanah Merah Barat	Tana Lia	Paddy Ricefield
30	Tengku Dacing	Tana Lia	Paddy Ricefield
31	Sambungan	Tana Lia	Paddy Ricefield
32	Sambungan Selatan	Tana Lia	Paddy Ricefield

Source: Department of Agriculture Summit, 2024.

Table 1 presents data on the agricultural commodity potential of 32 villages in Tana Tidung Regency, distributed across five districts. This potential includes a variety of key commodities such as lowland rice, upland rice, maize, chili, rubber, oil palm, cassava, sugarcane, pepper, as well as various perennial and seasonal horticultural crops. The distribution of commodities indicates a certain degree of specialization in each district—for example, Betayau District is predominantly characterized by oil palm cultivation, Sesayap District produces significant quantities of rice and horticultural crops, and Tana Lia District focuses on lowland rice production. This data provides an overview of the region’s agrarian potential, which can serve as a foundation for local economic development.

In addition, the villages in Tana Tidung Regency possess institutional potentials that are vital for regional growth and progress. These institutions have the capacity to sustainably advance the villages if managed effectively, supported by active community participation, and reinforced by government and multi-stakeholder collaboration. Several examples of institutional potential in the villages of Tana Tidung Regency are presented in Table 2.

Table 2. Institutional Potential of Villages in Tana Tidung Regency

No.	Institution	Institutional Role
1	Village Government	Responsible for managing administration, development, and public services at the local level.
2	Village Consultative (Badan Permusyawaratan Desa/BPD)	A legislative institution at the village level that functions to regulate and supervise the administration of village governance, as well as to serve as a forum for public representation in decision-making processes.

3	Microfinance Institutions	Microfinance bodies such as Village-Owned Enterprises (BUMDes) or cooperatives play an important role by providing financial services, business credit, and economic development support for the village community.
4	Agricultural and Livestock Business Institutions	Farmer cooperatives, farmer groups, or agricultural associations that help farmers and livestock breeders access knowledge, technical support, and market opportunities.
5	Educational and Training Institutions	Schools, learning centers, and other informal education institutions in the village that contribute to improving the community's educational level and organize skills training to enhance capabilities and economic potential.
6	Public Health Institutions	Community health centers, integrated health posts, and other health facilities in the village that play an important role in health education, disease prevention, and the provision of basic health services.
7	Environmental and Conservation Agencies	Institutions that play a vital role in environmental preservation, sustainable natural resource management, and environmental education for the community.
8	Institutions for Arts, Culture, and Tourism	Entities that promote, preserve, and develop local culture and tourism potential, such as managing tourist sites, organizing traditional art performances, and supporting handicrafts.

Source: Processed Primary Data, 2024.

Table 2 presents eight types of village-level institutions and their roles in supporting community development and welfare. These institutions include: village government, village legislative (BPD), microfinance institutions, agricultural and livestock organizations, educational and training institutions, public health institutions, environmental and conservation organizations, and arts, culture, and tourism institutions. Each plays a specific function, ranging from managing administration and public services, overseeing governance, providing financial services, assisting farming enterprises, enhancing education and skills, delivering health outreach, preserving the environment, to promoting local culture and tourism.

This institutional structure serves as a critical foundation for fostering sustainable, locally based village development. Villages that leverage

social capital effectively tend to be more resilient to change and better positioned to achieve sustainable development goals. The social capital potential of villages in Tana Tidung Regency is presented in Table 3.

Table 3. Village Potential Based on Social Capital in Tana Tidung Regency

No	Social Capital	Activity
1	Mutual Cooperation	Communities often come together to carry out activities such as cleaning the environment, repairing road infrastructure, houses of worship, or supporting social and religious events.
2	Local Customs and Traditions	Traditional wedding ceremonies, traditional death ceremonies, dances such as the Enggang dance, the Pendalaman dance, or dances that depict daily life, religious rituals, celebrations of religious holidays, and traditional forum meetings.
3	Religion and Culture	Study groups, worship services, celebrating religious holidays, such as Eid al-Fitr, Eid al-Adha, Christmas, Easter, and other religious celebrations, as well as distributing zakat.
4	Community Organization	Farmer groups, women's groups, and traditional institutions. These organizations facilitate collaboration in various activities such as agriculture, local economic development, education, and the promotion of cultural and environmental values.
5	Network Social And Community Interaction	Cooperation to clean the village environment, such as sweeping the streets, or maintaining public facilities such as parks or places of worship, regular community meetings, fundraising for charitable activities, and assistance to people in need, and sporting events such as football or volleyball tournaments.

Source: Processed Primary Data, 2024.

Table 3 presents various forms of social capital that serve as vital strengths in the daily life of rural communities in Tana Tidung Regency. This social capital is manifested in five main aspects: cooperation (gotong royong), local customs and traditions, religious and cultural practices, community organizations, and social networks with community interactions.

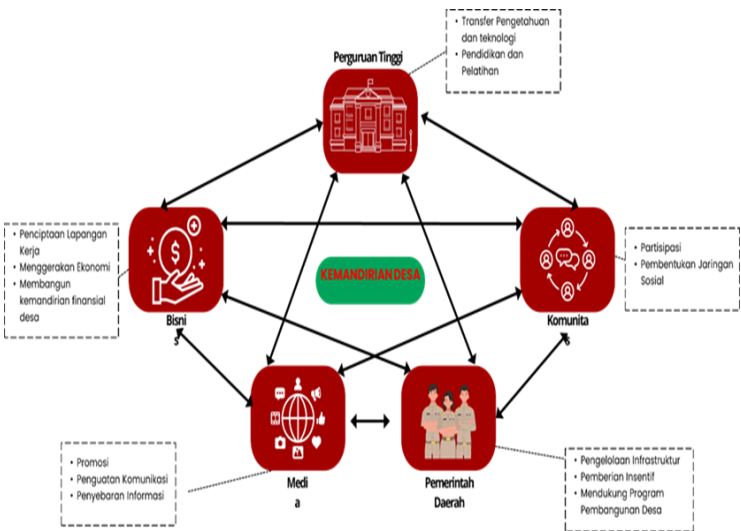
Community cooperation in Tana Tidung is reflected in collective activities such as environmental cleanups, infrastructure repairs, and support for social and religious events. Local traditions are maintained through

cultural performances like Tari Enggang and Tari Pendalaman, along with religious gatherings and celebrations. Various community organizations—farmers’ groups, women’s groups, and customary institutions—facilitate collaboration in economic, educational, and cultural initiatives. Strong social networks and joint activities further strengthen social capital as a unifying force and driver of participatory village development.

Pentahelix Strategy for Developing Agricultural Potential, Institutional Capacity, and Social Capital in Tana Tidung Regency

Village self-reliance can be achieved by developing the village’s potential (Haksama et al. 2023). The strength in developing the potential of villages and rural areas must be supported by all stakeholders. Such development cannot be carried out by a single party alone. Commitment and synergy among all elements are the key factors. Therefore, the pentahelix or multi-stakeholder concept—where the government, academics, business entities or entrepreneurs, communities, and the media work together in coordination and commitment—becomes essential to developing the local potential of villages and rural areas. In practice, each stakeholder involved in realizing village self-reliance has its own roles and responsibilities, which synergize with one another.

Figure 1. The Pentahelix Concept of Village Self-Reliance in Tana Tidung Regency



Village self-reliance in Tana Tidung Regency is achieved through synergy among key stakeholders. The village government acts as a policy driver, managing infrastructure and promoting sustainable development. Business and industry actors stimulate economic growth by creating jobs, advancing agro-industries, and promoting local products and tourism. Educational and research institutions enhance human resource quality through relevant training and applied studies, while community participation strengthens ownership, social cohesion, and environmental sustainability. Meanwhile, local media supports information dissemination and coordination among stakeholders, promoting transparency, collaboration, and the village's positive image.

DISCUSSION

Agricultural Potential, Institutional Capacity, and Social Capital in Tana Tidung Regency

The research findings reveal a diversity of agricultural commodities in the villages, including lowland rice, chili, both seasonal and perennial horticultural crops, maize, and oil palm. This variation reflects diverse agroecological conditions influenced by climatic factors, soil characteristics, and the local knowledge possessed by farmers. Such commodity diversification serves as an important adaptive strategy within Indonesia's rural agricultural systems and contributes to community economic resilience (Waluyo 2023).

The strength of local institutions is also clearly evident. Village governments and Village Consultative Bodies (BPD) hold central roles in administrative and legislative governance. Meanwhile, Village-Owned Enterprises (BUMDes), cooperatives, and farmer groups act as key intermediaries providing access to capital, knowledge, and markets for the community. Furthermore, educational, health, environmental, and cultural institutions support the sustainability of the village institutional structure (Hajar 2018).

In addition, social capital manifested through mutual cooperation (gotong royong), local traditions, community organizations, and social networks strengthens collective dynamics. Similar findings in Tengger indicate that social capital—whether in the form of bonding, bridging, or linking—plays a significant role in enhancing economic resilience while preserving the village's cultural heritage (Ambayoen et al. 2024).

Pentahelix Strategy for Sustainable Development

Building on the existing potential, the strategic framework serves as a highly relevant foundation to optimize sustainable village development (Wicaksono, Agustina, and Hidayat 2023). Within this framework, the Village Government acts as a policy director and provider of strategic infrastructure that enables integrated growth in agriculture, the creative economy, and public services. Business actors are tasked with expanding the value chain of commodities through innovation in processing, branding, and broader market penetration, thereby significantly increasing the added value of local products (Sukri, Riskiyani, and Syafar 2023). Educational and research institutions not only provide training and mentoring but also integrate applied research outcomes that support technological innovation in agriculture and entrepreneurship based on local resources. The community, as the main actor, drives collective action, safeguards environmental sustainability, and ensures cross-generational involvement in development. Meanwhile, local media plays a role in maintaining transparent information flow, building a positive village image, and strengthening promotional networks at regional and national levels.

This cross-sectoral collaborative model has proven effective in enhancing the competitiveness and self-reliance of villages across various regions in Indonesia, particularly in the agricultural and creative economy sectors. This approach aligns with the perspective of (Nugroho, Wulandari, and Farihati 2024) who argue that successful village development depends not only on the strength of natural resources but also on the quality of synergy among actors managed inclusively and participatively. Therefore, the Pentahelix model can serve as a strategic framework that not only optimizes local potential but also anticipates future challenges in realizing competitive, resilient, and sustainable villages.

Social Capital as a Driver of Sustainable Agriculture

The qualitative findings indicate that collective norms, mutual trust, and networking among farmers—especially those organized in formal groups—play a crucial role in promoting the adoption of sustainable agricultural practices. These groups function not only as coordination platforms but also as primary channels for knowledge exchange, innovation dissemination, and the formation of shared commitments toward land and natural resource conservation. Practices such as soil conservation, integrated

water management, and no-till methods are more easily adopted when supported by strong social support mechanisms.

This phenomenon aligns with international findings, for example in the United States, where farmer involvement in networks like the Practical Farmers of Iowa significantly increases the adoption rates of conservation practices through peer-to-peer interactions and experience-based information exchange (Adanywu, 2023). Similar mechanisms can be adapted to the Indonesian rural context, where deeply rooted social capital can be integrated with technical interventions from research institutions and local governments. Thus, social capital is not merely a complement but a key catalyst that accelerates the transformation of agriculture toward sustainability, both ecologically and in terms of farmers' economic resilience.

Institutional Capacity and Local Synergy within the Pentahelix Framework

Village-Owned Enterprises (BUMDes) and cooperatives hold a strategic position as microfinancial institutions that provide access to capital, facilitate the distribution of local products, and expand market reach for village-level entrepreneurs. The existence of BUMDes not only functions as an economic driver but also serves as a catalyst for community empowerment through the sustainable management of village assets. Research shows that strengthening the institutional capacity of BUMDes—through management training, improved financial literacy, and business diversification—can enhance village economic self-reliance and reduce dependence on external aid (Wijaya 2023).

Furthermore, the application of a collaborative approach based on the Pentahelix model—which involves government, academics, business actors, communities, and media—can create cross-sectoral synergy in the planning, implementation, and evaluation of village development programs (Rosari et al. 2022). The integration of BUMDes within the Pentahelix framework enables the optimization of local resource potential through knowledge-based innovation and appropriate technology, which in turn improves community welfare evenly (Mazlan, Ismail, and Juharni 2021). Such collaboration has been proven more effective in building an inclusive, competitive, and sustainable village development ecosystem.

Challenges and Opportunities for Intervention

Despite Tana Tidung Regency's strong economic and social potential, significant challenges remain, including institutional fragmentation, limited capacity in village fund management, and low social inclusivity. Studies on the Village Fund program in several regions report that weaknesses in human resource capacity and institutional regulations have led to suboptimal allocation and weak community participation in program planning (Ghassani, Chandra, and Rosalina 2022). Research in Luwu highlights that social capital—in the form of community collaboration and mutual trust—can strengthen food security through agroforestry practices while also serving as a social buffer against climate uncertainty. Meanwhile, a Gamage et al. (2023) found that social networks, shared norms, and trust play key roles in farmers' decisions to adopt organic farming, with high coefficients for trust and social networking

Therefore, interventions in Tana Tidung must be designed to strengthen internal networks through community organization training and institutional mentoring, while also expanding external linkages (linking social capital) through cross-sector partnerships—with the district government, academia, NGOs, and markets. Additionally, strengthening local institutions is essential by enhancing the human resource capacity of village officials in managing village finances, ensuring transparent reporting, and implementing accountable administrative practices. These strategies are expected to make village development more adaptive to change and inclusive, as well as improve the effectiveness of Village Fund utilization for community welfare.

CONCLUSION

Tana Tidung Regency holds vast economic potential in agriculture, livestock, and plantations, supported by strong human resources, institutional capacity, social capital, and adequate health infrastructure. Robust social capital and active village institutions enable synergy and sustainable resource management toward economic self-reliance. To accelerate village autonomy, an integrated and sustainable strategy is essential—beginning with economic diversification and human resource development through education and entrepreneurial training, supported by improved infrastructure, digital connectivity, and market access. Empowering women, fostering productive community groups, and enhancing village governance through administrative and financial capacity building will strengthen participatory development, while improved health

services and outreach programs will ensure a healthy and productive rural society.

ACKNOWLEDGMENTS

The authors would like to thank Borneo Tarakan University (UBT) and UBT's LPPM for providing the facilities, funding, and time necessary to carry out this research. It is hoped that this article will contribute positively to the community.

REFERENCES

- Amalia, Ayu Diah, and Mochamad Syawie. 2016. "pembangunan kemandirian desa melalui konsep pemberdayaan: suatu kajian dalam perspektif sosiologi." *sosio Informa*. <https://doi.org/10.33007/inf.v1i2.146>.
- Ambayoen, Mas Ayu, Kliwon Hidayat, Yayuk Yuliati, and Edi Dwi Cahyono. 2024. "The Roots of Resilience: Strengthening Agricultural Sustainability in Tengger, Indonesia Through Social Capital." *Sustainability* 17 (December):192. <https://doi.org/10.3390/su17010192>.
- Anggraheni, Siti, Asep Nurjaman, and Muhammad Kamil. 2022. "Village Institutional Transformation to Smart Village Governance in Tourism Village Development." *Jurnal Public Policy*. <https://doi.org/10.35308/jpp.v8i2.4767>.
- Azwar, Hendri, Mohd Hafiz Hanafiah, Arni Abd Ghani, Muaz Azinuddin, and Nur Shahirah Mior Shariffuddin. 2023. "Community-Based Tourism (Cbt) Moving Forward: Penta Helix Development Strategy Through Community Local Wisdom Empowerment." *Planning Malaysia*. <https://doi.org/10.21837/PM.V21I25.1225>.
- BPS RI. 2023. "Statistik Indonesia 2023." *Statistik Indonesia 2023*.
- Budhi, Made Kembar Sri, Ni Putu Nina Eka Lestari, and Ni Nyoman Reni Suasih. 2022. "The Recovery Of The Tourism Industry In Bali Province Through The Penta-Helix Collaboration Strategy In The New Normal Era." *Geojournal of Tourism and Geosites* . <https://doi.org/10.30892/GTG.40120-816>.
- Calzada, Igor. 2023. "Smart Rural Communities: Action Research in Colombia and Mozambique." *Sustainability (Switzerland)*. <https://doi.org/10.3390/su15129521>.
- Creswell, John W, and Timothy C Guetterman. 2024. *Educational Research:*

- Planning, Conducting, and Evaluating Quantitative and Qualitative Research*. 7th ed. Pearson.
- Endah, Kiki. 2018. "Mewujudkan Kemandirian Desa Melalui Pengelolaan Badan Usaha Milik Desa." *Jurnal MODERAT* 4 (November): 25–33. <https://jurnal.unigal.ac.id/index.php/moderat>.
- Gamage, Ashoka, Ruchira Gangahagedara, Jeewan Gamage, Nepali Jayasinghe, Nathasha Kodikara, Piumali Suraweera, and Othmane Merah. 2023. "Role of Organic Farming for Achieving Sustainability in Agriculture." *Farming System*. <https://doi.org/10.1016/j.farsys.2023.100005>.
- Ghassani, Nurshabrina Alin, Yanita Ella Chandra, and Erlyn Rosalina. 2022. "Pengaruh Social Media Marketing Dan Keterampilan Wirausaha Terhadap Keberhasilan UMKM Dalam Menghadapi Covid-19 Di Kota Bogro." *Politeknik Negeri*
- Guetterman, Timothy, Vicki Clark, and Jose Molina-Azorin. 2023. "Terminology and Mixed Methods Research: A Persistent Challenge." *Journal of Mixed Methods Research* 18 (December):9–13. <https://doi.org/10.1177/15586898231217855>.
- Hajar, Siti; dkk. 2018. *Pemberdayaan Dan Partisipasi Masyarakat Pesisir. Lembaga Penelitian Dan Penulisan Ilmiah Aql*.
- Haksama, Setya, Diansanto Prayoga, M. Farid Dimjati Lusno, Jayanti Dian Eka Sari, Syifaul Lailiyah, Muhammad Harisul Ilmi, Jessika Pramudya Wardani, et al. 2023. "Peningkatan Peran Kolaborasi Pentahelix Dalam Upaya Kesiapsiagaan Mengenai Bencana Multihazard Di Kabupaten Banyuwangi." *Journal of Community Empowerment and Innovation*. <https://doi.org/10.47668/join.v1i3.660>.
- Kolehmainen, Jari, Joe Irvine, Linda Stewart, Zoltan Karacsonyi, Tünde Szabó, Juha Alarinta, and Anders Norberg. 2016. "Quadruple Helix, Innovation and the Knowledge-Based Development: Lessons from Remote, Rural and Less-Favoured Regions." *Journal of the Knowledge Economy*. <https://doi.org/10.1007/s13132-015-0289-9>.
- Li, Y, H Westlund, and Y Liu. 2021. "Rural Development in China: Recent Progress and Practices." *Habitat International* 118:102464.
- Mazlan, Mazlan, Imran Ismail, and Juharni Juharni. 2021. "Strategi Pengembangan Badan Usaha Milik Desa (Bumdes) Di Kabupaten Sinjai." *Jurnal Paradigma Administrasi Negara*.

- <https://doi.org/10.35965/jpan.v2i2.563>.
- Nugroho, Rafli Adi, Suci Wulandari, and Lulu Farihati. 2024. "Optimalisasi Taman Bacaan Masyarakat Rumah Kreatif Wadas Kelir Dalam Penguatan Literasi Informasi Di Era Digital." *Visi Pustaka* 26 (3). <https://doi.org/10.37014/visipustaka.v26i3.5372>.
- Pradhipta, R. M.W.Agie, Pusparani, and Fifi Nofiyanti. 2021. "Penta Helix Strategy in Rural Tourism (Case Study of Tugu Utara Bogor)." In *E3S Web of Conferences*. <https://doi.org/10.1051/e3sconf/202123204010>.
- Putnam, R, R. Putnam, RD Putnam, D Putnam, and Robert PUTNAM. 1993. "The Prosperous Community: Social Capital and Public Life." *The American Prospect*.
- Rosari, Renya, Pandu Adi Cakranegara, Ratih Pratiwi, Irsyad Kamal, and Chitra Indah Sari. 2022. "Strategi Manajemen Sumber Daya Manusia Dalam Pengelolaan Keuangan BUMDES Di Era Digitalisasi." *Owner*. <https://doi.org/10.33395/owner.v6i3.870>.
- Samsul, Samsul, La Gurusi, Eko Satria, Edy Nurcahyo, La Asiri, Herianto Herianto, Nurdin Nurdin, La Pande Jurumai, Dandi Kurnianto, and La Adilani. 2023. "Mewujudkan Kemandirian Ekonomi Desa Melalui Pembangunan Dan Pengembangan Potensi Ekonomi Desa Watiginanda." *ANO A: Jurnal Pengabdian Masyarakat Fakultas Teknik* 2 (01): 44–51. <https://doi.org/10.51454/anoa.v2i01.445>.
- Sidik, Fajar. 2015. "Menggali Potensi Lokal Mewujudkan Kemandirian Desa." *JKAP (Jurnal Kebijakan Dan Administrasi Publik)*. <https://doi.org/10.22146/jkap.7962>.
- Sjögren Forss, Katarina, Anders Kottorp, and Margareta Rämgård. 2021. "Collaborating in a Penta-Helix Structure within a Community Based Participatory Research Programme: 'Wrestling with Hierarchies and Getting Caught in Isolated Downpipes.'" *Archives of Public Health*. <https://doi.org/10.1186/s13690-021-00544-0>.
- Sukri, Sarina, S. Riskiyani, and M. Syafar. 2023. "The Pentahelix Partnership Responses during Covid-19 Pandemic in Makassar." *International Journal of Statistics in Medical Research*. <https://doi.org/10.6000/1929-6029.2023.12.20>.
- Tuan, Nguyen Hoang, and Truong Thanh Canh. 2022. "Integral Swot-Ahp-Tows Model For Strategic Agricultural Development In The Context Of Drought: A Case Study In Ninh Thuan, Vietnam." *International*

- Journal of the Analytic Hierarchy Process*.
<https://doi.org/10.13033/IJAHP.V14I1.890>.
- Waluyo, B. 2023. *Sistem Pemasyarakatan Di Indonesia*. Sinar Grafika.
<https://books.google.co.id/books?id=723dEAAAQBAJ>.
- Wang, J, and Y Zhu. 2020. "Agricultural Modernization and Rural Development in China." *Journal of Rural Studies* 74:65–75.
- Westlund, Hans. 2006. *Social Capital in the Knowledge Economy: Theory and Empirics. Advances in Spatial Science*.
- Wicaksono, Agus Dwi, Devi Agustina, and A. R.Rohman Taufiq Hidayat. 2023. "Pentahelix Model for Eco-Industrial Development: A Collaborative Policy Approach." *International Journal of Sustainable Development and Planning*. <https://doi.org/10.18280/ijstdp.180906>.
- Wijaya, Nasdar. 2023. "strategi pengelolaan badan usaha milik desa (bumdes) dalam meningkatkan pendapatan asli desa." *Jurnal Wahana Bina Pemerintahan*. <https://doi.org/10.55745/jwbp.v10i1.118>.
- World Bank. 2022. "Inflation, Consumer Prices (Annual %) - Peru." World Bank. 2022.