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Local Food Diversification as a Pillar of Sustainable Food Development: A Critical Review of Global and Local Perspectives

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A B S T R A C T

This study presents a critical narrative review of national and international literature published between 1995 and 2024 to examine the conceptual and empirical contributions of local food diversification in building sustainable food systems. Local food diversification plays a strategic role in building a more equitable, inclusive, and sustainable food system. A narrative critical review method was employed, allowing for thematic synthesis of peer-reviewed publications obtained from databases such as Scopus, ScienceDirect, Google Scholar, and accredited national journals. Literature selection focused on the keywords: local food diversification, food security, agroecology, local wisdom, and sustainable food systems. The collected data were analysed by mapping findings into five key dimensions: ecology, socio-culture, economy, technology, and policy and institutions. Findings highlight that agroecological diversification based on local biodiversity improves climate resilience and food availability, while also preserving cultural identity and empowering rural economies. Technological innovation and participatory policy approaches are essential to support local food systems. Strengthening multi-sector collaboration, research funding, and community participation is key to positioning local food diversification as a foundation for inclusive and resilient national food policy. This study emphasises the importance of strengthening institutions, research funding, and cross-sector collaboration to make local food diversification the foundation of the national food security strategy. By placing local values and diversity as pillars of policy, Indonesia can realise a future food system that is resilient, sovereign, and aligned with the principles of sustainability.

Contribution to Sustainable Development Goals (SDGs):
SDG 2: Zero Hunger
SDG 12: Responsible Consumption and Production
SDG 13: Climate Action
SDG 15: Life on Land

1. INTRODUCTION

1.1. Research Background

The global food system is currently facing a multidimensional crisis that encompasses ecological, economic, social and health aspects. Over-reliance on a centralised industrial food system has resulted in environmental degradation, loss of biodiversity, nutritional insecurity and marginalisation of local communities. Production and distribution models focused on efficiency and volume often overlook principles of sustainability and social justice, while reinforcing the dominance of single commodities that are vulnerable to market and climate disruptions [1], [2].

In the Indonesian context, food distribution inequality and the shift in consumption patterns from local foods to imported

processed foods have weakened national food security. Regions that were once rich in local food diversity, such as eastern Indonesia and the Mentawai Islands, now face the dual challenges of ecosystem degradation and erosion of their food culture. Proper food security does not only mean the availability of sufficient food, but also the ability of a community to access, manage and sustain its food sources independently and sustainably. In response to this situation, local food diversification has emerged as a strategic approach that offers a holistic solution to global and local food crises. Food diversification involves the use of various types of local crops, livestock, non-timber forest products, and diverse marine food sources, based on local wisdom and agroecological practices. This approach not only expands the food source base but also enhances nutritional resilience, strengthens the local economy, and supports environmental conservation [1], [3], [4]. Agroecology as a holistic approach promotes the integration of traditional knowledge with scientific principles to create a resilient and socially just food system [5].

Further diversification of local food is closely related to the Sustainable Development Goals (SDGs) agenda, specifically Goals 2 (Zero Hunger), 12 (Responsible Consumption and Production), 13 (Climate Action), and 15 (Life on Land). This approach places local communities at the centre as key actors in building an inclusive food system that is resilient to climate change and based on biodiversity and local knowledge [6], [7].

1.2. Literature Review

1.2.1. The Concept of Sustainable Development

The concept of sustainable development grew out of critical thinking about conventional development models that emphasised economic growth without considering ecological sustainability and social justice. This issue was first raised globally at the United Nations Conference on the Human Environment in Stockholm (1972), which marked the beginning of the integration of environmental issues into the development discourse [8]. This awareness was further reinforced by the Club of Rome's report, entitled "The Limits to Growth" (1972), which predicted that uncontrolled economic growth and consumption would lead to ecological collapse in the long term if not accompanied by fundamental reforms [9]. A key milestone for this concept occurred in 1987 with the publication of the report "Our Common Future" by the World Commission on Environment and Development (WCED), also known as the Brundtland Report. In this report, sustainable development is defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' [10]. This definition is widely accepted and serves as a normative framework for designing cross-sectoral development policies, including food systems.

Sustainable development rests on three main pillars: economic, social and environmental. The economic pillar demands efficiency in resource utilisation and inclusive economic growth. Meanwhile, the social pillar emphasises justice, equality and protection of vulnerable groups. Finally, the environmental pillar requires the protection of biodiversity, the sustainable management of natural resources, and the mitigation of environmental damage [8], [11], [12], [13]. These three pillars support each other and form the foundation for development that not only meets current needs but also ensures future sustainability.

Sustainable development in the food system is defined as efforts to create a system that can provide nutritious food for everyone fairly and sustainably, while protecting ecosystems and strengthening the capacity of local communities. A purely sectoral approach to food policy is no longer adequate; synergy between the dimensions of health, the environment and social justice is needed [1].

In general, the 17 Sustainable Development Goals (SDGs) cover all aspects of human and environmental development. However, in the context of local food systems, the four most relevant goals are:

- SDG 2: End hunger and improve nutrition through sustainable food systems;
- SDG 12: Promote efficient and responsible food consumption and production;
- SDG 13: Take action against climate change, including adaptation of food systems;
- SDG 15: Protect and restore terrestrial ecosystems that support food diversity.

Local food systems based on diversification, ecosystem resilience, and traditional knowledge are more resilient to global disruptions, such as climate crises and supply chain disruptions [6], [14]. Thus, sustainable development in the context of food systems is not only about increasing production, but also recognising the role of local communities and integrating ecological values into every stage of production and consumption.

1.2.2. Definition and Characteristics of Local Food

Local food is part of a food system rooted in cultural practices, natural resources and the culinary traditions of local communities. Conceptually, local food is not only understood as food produced and consumed in a specific geographical area, but also as a symbol of cultural identity and the ecological adaptation practices of local communities to their environment. Local food reflects social relationships, spiritual values and traditional knowledge systems that have been passed down from generation to generation [15], [16].

The concept of local food is contextual and diverse, influenced by the geographical, cultural and political dimensions of a region. Some approaches define local food based on the geographical proximity between the place of production and consumption, as exemplified by the '100-mile diet' practice in North America [17]. Meanwhile, another approach places greater emphasis on the origin of ingredients, sustainable cultivation methods, and the active participation of local communities in the food system [18], [19]. In Indonesia, local food is often associated with non-rice commodities, such as sago, corn, cassava, and other tubers, which have long been the primary food source for various indigenous communities [20]. This definition reflects the close relationship between food, cultural identity and the sustainability of local resources.

The characteristics of local foods can be grouped into six main dimensions. First, local foods originate from local biodiversity, including minor crops such as porang, ganyong, jewawut, corn and sorghum in East Nusa Tenggara [21]. Second, local foods are rooted in traditional knowledge, encompassing cultivation, processing, and consumption, which is passed down from generation to generation, as evident in the processing of tempeh, tape, and sago products. Third, local foods are produced

through agroecological systems that use low levels of chemical inputs and maintain the ecological function of the land [22]. Fourth, local food is seasonal and fresh, as it follows natural cycles and avoids lengthy distribution chains. Fifth, local food is closely linked to cultural practices and social rituals, and sixth, local food supports the community economy through short distribution chains that empower small farmers and food SMEs [23].

The six main dimensions of local food characteristics are clearly reflected in the Mentawai community's food system. As a relatively isolated archipelago, the Mentawai community has developed a food system that relies on local resources and traditional knowledge, with sago (Metroxylon sagu) as a vital staple food [24], [25], [26], [27], [28], [29]. Sago is not only a major source of carbohydrates, but also has deep cultural significance, integrated into the traditional rituals and spiritual life of the Mentawai people [29], [30], [31], [32]. This plant grows naturally in swampy areas and is cultivated without the use of artificial fertilisers or pesticides, making it an ideal example of an ecologically friendly food that is flood-resistant [33], [34]. The sustainability of this system is reinforced by the economic and social value inherent in locally managed sago, which is traditionally consumed and supports culture-based food security [35].

In addition to sago, the Mentawai people also utilise bananas, taro, sweet potatoes, and various forest products such as ferns, wild mushrooms, and river fish caught using traditional methods [36]. Food processing is often carried out collectively in *uma* (traditional houses), which also serve as spaces for intergenerational learning about local processing practices, techniques for processing natural toxins in tubers, and food preservation without reliance on modern technology [37], [38]. Knowledge about planting cycles, food processing, and preservation is passed down from one generation to the next, strengthening local food resilience and demonstrating the community's independence in maintaining its food security. In terms of nutrition, Mentawai's local foods offer a variety of nutrients from natural plant and animal sources, without modern engineering, supporting the achievement of SDG 2: Zero Hunger. These traditional management methods also align with SDG 12 (Responsible Consumption) and SDG 13 (Climate Action), as they minimise waste and contribute to climate change adaptation [2]. With these characteristics, the Mentawai local food system represents a model of sustainability rooted in local culture and ecosystems. Efforts to understand and document this system, including food processing practices in uma, play an important role not only in preserving cultural knowledge but also as a strategic reference in designing a more equitable, resilient, and sustainable national food system.

1.2.3. Local Food Diversification: Theory and Practice

The practice of local food diversification can be found in the form of multicultural agriculture, the development of local varieties, the utilisation of wild plants, and the integration of food production, livestock farming, and fisheries. In Indonesia, these practices are commonly found in the eastern regions of the country, such as East Nusa Tenggara, where sorghum, millet, and titi corn serve as the primary sources of carbohydrates [39]. Additionally, communities in Papua and Maluku rely on a diverse range of food sources, including sago, tubers, seafood, and non-timber forest products.

Food diversification not only reflects the diversity of commodities, but also reflects the deep integration between food, culture and local knowledge. In many indigenous communities, traditional food processing methods, such as fermentation, smoking, natural drying, and regionally specific serving methods, are carried out through social cooperation in communal spaces, including traditional houses or community halls. These techniques play a crucial role in preserving the nutritional value of food while strengthening cultural identity and social cohesion [40]. Through intergenerational learning mechanisms in traditional spaces, local values and traditional skills are passed down in a participatory manner. This approach reflects a holistic food system, in which food is not only a source of nutrition, but also an element that shapes cultural identity and the strength of local communities [41].

From an economic perspective, local food diversification serves as a catalyst for strengthening the community economy by activating local markets, developing farmer cooperatives, and utilising agrotourism potential based on endogenous resources. Commodities such as sago flour, cassava chips, and traditional herbal beverages demonstrate competitive economic potential when supported by innovations in post-harvest processing, culturally-based packaging, digital marketing strategies, and the strengthening of local entrepreneurial capacity. This approach not only enhances product value but also shortens the supply chain and expands rural economic inclusion [42].

Nutritionally, local food diversification provides a broader spectrum of micronutrients than monoculture consumption patterns, enriching the intake of essential nutrients through plant and animal sources that are appropriate to the local ecology. Studies have shown that diversity in local food consumption is positively correlated with improved nutritional status, particularly in the context of rural households and indigenous communities [43]. The importance of a food environment that supports access to local food diversity as a key determinant of community-based nutritional security [44]. Thus, local food diversification is not merely a technical strategy for food production, but a holistic approach that integrates ecological, social, cultural, and economic dimensions. Strengthening diversification requires support from national policies, applied research, and active participation from local communities to achieve a fair, healthy, and sustainable food system in the long term.

1.2.4. Contribution of Local Food Diversification to Food Security

Local food diversification plays a crucial role in strengthening the four main dimensions of food security: availability, access, utilisation, and stability. In terms of availability, diversification enables communities to access a variety of food sources, including local plants, animals, and marine products, that can be produced sustainably. This diversity reduces reliance on a single commodity and enhances the ability to adapt to supply disruptions such as natural disasters or market fluctuations [45].

In terms of access, diverse and locally based food systems promote household food self-sufficiency through self-production and community-based, informal distribution. This shortens the supply chain and reduces logistics costs, making food more accessible, especially for vulnerable groups. Diversification also strengthens local markets and inter-regional food exchange networks based on trust and social solidarity.

In terms of utilisation, the consumption of various types of local foods contributes to increased nutritional intake and a better balance of micronutrients. Foods derived from minor crops and local species, such as taro, moringa leaves, sago, and traditional nuts, contain important nutrients like iron, vitamin A, calcium, and vegetable protein that support growth and immunity [46]. Households that consume a variety of local foods exhibit a better nutritional status and a lower prevalence of stunting compared to households with homogeneous consumption patterns.

The dimension of stability refers to the ability of food systems to provide food over time and under various conditions consistently. Diversification plays a key role in this stability, as diverse systems are more resilient to climate change, pest attacks and market uncertainty [47]. Food systems that integrate various local varieties and agroecological techniques demonstrate greater resilience to seasonal fluctuations and environmental pressures [48]. Empirical examples can be found in studies in West Timor, where the integration of dryland farming with local food crops, such as corn, peanuts, and sweet potatoes, has been shown to increase household food security and reduce dependence on food aid. In the Mentawai Islands, the diversity of food sources, including sago, taro, seafood, and garden crops, not only guarantees adequate energy and protein intake but also strengthens cultural food security through collective distribution systems and mutual assistance practices in traditional *uma* houses, which are still maintained today.

Overall, the contribution of local food diversification to food security is not only quantitative, but also qualitative and contextual. It is rooted in the interaction between ecology, society and culture that shapes a holistic food system. Therefore, recognition of the strategic role of local food diversification must be reflected in national food policies, nutrition intervention programmes, and community education initiatives that foster appreciation for local food as a source of strength and self-reliance [49].

1.2.5. Food Diversification as a Strategy for Adapting to Climate Change

Local food diversification has a strategic contribution as a form of adaptation to the increasingly apparent impacts of climate change, such as changes in rainfall patterns, extreme temperatures and degradation of natural resources. The connectivity between agroecology, climate change and local food is an important foundation in understanding how diversification functions as an adaptive strategy based on local wisdom and biodiversity. This approach aligns with the principles of sustainable development, which position local food systems as pillars of long-term ecological and social resilience.

Within the framework of agroecology, diversified food production systems tend to be more resilient to climate shocks than monoculture systems. Crop diversity increases ecological resilience because each species has different resistance to drought, flooding and pest attacks. This enables farmers to continue harvesting crops even in unpredictable weather conditions. Diversification increases production stability and minimises the risk of total failure due to extreme climate change [50]. Empirical evidence suggests that many local crops are resilient to extreme conditions and exhibit high adaptive potential. For example, sorghum and millet can grow in dry land with low inputs, while sago and taro remain productive in peatlands or flooded areas. Additionally, crops such as groundnuts, sweet potatoes, and moringa have relatively short growth cycles and are flexible to seasonal shifts. These adaptations are reinforced by local practices such as adjusting planting calendars, land rotation, and using organic materials to improve soil structure [51]. Diversification also strengthens community-based adaptation strategies, in which local communities act not only as implementers but also as producers of adaptive knowledge. Local knowledge plays a crucial role in preserving traditional cultivation techniques, soil conservation systems, and water management practices that are tailored to the unique geographical conditions of each region.

A participatory approach to climate adaptation through the development of household food gardens, agroecology training, and seed and information exchange among farmers. This approach builds collective resilience and strengthens social cohesion within communities. Thus, local food diversification is not only a strategy to maintain food production in crises but also an integral element in building an ecologically resilient, socially inclusive, and economically sustainable food system. Integrating diversification approaches into national climate policies, ecosystem-based adaptation programmes, and community food security strategies is a strategic step in addressing the growing complexity of global climate uncertainty.

1.2.6. Ecosystem Resilience and Environmental Services in Food Diversification

Local food diversification not only contributes to social and economic aspects but also plays a crucial role in maintaining ecosystem resilience and providing various environmental benefits. Diversified food systems support ecosystem functions through the provision of ecosystem services such as soil fertilisation, water cycling, natural pest control and pollination. Biodiversity in agroecological systems creates ecological synergies that enhance environmental stability and increase long-term productivity, reducing dependence on synthetic external inputs [52].

Diversification also plays a crucial role in enhancing soil quality and promoting water conservation. Farming systems that integrate different types of crops and local cultivation techniques, such as intercropping and organic fertilisation, are proven to maintain soil fertility, prevent erosion and increase water infiltration capacity. Vegetation diversity also plays a role in retaining soil moisture and reducing water loss through evaporation. For example, agroforestry practices in tropical Indonesia show that combining woody trees with food crops improves soil structure and reduces water runoff. Ecosystem studies demonstrate that diversification practices mitigate land degradation and facilitate the restoration of degraded agricultural ecosystems.

High biodiversity in local food systems also strengthens resistance to ecological disturbances and environmental changes. By planting a variety of local species and varieties, farmers can reduce the risk of total destruction due to attacks by certain pests or diseases. Additionally, in situ conservation of local varieties supports the genetic preservation of food crops, which is crucial for future adaptation. This effort aligns with the agro-ecological approach, which integrates ecological, economic, and cultural principles to create a sustainable and equitable food production system [52].

As an integrative approach, agroecology combines agricultural science, ecology, and local knowledge in building

food systems that prioritise the balance between production, conservation, and social justice. Agroecology is not just a production technique, but also a social movement and a political approach that places farmers as the primary actors in transforming the food system. Therefore, strengthening diversification through agroecological principles is a key strategy to ensure the continuity of environmental services on which future food security and sustainability are based.

1.2.7. Socio-Cultural Dimension of Food Diversification

In addition to its ecological and economic dimensions, local food diversification also plays a crucial role in building and maintaining the social and cultural foundations of society. Anthropological and sociological approaches to food systems show that food is not only an object of consumption, but also a symbol of identity, a cultural communication tool and a means of passing on local values.

Local food diversification not only has ecological and economic dimensions, but is also loaded with social and cultural values. Food is an integral part of community identity and plays a crucial role in shaping cultural identity, social structure, and local knowledge systems. In many indigenous communities, the type of food consumed, the way it is processed and how it is consumed symbolise local wisdom that is passed on across generations.

Local food not only serves as a source of nutrition but also plays a crucial role in maintaining the cultural identity and social structure of communities. In many indigenous communities, traditional food collection, processing and consumption practices reflect collective values, such as mutual aid and balance with nature. For example, in the Karen community in Thailand, traditional food systems reflect the close relationship between people and their environment, supporting food security and community health. However, modernisation and globalisation have led to the marginalisation of cultural values inherent in local food systems, threatening the sustainability of these traditional practices. Therefore, efforts to preserve and strengthen local food systems are crucial as an integral part of realising sustainable, inclusive and local wisdom-based food security [53].

1.2.8. The Role of Innovative Technologies in Strengthening Local Food Systems

Innovative technologies play a crucial role in enhancing the diversification and resilience of local food systems, particularly in post-harvest processing and distribution aspects. Innovations in this area enable local food products to be processed into value-added commodities with a longer shelf life and higher selling value. For example, solar drying technology, controlled fermentation and community-scale processing machines have proven suitable for implementation in remote areas. In the global context, new approaches to agro-processing, including high hydrostatic pressure, pulsed electric fields, and cold plasma, also show great potential to improve product quality and safety without compromising nutritional value [54].

While modern technologies promise to improve the efficiency and quality of food products, their success is highly dependent on the local context. In many rural communities, barriers such as high costs, limited infrastructure and incompatibility with traditional practices are significant factors in the failure of technology adoption. Therefore, the principle of appropriate and participatory technology is fundamental. The development of technologies tailored to local needs, supported by continuous training and knowledge transfer, is a prerequisite for promoting a more equitable and inclusive transformation of the food system [55].

Technology in local food systems should not only be positioned as an instrument of production efficiency, but also as a tool for social empowerment. Collaboration among research institutions, local governments, and local communities is crucial so that technological innovations truly address the community's real needs. A trans-disciplinary approach that combines technical, social, and cultural aspects enables innovation to not only improve food security but also strengthen local sovereignty and identity in the face of climate change and global market challenges.

1.2.9. Institutions and Policies in Food Diversification

Local food diversification often faces unfavourable institutional and policy challenges, mainly due to the tendency to dominate export orientation and mass production in the national food system [56]. This gap means that local food does not receive the same attention and incentives as export commodities. Agricultural policies that focus on the productivity of high-value commodities often overlook food diversity, which is crucial for food security and sustainability. For example, incentives and funding programmes are frequently geared more towards export commodities such as palm oil or rubber. In contrast, the development of local food varieties, such as sago, local maize, or barley, has not received adequate attention in national policy schemes.

The role of institutions is crucial in promoting a more inclusive transformation of the food system. Collaboration between academics, local governments, and NGOs has proven effective in supporting community-based local food development in various developing country contexts, including those in Asia [57].

The importance of evidence-based policies is becoming increasingly urgent in the face of the challenges posed by climate change, the global food crisis, and the degradation of natural resources. Scientific approaches and empirical data must be the basis for formulating adaptive and contextualised policies.

In Indonesia, sustainable food security relies heavily on strengthening local systems, including the integration of data on traditional food varieties, household consumption patterns and village institutional capacity. Local food diversification has proven to be more effective when supported by responsive institutions and pro-people regulations. A decentralised approach is considered more capable of addressing the challenges of socio-ecological diversity between regions and strengthening the role of local communities as the leading actors in the food system [58].

1.2.10. Research Gap and Direction of Scientific Strengthening

Despite the growing body of literature on local food systems, several significant research gaps remain. One of them is the limited study of local species and minor foods that have great potential to support food security and diversity. Most research still focuses on primary commodities and has not explored local biodiversity such as barley, gembili, wild sago and other tuber

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species. These species have the advantage of being adaptive to local environmental conditions and having high nutritional value. A significant challenge is the lack of documentation and visibility of traditional food in scientific knowledge systems and public policies. Local communities' knowledge of processing techniques, cultivation practices, and cultural values related to local foods is often not systematically recorded and not integrated into national data systems. As a result, the contribution of traditional food to food security is often overlooked in national planning and policies. Participatory community-based documentation is necessary to accurately record and recognise local wisdom and contextual practices as an integral part of the national food system [59], [60].

To overcome this limitation, the expansion of cross-disciplinary and cross-sectoral approaches is crucial. A transdisciplinary approach combining agricultural science, anthropology, ecology, food technology and community economics is needed to understand the complexity of local food systems holistically. In addition, collaboration between academics, policymakers, local communities and the private sector can foster the development of contextualised, inclusive and sustainable diversification strategies. Long-term policy support and research investments that prioritise the exploration, conservation and utilisation of local food as an integral part of national food security are also needed.

1.3. Research Objective

This article aims to critically examine the conceptual and empirical contributions of local food diversification in supporting the development of a sustainable food system. The focus of the study is on mapping the characteristics of local foods, the structural challenges in their development, and the opportunities for their integration into national food development policies and practices. Using a thematic narrative review approach, this article aims to strengthen the scientific and strategic basis for the systematic integration of local food diversification into the national food policy architecture, as part of transforming a fair, resilient, and sustainable food system.

2. MATERIALS AND METHODS

This study utilises a narrative critical review approach to formulate a conceptual and practical understanding of the contribution of local food diversification in strengthening sustainable food systems. This method allows for a narrative review of national and international scientific literature relevant to the focus of the study [61], [62].

The literature identification process was conducted through databases such as Scopus, ScienceDirect, Google Scholar and accredited national journals, using keywords focused on the themes of local food diversification and agroecology. Only relevant, peer-reviewed articles published between 1995 and 2024 were included in this review using the keywords local food diversification, food security, sustainable food systems, agroecology, local wisdom, food policy.

Analyses were conducted by exploring and grouping various arguments and findings based on the main themes emerging in the literature, such as ecological, socio-cultural, economic, technological and food policy dimensions [63]. The results of the study were reorganised in the form of a critical narrative that emphasises the contributions, challenges and opportunities for strengthening local food diversification.

This approach aims to strengthen the scientific basis for integrating local food diversification into national food policies, taking into account the complexity of food systems at all levels, from local to global.

3. RESULT AND DISCUSSION

3.1. Ecological Aspects: Production System Resilience and Biodiversity

Research indicates that diverse food systems are more resilient to ecological stresses, such as climate change and land degradation. Agroecological approaches that integrate local practices and ecosystem principles have been proven to maintain soil fertility, manage water efficiently, and strengthen biodiversity. For example, the integration of local food crops, such as sago, taro, and barley, in marginal land farming systems enhances adaptation to drought and seasonal flooding.

3.2. Social and Cultural Aspects: Preservation of Identity and Community Cohesion

Local food diversification reflects people's intimate relationship with cultural values, spiritual practices, and traditional knowledge passed down through generations. In many indigenous communities, food is not only a consumption commodity, but also a symbol of social cohesion and a means of transmitting local values. Studies in Mentawai and Papuan communities reveal that local food is integrated into social and spiritual structures that maintain intergenerational sustainability. However, the challenges of homogenization of consumption patterns and modernisation pose a threat to the sustainability of these values.

3.3. Economic Aspects: Community Empowerment and Local Market Potential

Food diversification creates opportunities for the development of locally sourced, resource-based products with high added value. Products such as sago flour, taro chips and traditional herbal drinks have the potential to be developed through post-harvest technology and culture-based packaging. Support for MSMEs, local cooperatives and short distribution infrastructure has been shown to strengthen village economies. Common constraints faced include access to financing and the limited availability of locally appropriate technology.

3.4. Technological and Innovation Dimension: Appropriate Technology for Community-Based Food Systems

The advancement of appropriate, context-sensitive technologies is critical for scaling up local food diversification. Community-scale innovations such as solar dryers, fermentation chambers, and eco-friendly processing tools can extend shelf life and improve hygiene without compromising traditional values. Participatory technology development that involves local actors ensures better adaptation and adoption. Furthermore, digital tools for market access, traceability, and education can support local producers while maintaining sovereignty over knowledge and practice. Integrating indigenous knowledge with modern

innovations fosters a resilient hybrid system that upholds sustainability and inclusivity.

3.5. Policy and Institutionalisation: Strategic Integration and Participatory Approaches

The integration of local food into the national policy architecture remains marginal, resulting in limited systemic support for the development of community-based food resources. The literature underscores the importance of integrating local data and community-based approaches in planning equitable and sustainable food programmes. The active role of local governments, multi-stakeholder synergies and adaptive regulations is needed to encourage institutional transformation towards a more inclusive food system.

Overall, local food diversification is not only a technical alternative to the food crisis, but also offers a transformative approach rooted in diversity, equity and sustainability. Policy support, technological innovation and cultural preservation are the foundation for designing a resilient and inclusive future food system.

4. CONCLUSION

Local food diversification is positioned as a crucial strategy in establishing food systems that are socially equitable, resilient to ecological disturbances, and tailored to local environmental and cultural contexts. This study confirms that food diversity based on local resources, traditional knowledge and ecological principles not only contributes to nutritional and environmental security, but also strengthens the cultural identity and economic independence of communities.

For local food diversification to be established as a strategic priority in food development policy, it requires a cross-sectoral commitment and systematic integration into national and regional planning documents. The strategy requires collaboration among the government, academia, businesses, and civil society in fostering evidence-based and participatory innovation, as well as technical assistance and long-term investment.

The findings demonstrate that local food diversification is not simply a complementary approach to mainstream food production but constitutes a transformative pathway toward building sustainable, inclusive, and resilient food systems. It bridges ecological preservation with economic empowerment, cultural continuity, and institutional reform.

To realize its full potential, strategic actions are needed across sectors:

1. Ecologically, promote agroecological practices rooted in biodiversity.
2. Socially, strengthen food-based cultural identity and intergenerational learning.
3. Economically, support MSMEs and innovation in value chains.
4. Technologically, invest in appropriate, community-driven solutions.
5. Institutionally, mainstream local food in policy and governance frameworks.

By addressing these interrelated dimensions holistically, local food diversification can become a central pillar in achieving the Sustainable Development Goals (SDGs), especially SDGs 2, 12, 13, and 15.

The recommended policy implications include: (1) strengthening regulations and incentives for local food production and distribution; (2) supporting research and documentation of traditional food resources; (3) facilitating access to appropriate technology and local markets; and (4) actively involving indigenous communities and smallholders in planning and decision-making processes. By placing local food diversification at the foundation of its food security strategy, Indonesia has the opportunity to build a sustainable, inclusive, and locally based food system.Synthesis and Strategic Implications

REFERENCE

[1] J. Fanzo, D. Hunter, T. Borelli, and F. Mattei, Eds., *Diversifying Food and Diets*, 0 ed. Routledge, 2013. doi: 10.4324/9780203127261.

[2] FAO, *The State of Food Security and Nutrition in the World 2023*. FAO; IFAD; UNICEF; WFP; WHO;, 2023. doi: 10.4060/cc3017en.

[3] Science for Sustainable Agriculture, *'World-leading UK research and innovation at the heart of more sustainable food and farming policies'*. Science for Sustainable Agriculture, 2022. [Online]. Available: https://www.scienceforsustainableagriculture.com/_files/ugd/c51144_7e162dc7043041648851d8eb03837631.pdf

[4] M. V. Kuhnlein, B. Erasmus, and D. Spigelski, *Indigenous peoples' food systems: the many dimensions of culture, diversity and environment for nutrition and health*. Food and Agriculture Organization of the United Nations, Centre for Indigenous Peoples' Nutrition and Environment, 2009. [Online]. Available: https://www.fao.org/4/i0370e/i0370e00.htm

[5] E. Lichtfouse, Ed., *Sustainable Agriculture Reviews: Volume 11*, vol. 11. in Sustainable Agriculture Reviews, vol. 11. Dordrecht: Springer Netherlands, 2012. doi: 10.1007/978-94-007-5449-2.

[6] S. R. Carpenter *et al.*, *'Science for managing ecosystem services: Beyond the Millennium Ecosystem Assessment', Proc.* Natl. Acad. Sci., vol. 106, no. 5, pp. 1305–1312, Feb. 2009, doi: 10.1073/pnas.0808772106.

[7] J. Lubchenco and S. D. Gaines, *'A new narrative for the ocean'*, Science, vol. 364, no. 6444, pp. 911–911, Jun. 2019, doi: 10.1126/science.aay2241.

[8] K. W. Robert, T. M. Parris, and A. A. Leiserowitz, *'What is Sustainable Development? Goals, Indicators, Values, and Practice'*, *Environ.* Sci. Policy Sustain. Dev., vol. 47, no. 3, pp. 8–21, Apr. 2005, doi: 10.1080/00139157.2005.10524444.

[9] K. M. Kish, 'Limits to growth', in *Dictionary of Ecological Economics*, B. M. Haddad and B. D. Solomon, Eds., Edward Elgar Publishing, 2023, pp. 326–327. doi: 10.4337/9781788974912.L.27.

[10] B. R. Keeble, *'The Brundtland report: "Our common future"'*, Med. War, vol. 4, no. 1, pp. 17–25, Jan. 1988, doi: 10.1080/07488008808408783.

[11] J. Fanzo, A. L. Bellows, M. L. Spiker, A. L. Thorne-Lyman, and M. W. Bloem, *'The importance of food systems and the environment for nutrition'*, Am. J. Clin. Nutr., vol. 113, no. 1, pp. 7–16, Jan. 2021, doi: 10.1093/ajcn/nqaa313.

[12] J. Sachs and G. mun Ban, *The age of sustainable development*. in EBL-Schweitzer. New York: Columbia University Press, 2015.

[13] P. P. Walsh, A. Banerjee, and E. Murphy, *'The UN 2030 Agenda for Sustainable Development', in Partnerships and*

the Sustainable Development Goals, E. Murphy, A. Banerjee, and P. P. Walsh, Eds., in Sustainable Development Goals Series. , Cham: Springer International Publishing, 2022, pp. 1–12. doi: 10.1007/978-3-031-07461-5_1.

[14] S. Gillespie, N. Poole, M. Van Den Bold, R. V. Bhavani, A. D. Dangour, and P. Shetty, *'Leveraging agriculture for nutrition in South Asia: What do we know, and what have we learned?'*, Food Policy, vol. 82, pp. 3–12, Jan. 2019, doi: 10.1016/j.foodpol.2018.10.012.

[15] P. (Polly) Burey, S. K. Panchal, and A. Helwig, 'Sustainable food systems', in *Food Engineering Innovations Across the Food Supply Chain*, Elsevier, 2022, pp. 15–46. doi: 10.1016/B978-0-12-821292-9.00015-7.

[16] D. R. Singh, S. Ghimire, S. R. Upadhayay, S. Singh, and U. Ghimire, *'Food insecurity and dietary diversity among lactating mothers in the urban municipality in the mountains of Nepal'*, *PLOS ONE*, vol. 15, no. 1, p. e0227873, Jan. 2020, doi: 10.1371/journal.pone.0227873.

[17] R. Feagan, *'The place of food: mapping out the "local" in local food systems'*, Prog. Hum. Geogr., vol. 31, no. 1, pp. 23–42, Feb. 2007, doi: 10.1177/0309132507073527.

[18] S. W. Martinez *et al.*, *'Local Food Systems: Concepts, Impacts, and Issues',* Econ. Res. Rep., 2010, doi: 10.22004/AG.ECON.96635.

[19] A. Tregear, *'Progressing knowledge in alternative and local food networks: Critical reflections and a research agenda'*, J. Rural Stud., vol. 27, no. 4, pp. 419–430, Oct. 2011, doi: 10.1016/j.jrurstud.2011.06.003.

[20] Trias Mahmudiono, Sri Sumarmi, and Richard R Rosenkranz, *'Household dietary diversity and child stunting in East Java, Indonesia'*, Asia Pac. J. Clin. Nutr., vol. 26, no. 2, Mar. 2017, doi: 10.6133/apjcn.012016.01.

[21] S. Padulosi, J. Thompson, and P. Rudebjer, *'Fighting poverty, hunger and malnutrition with neglected and underutilized species (NUS): needs, challenges and the way forward',* 2013, Unpublished. doi: 10.13140/RG.2.1.3494.3842.

[22] FAO, *Agroecology: principles and strategies for designing sustainable farming systems.* US: FAO US, 1995. [Online]. Available: https://www.fao.org/agroecology/database/detail/en/c/893012/

[23] J. Pretty, C. Toulmin, and S. Williams, *'Sustainable intensification in African agriculture'*, Int. J. Agric. Sustain., vol. 9, no. 1, pp. 5–24, Feb. 2011, doi: 10.3763/ijas.2010.0583.

[24] E. Erwin and A. Irwandi, *'Sago and Rice are Ambiguous: Food Security Under the Food Hood of Development Discourse in Mentawai Islands'*, Sos. Budaya, vol. 20, no. 2, p. 147, Dec. 2023, doi: 10.24014/sb.v20i2.23677.

[25] E. Erwin, A. Irwandi, and E. Ermayanti, *'Food Security Dilemma And Development Discourse in Mentawai Islands',* J. Ilm. Membangun Desa Dan Pertan., vol. 9, no. 3, pp. 233–242, May 2024, doi: 10.37149/jimdp.v9i3.1049.

[26] A. Irwandi, Erwin, Ermayanti, and E. Indrizal, *'Ketahanan Pangan Orang Mentawai di Bawah Tudung Saji Pembangunan',* in Diversifikasi Pangan Lokal untuk Ketahanan Pangan: Perspektif Ekonomi, Sosial, dan Budaya, S. Widowati and R. A. Nurfitriani, Eds., Penerbit BRIN, 2023. doi: 10.55981/brin.918.c795.

[27] E. Erwin, A. Irwandi, and R. Mitra, *'Mukop Sagai: Menakar Kadaulatan Pangan Orang Sarereiket Di Siberut Selatan, Kepulauan Mentawai',* EMPATI J. Ilmu Kesejaht. Sos., vol. 11, no. 2, Dec. 2022, doi: 10.15408/empati.v11i2.29282.

[28] R. Mitra and E. Erwin, *'Etnis Mentawai Dan Kondisi Ketahanan Pangan Lokal Pada Masa Pandemi COVID-19'*, Aceh Anthropol. J., vol. 6, no. 1, pp. 1–14, 2022, doi: https://doi.org/10.29103/aaj.v6i1.5782.

[29] A. Irwandi and Erwin, 'Pangan Lokal Non Beras: Ketahanan Pangan Rumah Tangga Pada Era Pandemi Covid-19 Di Mentawai', Mukadimah J. Pendidik. Sej. Dan Ilmu Sos., vol. 6, no. 1, p. f, 2022, doi: https://doi.org/10.30743/mkd.v6i1.5013.

[30] Darma, '*Improvement of Sago Processing Machinery', in Sago Palm*, H. Ehara, Y. Toyoda, and D. V. Johnson, Eds., Singapore: Springer Singapore, 2018, pp. 231–245. doi: 10.1007/978-981-10-5269-9_17.

[31] A. Irwandi and R. Taufik, *'Cultural Identity in the Shackles of Modernization: The Case of Mentawai Indigenous Peoples'*, J. Sosiol. Andalas, vol. 9, no. 2, pp. 211–228, Oct. 2023, doi: 10.25077/jsa.9.2.212-229.2023.

[32] A. Irwandi and K. Saleleubaja Irwandi, '*Dari Sagu Ke Beras: Perubahan Kehidupan Sosial Budaya Orang Mentawai'*, J. Masy. Indones., vol. 47, no. 2, pp. 195–206, 2021, doi: https://doi.org/10.14203/jmi.v47i2.985.

[33] M. Sasaoka, Y. Laumonier, and K. Sugimura, *'Influence of indigenous sago-based agriculture on local forest landscapes in Maluku, east Indonesia'*, J. Trop. For. Sci., vol. 26, no. 1, pp. 75–83, 2014.

[34] R. Ersi Noviyanti, C. Wulandari, and R. Qurniati, *'Kompetensi Sumberdaya Manusia Pada Kesatuan Pengelolaan Hutan Produksi Di Lampung'*, J. Sylva Lestari, vol. 4, no. 1, p. 11, Apr. 2016, doi: 10.23960/jsl1411-20.

[35] N. E. Lewaherilla, A. Soplanit, and P. Beding, *'Sustainable specialized village-based sago (Metroxylon sago Rottb) management direction in Jayapura Regency'*, IOP Conf. Ser. Earth Environ. Sci., vol. 1192, no. 1, p. 012054, Jun. 2023, doi: 10.1088/1755-1315/1192/1/012054.

[36] M. Delfi, *'Food Sovereignty of Communities in the Margins of the Nation: Staple Food and Politics in Mentawai, West Sumatera'*, Adv. Soc. Sci. Educ. Humanit. Res. ASSEHR, vol. 108, pp. 160–165, 2017.

[37] Darmanto, *'"Rice ambiguity" and the taste of modernity on Siberut Island, Indonesia',* J. Southeast Asian Stud., vol. 54, no. 1, pp. 64–88, Feb. 2023, doi: 10.1017/S0022463423000188.

[38] Darmanto, *'Good to Produce: Food, gardening, and valued persons in contemporary Mentawai society, Indonesia', Indones.* Malay World, vol. 50, no. 148, pp. 289–312, Sep. 2022, doi: 10.1080/13639811.2022.2089479.

[39] D. K. S. Swastika *et al.*, *'Pursuing circular economics through the integrated crop-livestock systems: An integrative review on practices, strategies and challenges post Green Revolution in Indonesia'*, J. Agric. Food Res., vol. 18, p. 101269, Dec. 2024, doi: 10.1016/j.jafr.2024.101269.

[40] R. Kanter, G. Kennedy, and S. Boza, *'Editorial: Local, traditional and indigenous food systems in the 21st century to combat obesity, undernutrition and climate change', Front. Sustain.* Food Syst., vol. 7, p. 1195741, Jul. 2023, doi: 10.3389/fsufs.2023.1195741.

[41] K. Swiderska *et al.*, *'Indigenous Peoples' Food Systems and Biocultural Heritage: Addressing Indigenous Priorities Using Decolonial and Interdisciplinary Research Approaches'*, Sustainability, vol. 14, no. 18, p. 11311, Sep. 2022, doi: 10.3390/su141811311.

[42] E. A. Frison, I. F. Smith, T. Johns, J. Cherfas, and P. B. Eyzaguirre, *'Agricultural Biodiversity, Nutrition, and Health: Making a Difference to Hunger and Nutrition in the Developing World',* Food Nutr. Bull., vol. 27, no. 2, pp. 167–179, Jun. 2006, doi: 10.1177/156482650602700208.

[43] B. Powell, S. H. Thilsted, A. Ickowitz, C. Termote, T. Sunderland, and A. Herforth, *'Improving diets with wild and cultivated biodiversity from across the landscape*', Food Secur., vol. 7, no. 3, pp. 535–554, Jun. 2015, doi: 10.1007/s12571-015-0466-5.

[44] A. Herforth and S. Ahmed, *'The food environment, its effects on dietary consumption, and potential for*

measurement within agriculture-nutrition interventions', Food Secur., vol. 7, no. 3, pp. 505–520, Jun. 2015, doi: 10.1007/s12571-015-0455-8.

[45] R. Dubey, D. J. Bryde, Y. K. Dwivedi, G. Graham, C. Foropon, and T. Papadopoulos, *'Dynamic digital capabilities and supply chain resilience: The role of government effectiveness'*, Int. J. Prod. Econ., vol. 258, p. 108790, Apr. 2023, doi: 10.1016/j.ijpe.2023.108790.

[46] Z. Islam, S. M. R. Islam, F. Hossen, K. Mahtab-ul-Islam, Md. R. Hasan, and R. Karim, *'Moringa oleifera is a Prominent Source of Nutrients with Potential Health Benefits'*, Int. J. Food Sci., vol. 2021, pp. 1–11, Aug. 2021, doi: 10.1155/2021/6627265.

[47] H. A. Mohamed Shaffril *et al.*, *'Diversification of agriculture practices as a response to climate change impacts among farmers in low-income countries: A systematic literature review'*, Clim. Serv., vol. 35, p. 100508, Aug. 2024, doi: 10.1016/j.cliser.2024.100508.

[48] I. Sugri, M. Abubakari, R. K. Owusu, and J. K. Bidzakin, *'Postharvest losses and mitigating technologies: evidence from Upper East Region of Ghana',* Sustain. Futur., vol. 3, p. 100048, 2021, doi: 10.1016/j.sftr.2021.100048.

[49] A. Doustmohammadian, F. Mohammadi-Nasrabadi, N. Keshavarz-Mohammadi, M. Hajjar, S. Alibeyk, and M. Hajigholam-Saryazdi, *'Community-based participatory interventions to improve food security: A systematic review',* Front. Nutr., vol. 9, p. 1028394, Dec. 2022, doi: 10.3389/fnut.2022.1028394.

[50] FAO, Agroecology and the Search for a truly sustainable agriculture. FAO US, 2005. [Online]. Available: http://www.agroeco.org/doc/agroecology-engl-PNUMA.pdf

[51] N. Panotra, R. K. Salgotra, M. Sharma, V. Gupta, and M. Sharma, Agriculture and Horticulture in India, 1st ed. ND Global Publication House, 2024. [Online]. Available: https://www.researchgate.net/publication/380402848_Agriculture_and_Horticulture_in_India_Edition_1

[52] S. Hales, A. J. McMichael, and C. Butler, *Ecosystems and Human Well-being - Health Synthesis: a report of the Millennium Ecosystem Assessment*. Geneva: World Health Organization, 2005.

[53] L. O. L. Banda, C. V. Banda, J. T. Banda, and T. Singini, *'Preserving cultural heritage: A community-centric approach to safeguarding the Khulubvi Traditional Temple Malawi'*, Heliyon, vol. 10, no. 18, p. e37610, Sep. 2024, doi: 10.1016/j.heliyon.2024.e37610.

[54] M. Palumbo *et al.*, *'Emerging Postharvest Technologies to Enhance the Shelf-Life of Fruit and Vegetables: An Overview',* Foods, vol. 11, no. 23, p. 3925, Dec. 2022, doi: 10.3390/foods11233925.

[55] D. Jairu, S. W. Quader, P. Pratiksha, and R. Khalkho, *'Neglected and Underutilized Species (NUS): The Smart Crop of the Future',* Food Sci. Rep., vol. 4, no. 12, pp. 1–9, 2023.

[56] M. Leach, N. Nisbett, L. Cabral, J. Harris, N. Hossain, and J. Thompson, *'Food politics and development',* World Dev., vol. 134, p. 105024, Oct. 2020, doi: 10.1016/j.worlddev.2020.105024.

[57] A. O. Manlosa, S. Partelow, T. S. Jiren, M. Riechers, and A. O. Paramita, *'The role of institutions in food system transformations: lessons learned from transdisciplinary engagements in Ethiopia, the Philippines, and Indonesia'*, Ecosyst. People, vol. 19, no. 1, p. 2146753, Dec. 2023, doi: 10.1080/26395916.2022.2146753.

[58] T. N. Aziza, *'Upaya Penguatan Kelembagaan Pangan',* J. Ekon. Pertan. Dan Agribisnis, vol. 3, no. 1, pp. 204–217, 2019, doi: https://doi.org/10.21776/ub.jepa.2019.003.01.20.

[59] N. Nurchayati and F. Ardiyansyah, '*Pengetahuan Lokal Tanaman Pangan dan Pemanfaatannya pada Masyarakat Suku Using Kabupaten Banyuwangi'*, Biotropika - J. Trop. Biol., vol. 7, no. 1, pp. 11–20, Apr. 2019, doi: 10.21776/ub.biotropika.2019.007.01.02.

[60] F. B. Saroinsong, *'Desain Edible Landscape, Bentuk Pertanian Kota Yang Meningkatkan Estetika Dan Ketahanan Pangan'*, AGRI-SOSIOEKONOMI, vol. 18, no. 3, pp. 759–764, Sep. 2022, doi: 10.35791/agrsosek.v18i3.44716.

[61] M. J. Grant and A. Booth, *'A typology of reviews: an analysis of 14 review types and associated methodologies'*, Health Inf. Libr. J., vol. 26, no. 2, pp. 91–108, Jun. 2009, doi: 10.1111/j.1471-1842.2009.00848.x.

[62] H. Snyder, *'Literature review as a research methodology: An overview and guidelines'*, J. Bus. Res., vol. 104, pp. 333–339, Nov. 2019, doi: 10.1016/j.jbusres.2019.07.039.

[63] M. Naeem, W. Ozuem, K. Howell, and S. Ranfagni, *'A Step-by-Step Process of Thematic Analysis to Develop a Conceptual Model in Qualitative Research'*, Int. J. Qual. Methods, vol. 22, p. 16094069231205789, Oct. 2023, doi: 10.1177/16094069231205789.