Volume 6 Number 2 (2025) Page 132– 144
Ecopreneur : Journal of Islamic Economics and Business
Email Journal : ecopreneur.bbc@gmail.com
Web Journal : http://journal.bungabangsacirebon.ac.id/index.php/ecopreneur

Sorghum as Sustainable Ṭayyib Food: A Study on Local Consumption Strategies and the Implementation of Maqāṣid al-Sharī'ah in Beber Subdistrict

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Received: 2025-10-01; Accepted: 2025-10-01; Published: 2025-10-30

Abstract

Food security in Indonesia remains fragile due to heavy dependence on rice and wheat as staple foods. This reliance creates structural risks when domestic output is insufficient or global supply chains are disrupted. Diversifying local food sources is therefore essential to strengthening national resilience. This study examines strategies to enhance sorghum consumption in Beber Subdistrict, Cirebon Regency, positioning it as *ṭayyib* food within the framework of *maqāṣid al-sharī'ah*. A qualitative descriptive method was applied, using secondary data from journals, international reports, government documents, and local publications. Thematic analysis focused on three themes: sorghum's potential, local consumption strategies, and the role of policy and institutions. Findings show that bioguma sorghum in Beber yields 10–16 tons per harvest with up to three harvests annually, far above the national average. This productivity provides economic opportunities through processing into flour, noodles, and healthy snacks. Challenges remain, including limited processing facilities, low nutritional awareness, and weak village institutions. Promoting sorghum as *ṭayyib* food supports *hifz al-nafs* (protection of life), *hifz al-mal* (protection of wealth), and *imārat al-ardh* (stewardship of the earth). Integrated, community-based strategies and multi-stakeholder collaboration could position Beber as a replicable model of Islamic and sustainable local food security.

Keywords: *Sorghum; ṭayyib food; food diversification; maqāṣid al-sharī'ah; food security.*

INTRODUCTION

Global food security remains one of the most pressing issues of the 21st century (FAO n.d.). Despite various sustainable development agendas, the world is still far from achieving the Zero Hunger 2030 target set in the Sustainable Development Goals (SDG 2) (Bappenas 2019). The joint report of FAO, IFAD, UNICEF, WFP, and WHO (FAO et al. 2024) highlights that more than 700 million people suffer from hunger, while nearly 2.4 billion face moderate to severe food insecurity. This situation reflects serious challenges in ensuring access to affordable, nutritious, and sustainable food, particularly in low- and middle-income countries. Global factors such as climate change, energy crises, geopolitical conflicts, and economic downturns further exacerbate the condition.

Indonesia, the world's fourth most populous country, faces similar challenges. National food security still heavily depends on rice as the staple food. Rice contributes more than 55 percent of calorie intake and 44 percent of protein consumption among Indonesians (WFP 2022). Such heavy reliance on a single commodity creates structural vulnerabilities. Domestic rice supplies are often insufficient, leading to reliance on imports (Akbar, Subiyantoro, and Sidik 2023). Import dependency not only destabilizes prices but also undermines national food sovereignty. Furthermore, rice production faces serious constraints such as land conversion, limited irrigation, soil degradation, and declining productivity caused by climate change (Ansari et al. 2023).

When food security relies on a single commodity, any disruption in the supply chain poses broad risks to social and economic stability (Octania 2021). Therefore, food diversification based on local potential becomes a strategic step to strengthen national food security (Rahmanto, Purnomo, and Kasiwi 2020a). Diversification is not merely about replacing rice with other crops but about building a food system that is resilient, adaptive, and compatible with Indonesia's diverse agroecological conditions (Harahap et al. 2022). The Indonesian government has emphasized the importance of diverse, balanced, and locally-based food consumption patterns (Deputi Bidang Perekonomian 2023), which also align with FAO's recommendations for food system transformation through diversification (FAO et al. 2024).

From an Islamic perspective, excessive dependence on a single food commodity contradicts the Qur'anic principle of diversity. QS. 'Abasa (80:24–32) describes the variety of food, grains, fruits, and pastures, as a blessing of Allah for humans and animals. Ibn Kathir's *Tafsir* (ad-Dimasyqi 1999) emphasizes that such diversity is both a sign of Allah's power and a reminder for humans to manage it with gratitude. Similarly, QS. Al-A'raf (7:31) commands moderation in eating and drinking and prohibits excessiveness. This message is highly relevant to avoid overreliance on one food source such as rice. Thus, diversification is not only a technical or economic necessity but also a moral and spiritual imperative.

In this context, sorghum emerges as a strategic alternative. It is drought-resistant, grows well on marginal land, requires little water, and is rich in nutrients such as carbohydrates, protein, minerals, and fiber (Mulyawanti et al. 2024). Globally, sorghum has long served as a staple in Africa and South Asia (Khoddami et al. 2023). In Indonesia, sorghum was once widely cultivated but has since been overshadowed by rice and wheat. Beyond being a staple, sorghum offers economic opportunities through processed products such as flour, rice analogs, animal feed, and fermented beverages. With high nutritional value and gluten-free properties, it is also

relevant as a functional food for modern consumers who are increasingly health-conscious (Murtini 2021).

The importance of sorghum has grown even more amid the wheat crisis caused by the Russia–Ukraine war, which disrupted global supply chains (Jagtap et al. 2022). As one of the world's largest wheat importers, Indonesia has been heavily affected, given wheat's role as the raw material for instant noodles and bread, two of the country's most consumed products (Anugraheni, Darwanto, and Rohmah 2024). This situation exposes the fragility of Indonesia's food security if it continues to depend on imported staples. Recognizing this, the Indonesian government formulated the *National Action Plan (RAN) for Sorghum 2022–2024* (Kementerian Koordinator Bidang Perekonomian Republik Indonesia 2022), which covers cultivation, productivity improvement, farmer institutions, and downstream innovation.

West Java, including Cirebon Regency, has been designated as a priority region for sorghum development. Favorable agroclimatic conditions, the availability of dry land, and relatively high productivity make this region strategic for sorghum-based diversification (Ghofar 2024). Specifically, Beber Subdistrict holds great potential. Ministry of Agriculture data (2021) show that sorghum cultivation in West Java covered 488 hectares with an average productivity of 3.3 tons per hectare—higher than the global average of 2.7 tons (Kementerian Investasi dan Hilirisasi/BKPM 2023). Yet, success in cultivation does not automatically ensure increased consumption. Major challenges lie in social and institutional aspects: low popularity among farmers and consumers, limited processing innovation, and weak nutritional awareness (Kementerian Investasi dan Hilirisasi/BKPM 2023).

In many cases, food diversification efforts fail because they are not supported by effective processing and marketing strategies (Delisle 2003; Rahmanto, Purnomo, and Kasiwi 2020b). Sorghum, despite its potential, still lacks a strong cultural foothold in Indonesian dietary practices (Sutrisna 2013). Strengthening local consumption therefore requires an integrated strategy: (1) promoting nutrition education to raise awareness, (2) developing processing technologies to create modern, consumer-friendly products, (3) expanding market access through consistent policy and promotion, and (4) strengthening farmer groups and cooperatives to sustain the value chain from upstream to downstream (Kementerian Investasi dan Hilirisasi/BKPM 2023; Mulyawanti et al. 2024).

Evidence from East Flores demonstrates that an integrated sorghum agroindustry model can increase added value, expand markets, and strengthen farmer institutions (Mulyawanti et al. 2024). This suggests that development must go beyond cultivation, encompassing the entire value chain from production to consumption. Such models can be adapted for Beber Subdistrict with adjustments to local conditions. Moreover, sorghum must be positioned as healthy, eco-friendly, and aligned with modern lifestyles. Product branding, diversification into snacks or beverages, and alignment with functional food trends can improve consumer acceptance (Ponte et al. 2025; Siró et al. 2008). With urban consumers increasingly health-conscious, the potential market for sorghum-based products is significant.

Nonetheless, structural challenges such as land conversion, limited infrastructure, and weak regulations must be addressed (Ariningsih et al. 2023). Cross-sector collaboration involving government, academia, private actors, and communities is essential (Maryono et al. 2024). Building a resilient local food system requires multi-stakeholder cooperation grounded in sustainability and self-reliance (Panggabean et al. 2024). Thus, sorghum development in

Beber Subdistrict can serve as a representative model for strengthening local food security in line with SDG 2.

Although many studies highlight the importance of food diversification, most focus on technical aspects of cultivation or productivity (Irawan and Sutrisna 2016; Mulyawanti et al. 2024). Research on strategies to strengthen local sorghum consumption from social, institutional, and marketing perspectives remains limited. While studies on sorghum's nutritional value (Murtini, 2021) and potential as a healthy alternative food exist, consumer acceptance and marketing strategies are rarely explored. Moreover, most research is conducted at macro or regional levels, while micro-level studies at the subdistrict or village scale are scarce (Dewi 2017; Mulyawanti et al. 2024). This gap highlights the need for in-depth analysis of integrative strategies to strengthen sorghum's position as a local food in Beber.

The novelty of this study lies in its integration of local consumption strategies, village-level institutional roles, and Islamic values through the lens of *maqāṣid al-sharī'ah*. Accordingly, the study aims to provide both conceptual and practical contributions to strengthening national food security through diversification based on *ṭayyib* food (Kamali 2013), food that is not only halal by Islamic law but also good in quality, hygienic, safe for consumption as emphasized in QS. Al-Baqarah (2:168), and beneficial for sustainable health.

This study does not cover technical aspects of sorghum cultivation in detail, such as pest management, fertilization, or seed technology. Nor does it examine financing schemes, investment, or profitability of the sorghum processing industry in depth. Instead, the focus is on analyzing social, institutional, and market strategies to reinforce local sorghum consumption. As such, the findings are expected to serve as a foundation for future studies on technical and economic aspects, while positioning sorghum as a community-based diversification model grounded in Islamic values and *maqāṣid al-sharī'ah*.

RESEARCH METHODOLOGY

This study adopts a qualitative descriptive approach, as it is considered most suitable for exploring social dynamics, institutional strategies, and policy directions related to strengthening local sorghum consumption as a sustainable *ṭayyib* food. Such an approach allows for a systematic and contextual description of existing data without manipulating variables (Sugiyono 2018). It enables the analysis to go beyond technical cultivation aspects by also addressing social, economic, and Islamic values through the lens of *maqāṣid al-sharī'ah*.

The research relies entirely on secondary data collected from multiple sources. These include peer-reviewed journals on food diversification and food security, reports from international organizations such as FAO (FAO 2017; FAO et al. 2024; FAO 2025, n.d.), official government documents such as the *National Action Plan for Sorghum 2022–2024*, and national regulations emphasizing diverse and locally based food consumption (Kementerian Investasi dan Hilirisasi/BKPM 2023; Kementerian Koordinator Bidang Perekonomian Republik Indonesia 2022). The use of secondary data is particularly relevant to capture macro-level perspectives while providing conceptual grounding for local-level analysis.

The study focuses on Beber Subdistrict, Cirebon Regency, West Java, selected due to its agroclimatic suitability for sorghum cultivation and its recognition as a priority region for food diversification (Pusat Data dan Sistem Informasi Pertanian Kementerian Pertanian 2024). Beber also represents a practical case, where village-owned land has been successfully cultivated with

bioguma sorghum, thus serving as a "social laboratory" for examining local food strategies (Ghofar 2024; Mahardika 2024).

Data analysis employed thematic analysis identifying and coding data into three themes: (1) sorghum's potential as sustainable *ṭayyib* food, (2) local consumption strategies involving community and village institutions, and (3) policy directions supporting diversification within *maqāṣid al-sharī'ah*. Findings are presented narratively, emphasizing the interconnections between technical potential, social strategies, and institutional support.

RESULTS AND DISCUSSION

1. Beber Subdistrict and the Relevance of Food Diversification

Beber Subdistrict in Cirebon Regency is characterized by dry land conditions that are less suitable for rice cultivation. Yet, this limitation has created an opportunity to develop alternative crops that are more adaptive to such environments. Since 2024, Beber Village has utilized two hectares of previously unproductive village-owned land (*tanah kas desa*) to cultivate bioguma sorghum. The initiative was carried out in collaboration with ten local farmers and supported by the regency government and the Department of Agriculture (Ghofar 2024; Kinerjaekselen 2025; Mahardika 2024). Harvest results show productivity ranging from 10 to 16 tons per growing season, with the potential for up to three harvests annually. This means total annual production could reach 30–48 tons of sorghum grain.

In addition to grain production, sorghum stalks are also used as livestock feed by local entrepreneurs. This practice reflects an integration of crop farming and animal husbandry that has the potential to establish a more circular village economy (Ghofar 2024). The initiative has since been designated as a pilot project by the regency government, serving as tangible evidence that locally based food diversification can be realized effectively at the village level.

At the national scale, sorghum development in Beber represents the implementation of local food policies aimed at reducing dependence on rice and wheat. On a global scale, this practice aligns with recommendations from the Food and Agriculture Organization (FAO et al. 2024) which emphasize the importance of promoting local food diversification to build resilient food systems in the face of climate change, geopolitical disruptions, and economic crises.

2. The Potential of Sorghum as *Pangan Thayyib* (Kamali 2013)

Sorghum is widely recognized as a cereal crop with high drought tolerance, low water requirements, and the ability to thrive on marginal lands. On average, national productivity ranges from 2.5 to 3.3 tons per hectare (Sutrisna 2013). In Beber, however, yields have proven significantly higher, between 10 and 16 tons of dry grain per hectare, with the possibility of harvesting up to three times a year (Ghofar 2024). This evidence highlights that sorghum should not be viewed merely as an emergency crop, but rather as a strategic commodity with long-term potential.

From a nutritional perspective, sorghum is rich in dietary fiber, has a low glycemic index, and contains polyphenols that function as natural antioxidants (Tanwar et al. 2023). These properties make sorghum a functional food with proven health benefits (Xu, Wang, and Zhao 2021), particularly in managing diabete (Suvarna et al. 2024), cholesterol, and hypertension (dos Reis Gallo et al. 2021). Its nutritional profile reinforces sorghum's position as *pangan*

thayyib—food that is not only permissible (*halal*) but also wholesome, safe, and beneficial for sustaining life (Kamali 2013).

From an Islamic perspective, the cultivation and consumption of sorghum reflect the Qur'anic teaching of food diversity. In Surah *'Abasa* (80:24–32), Allah reminds humanity of the variety of crops, grains, and fruits created to nourish both people and animals. Al-Qurthubi's commentary (al-Qurthubi 2020) stresses that this diversity is a divine blessing that should be managed with gratitude and fairness. Hence, promoting sorghum contributes not only to food security but also to the realization of *maqāṣid al-sharī'ah*, particularly *hifz al-nafs* (protection of life) and *hifz al-mal* (protection of wealth).

3. Challenges and Barriers to Sorghum Consumption

Despite the impressive yields achieved in Beber, local consumption continues to face several challenges (Ghofar 2024; Mahardika 2024). First, limited processing infrastructure means that sorghum is often sold as raw grain or diverted for animal feed, leaving its added value underdeveloped. Second, low levels of nutritional awareness among the community have prevented sorghum from being embraced as a healthy alternative to rice or wheat. Third, local institutions such as cooperatives or village-owned enterprises (*BUMDes*) remain largely inactive in distribution, leaving market channels weak (Mulyawanti et al. 2024; Octania 2021).

These challenges echo findings from Giacalone and Jaeger (FAO n.d.; Giacalone and Jaeger 2023), who emphasize that the success of food diversification depends heavily on consumer acceptance and market readiness. Without strong demand-side strategies, diversification initiatives often stagnate at the production stage. In addition to internal barriers, external threats also persist, such as land conversion, entrenched consumer preferences for rice, and dependency on large buyers who may suppress prices.

From an Islamic standpoint, these challenges resonate with the Prophet's ﷺ guidance in a hadith narrated by Bukhari: *"Whoever owns land should cultivate it..."* This teaching highlights the obligation to optimize land use for communal benefit, including through alternative crops like sorghum. Collective efforts grounded in the principle of *ta'awun* (mutual cooperation), as emphasized in Surah *al-Mā'idah* (5:2), are key to strengthening local sorghum consumption through shared production, processing, and distribution.

4. SWOT Analysis through the Lens of *Maqāṣid al-Sharī'ah*

A SWOT analysis provides a structured way to examine sorghum's strategic position in Beber.

1) *Strengths*
   Agro-climatic suitability, high productivity (10–16 tons/ha), potential for three annual harvests, community farming experience, and local government support (Ghofar 2024).
2) *Weaknesses*
   Limited processing infrastructure, low public nutrition literacy, weak market integration, and underdeveloped local institutions (Mulyawanti et al. 2024; Tanwar et al. 2023).
3) *Opportunities*
   Growing consumer demand for healthy foods, supportive government policies on diversification, and international backing from organizations such as FAO (FAO et al. 2024).
4) *Threats*

Land conversion (Susilawati et al. 2023), shifting consumer preferences, and dependence on dominant buyers who may suppress farm-gate prices.

When examined through the framework of *maqāṣid al-sharī'ah*, sorghum's strengths and opportunities align with *hifz al-nafs* (protecting life through healthy food) and *hifz al-mal* (protecting wealth through sustainable livelihoods). Conversely, its weaknesses and threats, if left unaddressed, could undermine these objectives and cause harm (*mudarat*). Thus, strengthening sorghum consumption in Beber is not merely a technical necessity but also a *shar'i* responsibility to safeguard community welfare.

5. Downstream Development and Circular Economy within Islamic Sustainability Principles

Simulation studies suggest that sorghum in Beber could generate gross annual revenues of IDR 150–240 million, with potential increases to IDR 315–500 million if processed into flour (Taylor and Anyango 2011) and higher-value products (Fuller and Stevens 2018). Beyond grain, sorghum stalks are also utilized for livestock feed (Ronda et al. 2019; Yusriani et al. 2024) exemplifying *zero-waste farming* (Mutmainna et al. 2025; Vidiati et al. 2024). This model reflects Qur'anic guidance in Surah *al-An'am* (6:141): *"...Eat of their fruit when they ripen, and give their due on the day of harvest, but do not waste. Indeed, He does not like the wasteful."* The verse calls for agricultural outputs to be used efficiently, ensuring maximum benefit and minimizing waste.

Accordingly, the Beber model emphasizes integrated roles: farmers managing production, women's groups (*KWT*) handling processing, *BUMDes* overseeing distribution, and communities engaging in nutrition education. This approach embodies the Islamic values of *ukhuwah* (solidarity) and *shirkah* (partnership), where communities work collectively to build an equitable local food ecosystem. Supported by local institutions and cross-sector partnerships, sorghum can be repositioned as a modern, healthy staple, consistent with the Islamic principle of *al-maslahah al-'ammah* (public welfare).

6. Productivity Simulation and Added Value

Empirical evidence confirms sorghum's strong economic viability in Beber. With two hectares of land yielding 30–48 tons annually, and an average selling price of IDR 5,000/kg, gross revenue ranges between IDR 150–240 million (Ghofar 2024). If processed into flour at IDR 15,000/kg, income could rise to IDR 315–500 million (Mulyawanti et al. 2024).

Table 1. Productivity Simulation

Production Components	Production Value
Sorghum Cultivated Area	2ha
Harvest Frequency per Year	10-16ton
Total Annual Production	3times
Selling Price of Grain (Rp/kg)	30-48ton
Total Gross Value per Year	Rp150–240 juta
Potential Processed Value (Flour) (with 3–5× margin over raw grain)	Rp315–500 juta

Processed by the author from online secondary sources (Ghofar 2024; Kinerjaekselen 2025; Mahardika 2024)

Value-added products such as cookies, noodles, and healthy snacks could further enhance returns, as highlighted by Low et al (antaranews.com 2025; Low et al. 2021). Non-food components of sorghum also contribute economically. Stalks and leaves are already being processed into livestock feed by CV PLUR Beber (Ghofar 2024; Kinerjaekselen 2025; Mahardika 2024), reinforcing the village's *zero-waste agriculture* model. This strengthens the local circular economy by maximizing resource use and ensuring that sorghum functions not only as a staple food but also as a driver of village-level economic growth.

7. Strategic Model for Strengthening Local Consumption

Strengthening sorghum consumption in Beber requires a comprehensive, village-based strategy. Farmers focus on cultivation, women's groups develop processed products, and *BUMDes* manage distribution. Meanwhile, community education through schools, health posts (*posyandu*), and women's organizations (PKK) fosters cultural acceptance of sorghum. Practical activities such as cooking demonstrations, nutrition campaigns, and local food competitions help shape positive perceptions.

Institutional empowerment is also key. Cooperatives and *BUMDes* can act as intermediaries linking farmers, processors, and consumers while ensuring fair pricing. Branding sorghum-based products as healthy local foods is vital to enhancing competitiveness (Ikhwana et al. 2019). At the same time, multi-stakeholder collaboration, including government, academia, private sector, and civil society, can provide financial support, halal certification, and access to modern markets.

This strategic model reflects the principle of *al-maslahah al-'ammah* in Islam, where local resources are mobilized for the collective good. With such an integrated approach, Beber Village could emerge as a representative model for sustainable and faith-based local food security, contributing directly to the achievement of SDG 2.

8. Strategic Recommendations

Based on the findings, four key recommendations are proposed:

1) Nutrition education through schools, *posyandu*, and PKK using creative methods such as cooking competitions or media campaigns to build positive perceptions of sorghum as healthy and affordable.
2) Downstream development led by women's groups and youth to produce flour, noodles, and snacks marketed via *BUMDes*, cooperatives, and local outlets.
3) Institutional strengthening of food cooperatives or *BUMDes* to coordinate production, processing, and distribution while ensuring fair pricing.
4) Cross-sector collaboration involving government, private partners, and community institutions to provide funding, halal certification, and broader market access.

Through these strategies, Beber Village can strengthen local food security, serve as a replicable model for other regions, and contribute meaningfully to the realization of SDG 2.

CONCLUSION

This study finds that Beber District in Cirebon Regency has significant potential to become a model for developing sorghum as sustainable *pangan thayyib*. The use of two hectares of previously idle village land has produced 10–16 tons of sorghum per harvest, with up to three

harvests annually, amounting to 30–48 tons per year. These results highlight sorghum's adaptability to marginal land and its role in addressing both land limitations and the need for alternative food sources.

Nutritionally, sorghum is high in fiber, has a low glycemic index, and contains polyphenols, strengthening its position as food that is not only halal but also wholesome and beneficial. From the perspective of *maqāṣid al-sharī'ah*, sorghum contributes to *hifz al-nafs* (preserving life) by providing healthy food, *hifz al-mal* (protecting wealth) through community-based economic benefits, and *imārat al-ardh* (stewarding the earth) through sustainable land use.

However, challenges remain, including limited processing infrastructure, low nutritional awareness, and underdeveloped village institutions, alongside external risks such as land conversion and strong rice-based preferences. Addressing these requires integrated strategies: farmer training, downstream processing through women's groups and local enterprises, nutrition education, institutional strengthening, and cross-sector collaboration.

With these measures, sorghum can serve not only as an alternative staple but as a pillar of Islamic and sustainable local food security, offering a replicable model that supports the achievement of SDG 2 (*Zero Hunger*).

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