

Empowerment Construction Management of Processed Porang (*Amorphophallus Muelleri*) through Responsible Consumption and Production Approach to Accelerate Food Sustainability on Marginal Land in East Java

Suhud Wahyudi¹, Soehardjoepri², Yulius Hari³, Muslichah Erma Widian⁴

Abstract

Indonesia have a vast farmland but only 58.4% be used for agriculture. It should support national food security afterwards. The porang plant (*amorphophallus muelleri*) is an economically valuable alternative food. According to data from East Java Surabaya Agricultural Quarantine Center (BBKP) porang exports grew from 2018 to 2020. The volume was 5,516,382 kg and Rp 270,302,720,450 in 2018. China, Vietnam, Japan, Thailand, Singapore, South Korea, and Taiwan exported. The volume was 6,064,947 kg and worth IDR 297,182,412,310 in 2019. Thailand, China, Taiwan, Vietnam, Cambodia, Pakistan are destinations. Porang is rarely used as an alternative food component in Indonesia. So that strategic efforts must be done to promote this development holistically from upstream to downstream to encourage economic growth for local residents, especially in suboptimal land regions. On the other hand, Ministry of PPN found that Indonesia lost 23-48 million tons of food between 2000–2019, or 115-184 kg per inhabitant. Food ingredients are extremely prone to waste. Indonesia generates the most Southeast Asian food waste. The Indonesian food waste is 20.93 million tons per year. Food waste costs Indonesia Rp 213-551 trillion per year, or 4-5% of its GDP Indonesia develops diversified and sustainable local food sources for food security. Porang is a notable food. The growth of porang in Madiun City can improve food security. Developing micro and medium agro-industrial firms is possible for Madiun residents. Madiun City porang farmers also benefit from the rising domestic and international porang market. This is crucial for climate change and global food price fluctuations-related food security. Porang development needs substantial help from Madiun municipal and relevant entities. With sustainable porang development, Madiun City can help achieve national food security. In addition to economic benefits and local food variety, porang can help Madiun and its neighbors access quality and sustainable food. This study develops a Responsible-Consumption-and-Production (RCAP) paradigm using processed porang to enhance food security on suboptimal land in East Java, Indonesia. Porang farmer samples and targets in Madiun, East Java.

Keywords: Responsible-Consumption, sustainability, marginal land, management.

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1. INTRODUCTION

According to the Soil Research Center of the Ministry of Agriculture in 2015, the area of marginal land in Indonesia reached 157,246,565 hectares. However, the potential land that can be utilized for agriculture is only 91,904,643 hectares, or about 58.4% (Subrata & Abdillah, 2022). Of course, the land that is still 'sleeping' cannot be utilized for agricultural cultivation. Land that is often referred to as LSO (sub-optimal land) can be planted with food crop commodities (Ngongo et al., 2022). Which later is expected to be able to support national food security. Various conditions of limited access to resources on marginal lands with support have been able to adapt to environmental dynamics and challenges and mitigate the negative impacts of environmental change and give birth to various local innovations that manage resources in a good and environmentally friendly way and in turn can improve environmental quality and improve the quality of people's livelihoods (Widiyanto & Fauziah, 2022). On the other hand, the porang plant (*amorphophallus muelleri*) is one of the alternative food commodities that has high economic value. Porang is a tuberous plant that contains glucomannan carbohydrates or sugar substances in complex form (Dermoredjo et al., 2021). This porang plant is also known as *iles-iles*. Porang is usually processed into rice, shirataki, mixed ingredients in cake products, bread, ice cream, candy, jelly, jam, and thickening agents in syrup products. Launching data from the birohumas.jatimprov.go.id page, the development of porang exports from 2018 to 2020 in East Java through the Surabaya Agricultural Quarantine Center (BBKP) has always increased (Ridhanto et al., 2023). In 2018, the volume reached 5,516,382 kg with a value of Rp 270,302,720,450. Export destination countries were China, Vietnam, Japan, Thailand, Singapore, South Korea, and Taiwan. Then in 2019 the volume reached 6,064,947 kg with a value of IDR 297,182,412,310. The destination countries are Thailand, China, Taiwan, Vietnam, Cambodia, Pakistan. In 2020, the volume reached 10,319,458 kg worth Rp 499,082,915,019, with destination countries of China, Belgium, Thailand, Myanmar, Japan, Vietnam, India, Taiwan, Singapore, Bulgaria, South Korea, France and the US. However, the utilization of porang as an alternative food ingredient in Indonesia is still very small (Riptanti et al., 2022). So that strategic steps need to be taken to support this development holistically from upstream to downstream to be able to encourage economic growth for local communities, especially in areas with sub-optimal land (Widyastuty & Widiana, 2022).

On the other hand, food ingredients are very vulnerable to waste, according to a study by the Ministry of PPN / Bappenas, food waste wasted in Indonesia in 2000-2019 reached 23-48 million tons per year or the equivalent of 115-184 kilograms per capita per year. Indonesia is the country with the highest food waste production in Southeast Asia. The total food waste in Indonesia reaches 20.93 million tons each year. Food waste also has an impact on economic losses that reach Rp 213-551 trillion per year or equivalent to 4-5% of Indonesia's GDP (McCarthy & Obidzinski, 2017). The social impact is the loss of energy content equivalent to a meal for 61 to 125 million people or 29-47% of Indonesia's population.

Food security in Indonesia involves efforts to develop diverse and sustainable local food sources. One food commodity that attracts attention is porang. Porang is a tuberous plant that can grow well in various types of soil, including in the Madiun area (Nugrahaeni et al., 2021). The development of porang in Madiun City has several benefits that can contribute to food security. Porang is an alternative food source that is rich in fiber, low in calories, and has a low glycemic index. This makes porang suitable as a food for people who want a healthy and diverse diet. Porang has promising economic potential. Porang tubers can be processed into various products, such as porang flour, porang crackers, and other preparations. This provides opportunities for the people of Madiun to develop micro and medium enterprises in the agro-industrial sector. In addition, the growing porang

market both at home and abroad provides bright prospects for porang farmers in Madiun City.

Porang development also contributes to local food diversification. By optimizing the potential of porang in Madiun, the community can reduce dependence on imported food and increase the availability of diverse local food. This is important to achieve sustainable food security in the face of climate change and global food price fluctuations. The Madiun city government and related agencies need to provide tangible support for porang development. This includes the provision of training, technical assistance, financing, and better market access for porang farmers and businesses. In addition, research and innovations related to porang processing and utilization also need to be carried out to increase the added value of products and expand market share.

With the sustainable development of porang, Madiun City can become one of the regions that contribute to achieving food security nationally (Ridhanto et al., 2023). In addition to providing economic benefits and local food diversification, porang can also be one of the solutions in maintaining the availability of quality and sustainable food for the people of Madiun and its surroundings.

This research tries to develop a Responsible-Consumption-and-Production (RCAP) model through processed porang to support food security on sub-optimal land with a target location in East Java, Indonesia. With samples and targets of porang farmers in Madiun city, East Java.

2. LITERATURE REVIEW

2.1. Responsible Consumption And Production

The United Nations has established Sustainable Development Goal (SDG) 12 to promote sustainable consumption and production patterns that will help to reduce the negative impact of human activities on the environment. The goal of SDG 12 is to promote sustainable consumption and production patterns that will help to reduce the negative impact of human activities on the environment. The Indonesian government has implemented various programs to support SDG 12, including the implementation of a national action plan for sustainable consumption and production (SCP). The SCP program aims to promote sustainable consumption and production patterns in Indonesia by reducing waste, promoting resource efficiency, and increasing the use of renewable energy (WIDIANA et al., 2021). The SCP program also aims to promote sustainable public procurement practices, support the development of sustainable tourism, and promote sustainable food systems. The United Nations in Indonesia is also supporting progress towards SDG 12 by implementing various key activities in the country. These activities include promoting sustainable consumption and production patterns, supporting the development of sustainable tourism (Widyastuty & Widiana, 2022), promoting sustainable public procurement practices, and supporting developing countries' scientific and technological capacity for sustainable consumption and production.

To achieve this goal, it is necessary to use and produce natural resources in sustainable ways that will reduce waste, pollution, and other negative environmental impacts (Imran, 2023). There are many targets associated with SDG 12, including implementing a 10-year framework of programs on sustainable consumption and production patterns, achieving the sustainable management and efficient use of natural resources, halving global per capita food waste, promoting sustainable public procurement practices, and supporting developing countries' scientific and technological capacity for sustainable consumption and production.

2.2. Marginal Land

According to the Soil Research Center of the Ministry of Agriculture in 2015, the area of marginal land in Indonesia reached 157,246,565 hectares. However, the potential land that can be utilized for agriculture is only 91,904,643 hectares, or about 58.4%. Many marginal lands in Indonesia are found on wetlands and drylands. Wetlands in the form of peatlands, acid sulphate lands and tidal swamps cover 24 million ha, while drylands in the form of Ultisol 47.5 million ha and Oxisol 18 million ha. Marginal lands can be caused by land degradation due to erosion, soil compaction due to the use of agricultural machinery, flooding, and inundation. In addition, it is also caused by the deterioration of chemical properties due to salinization, acidification, and agrochemical pollution, as well as depletion of plant nutrients. The development of marginal land use can be optimized with an ecosystem approach strategy through improving soil fertility and selecting various types of food crops that are suitable and profitable. Optimizing the use of dry marginal land can be done by increasing the availability of groundwater, land cultivation, and utilization of available natural resources. In addition, it can also be done by adding ameliorant materials, such as lime, organic matter, and natural phosphate rock (BFA)(Subrata & Abdillah, 2022).

The utilization of marginal land for food security can be improved by implementing several strategies. According to the World Bank Group, these strategies include raising agricultural productivity, linking farmers to markets, reducing risk and vulnerability, improving nonfarm rural employment, and making agriculture more environmentally sustainable. The Indonesian government has implemented various programs to support sustainable consumption and production patterns in Indonesia by reducing waste, promoting resource efficiency, and increasing the use of renewable energy(Karsam et al., 2022). The SCP program also aims to promote sustainable public procurement practices, support the development of sustainable tourism, and promote sustainable food systems. According to a study conducted in Wonogiri Regency, Central Java Province, Indonesia, porang farming is less sustainable. This implies that the indicators in each dimension have little or no support for the cultivation of this plant. However, there are strategies to improve the sustainability of porang farming as it plays an essential role in supporting the triple export policy

3. RESEARCH METHODS

This research tries to measure and develop a policy framework with a Responsible Consumption and Production approach model, by considering the following aspects:

1. Sustainability of natural resource management over the next 10 years.
2. Management of waste and waste generated during production by diverting it to reduction, recycling or reuse so as to minimize the waste generated.
3. Reducing the global waste impact per capita from a series of processes from upstream to downstream. From farm to plate.
4. Long-term reduction of chemicals that are harmful to soil nutrients.
5. Diversification of porang products and processed products so that it becomes a new alternative.

The model of this research activity can be presented briefly in the figure below:

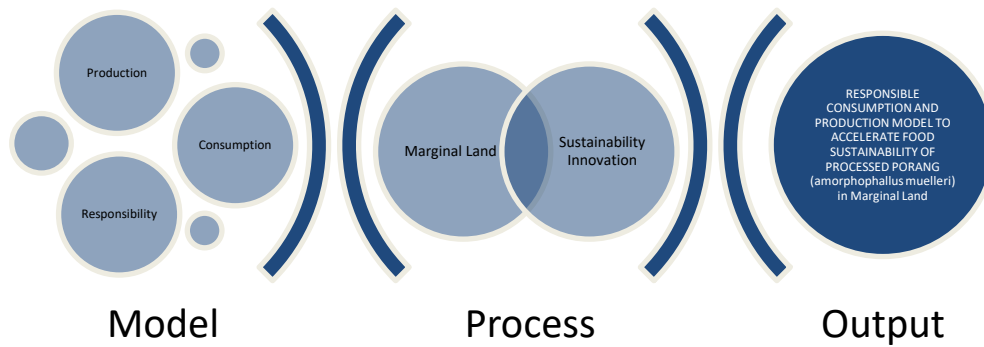


Figure 1. Research model and output goals.

This research uses a multidisciplinary applied quantitative method approach that looks at problems from various points of view in order to get a more holistic view. With data collection techniques from surveys, observation, documentation, and focus group discussions. The data analysis technique used uses quantitative descriptive analysis through secondary data.

In detail, this research tries to find the common thread of modeling responsible consumption production models on marginal land by combining the process of innovation to support food security in the region. The detailed model of the factors of this research can be presented in Figure 2.

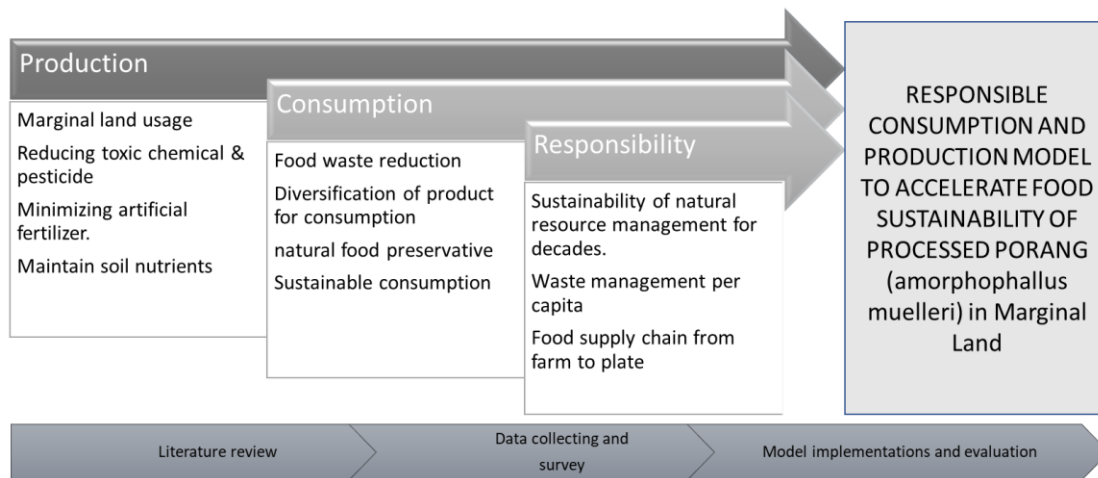


Figure 2. Details of factor and research process.

This research was conducted with respondents from SMEs and porang artisans in Madiun city, East Java, Indonesia. This location was chosen because the largest porang production is in Madiun city. As well as being a national food barn for food security on the island of Java.

4. RESULTS AND DISCUSSIONS

Food Security in Madiun City involves efforts to develop diverse and sustainable local food sources. One food commodity that attracts attention is porang. Porang is a tuberous plant that can grow well in various types of soil, including in the Madiun area.

The development of porang in Madiun City has several benefits that can contribute to food security. Porang is an alternative food source that is rich in fiber, low in calories, and has a low glycemic index. This makes porang suitable as a food for people who want a

healthy and diverse diet. Porang has promising economic potential. Porang tubers can be processed into various products, such as porang flour, porang crackers, and other preparations. This provides opportunities for the people of Madiun to develop micro and medium enterprises in the agro-industrial sector. In addition, the growing porang market both at home and abroad provides bright prospects for porang farmers in Madiun City.

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Madiun City is ranked first in the best food security index compared to other cities in East Java. This is in accordance with the National Food Agency (Bapanas) report on the 2022 Food Security and Vulnerability Map. The data shows indicators in 2021.

Reporting from Katadata.co.id, the food security indicator of a region is measured by eight main indicators assessed by Bapanas. Starting from the percentage of people living below the poverty line, households with a proportion of expenditure on food > 65% of total expenditure, households without access to electricity and clean water, life expectancy at birth. Then the ratio of the number of people per health worker to the population density level, the average length of schooling for women over 15 years. And the percentage of toddlers with height below standard or stunting.

The indicators are then processed by Bapanas and scored on a scale of 0-100. The higher the score, the better a city's food security is assumed to be. From this method, Madiun City achieved a score of 85.32 in 2021. This figure is the best among the nine East Java cities researched by Bapanas. Or higher than the capital city of East Java Province, namely Surabaya, which only scored 81.59.

In Madiun, there are a number of porang craftsmen who are dedicated to producing high-quality porang products. Porang is a type of tuber that is widely used as a raw material in the food, pharmaceutical, and cosmetic industries. Porang artisans in Madiun have the knowledge and skills in processing porang into ready-to-use products. Porang craftsmen in Madiun can produce various processed porang products, such as porang flour, porang noodles, porang crackers, and porang dodol. These products have a high selling value because porang has a high fiber content and various health benefits.

Porang craftsmen in Madiun also strive to improve product quality and innovation in porang processing. They continue to conduct research and development to present more varied and value-added porang products. With the existence of porang craftsmen in Madiun, it is expected to contribute to the development of the porang industry in Indonesia. In addition, porang craftsmen can also help increase the income of local communities through increased production and marketing of porang products. Documentation of this activity can be seen in Figure 3. Implementation of research to porang processing umkm in Madiun.



Figure 3. Implementation of research on porang processing umkm in Madiun

The porang farmers in Madiun use the best farming techniques, from the selection of superior seeds to good plant maintenance. They fully understand the needs of porang plants, such as optimal soil conditions, proper watering patterns, and appropriate fertilization. Porang farmers also pay attention to climate and seasonal factors so that the plants can grow well.

Facing challenges in the agricultural industry, porang farmers in Madiun strive to continuously improve their skills and knowledge through training and farmer group meetings. They share their experiences and best techniques in overcoming problems such as pests, plant diseases, and weather changes that can affect porang production. In addition, porang farmers in Madiun also play a role in maintaining environmental sustainability. They are aware of the importance of environmentally friendly and sustainable agricultural practices. The farmers strive to reduce the use of harmful pesticides and apply organic methods in porang cultivation.

However, recently, a number of porang farmers in Madiun Regency, East Java, have switched to growing tobacco to avoid losses due to the uncertain and declining selling price of porang tuber harvests. Chairman of the Gotong Royong Farmer Group Ahmat Dilam in Bodag Village, Kare Subdistrict, said that previously he and dozens of farmers in his village planted their land with corn and porang. "But because the price of porang harvest in the market fluctuates and tends to fall sharply, we finally decided to switch to tobacco," he said in Madiun, Thursday (11/5/2023). According to him, in addition to the declining price of porang, the decision to switch to planting tobacco was also based on the commodity's clear market share after harvest. Entering the dry season in 2023, as an initial stage, he and other farmer group members planted tobacco on 2 hectares of terraced land. "Before planting on hectares of land, we tried planting 100-200 stems on our own land for personal consumption. After learning about the marketing methods and flow, we decided to make the switch because it turned out to be a more promising prospect," he said. At harvest time, members of his farming group will be facilitated by a third party to collect the harvest. Most importantly, the selling price of the harvest is also high. Kare Subdistrict Field Agricultural Extension Coordinator Agung Setyo Nugroho said he wanted to change the thinking of farmers in his area so that fertile land did not only have to be planted with food or horticultural commodities. "Existing fertile land can also be planted with strategic plantation commodities, one of which is tobacco," Agung said. The selling price of the tobacco harvest per kilogram varies according to its quality or 'grade'. For the lowest quality, the price of knitted tobacco leaves ranges from IDR 15-18 thousand per kilogram. Then the standard quality ranges from IDR 25-30 thousand per kilogram, while the best quality reaches IDR 40-45 thousand per kilogram. Meanwhile, the price of porang tubers in Madiun Regency has fallen to around Rp2 thousand to Rp3 thousand per kilogram. A few years earlier, the price of porang tubers could reach Rp10-12 thousand per kilogram.

The success of this effort is contingent upon the establishment of collaborative partnerships with local communities, farmers, non-governmental organizations (NGOs), and governmental entities. The ongoing adoption of responsible farming methods

necessitates the important involvement of local stakeholders through knowledge-sharing, training, and capacity-building measures. This methodology facilitates the cultivation of a perception of possession, encourages self-reliance, and enhances the resilience of food availability at the local level.

The potential to establish resilient food systems can be realized through the integration of processed Porang cultivation with principles of responsible consumption and production. This technique effectively tackles various difficulties, such as food scarcity, malnutrition, land degradation, and climate change, by leveraging the adaptability of Porang to marginal lands and implementing construction management practices.

5. CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

Given the ongoing increase in the world population, it is crucial to prioritize sustainable food production in marginal lands. The implementation of responsible consumption and production approaches in the construction management of processed Porang serves as an empowering strategy that is in line with the ideals of environmental conservation and food security. By adopting innovative approaches, fostering collaboration, and actively engaging with the community, this initiative lays the foundation for a future that is both sustainable and equitable. It envisions a scenario where even the most disadvantaged areas may thrive and prosper with ample resources.

5.2 Suggestions

To establish resilient food systems can be realized through the integration of sustainable food production. Therefore, we need to research further about the variety of sustainable alternatives food, especially in marginal land. Further integration from local communities, farmers, NGOs, and governmental bodies need to be implemented and make this one of the targets to reduce poverty and increase the sustainability of food alternatives in their area.

ACKNOWLEDGMENT

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On the other hand, food ingredients are very vulnerable to waste, according to a study by the Ministry of PPN / Bappenas, food waste wasted in Indonesia in 2000-2019 reached 23-48 million tons per year or the equivalent of 115-184 kilograms per capita per year. Indonesia is the country with the highest food waste production in Southeast Asia. The total food waste in Indonesia reaches 20.93 million tons each year. Food waste also has an impact on economic losses that reach Rp 213-551 trillion per year or equivalent to 4-5% of Indonesia's GDP (McCarthy & Obidzki, 2017). The social impact is the loss of energy content equivalent to a meal for 61 to 125 million people or 29-47% of Indonesia's population.

Food security in Indonesia involves efforts to develop diverse and sustainable local food sources. One food commodity that attracts attention is porang. Porang is a tuberous plant that can grow well in various types of soil, including in the Madiun area (Nugrahaeni et al., 2021). The development of porang in Madiun City has several benefits that can contribute to food security. Porang is an alternative food source that is rich in fiber, low in calories, and has a low glycemic index. This makes porang suitable as a food for people who want a healthy and diverse diet. Porang has promising economic potential. Porang tubers can be processed into various products, such as porang flour, porang crackers, and other preparations. This provides opportunities for the people of Madiun to develop micro and medium enterprises in the agro-industrial sector. In addition, the growing porang

market both at home and abroad provides bright prospects for porang farmers in Madiun City.

Porang development also contributes to local food diversification. By optimizing the potential of porang in Madiun, the community can reduce dependence on imported food and increase the availability of diverse local food. This is important to achieve sustainable food security in the face of climate change and global food price fluctuations. The Madiun city government and related agencies need to provide tangible support for porang development. This includes the provision of training, technical assistance, financing, and better market access for porang farmers and businesses. In addition, research and innovations related to porang processing and utilization also need to be carried out to increase the added value of products and expand market share.

With the sustainable development of porang, Madiun City can become one of the regions that contribute to achieving food security nationally (Ridhanto et al., 2023). In addition to providing economic benefits and local food diversification, porang can also be one of the solutions in maintaining the availability of quality and sustainable food for the people of Madiun and its surroundings.

This research tries to develop a Responsible-Consumption-and-Production (RCAP) model through processed porang to support food security on sub-optimal land with a target location in East Java, Indonesia. With samples and targets of porang farmers in Madiun city, East Java.

2. LITERATURE REVIEW

2.1. Responsible Consumption And Production

The United Nations has established Sustainable Development Goal (SDG) 12 to promote sustainable consumption and production patterns that will help to reduce the negative impact of human activities on the environment. The goal of SDG 12 is to promote sustainable consumption and production patterns that will help to reduce the negative impact of human activities on the environment. The Indonesian government has implemented various programs to support SDG 12, including the implementation of a national action plan for sustainable consumption and production (SCP). The SCP program aims to promote sustainable consumption and production patterns in Indonesia by reducing waste, promoting resource efficiency, and increasing the use of renewable energy (WIDIANA et al., 2021). The SCP program also aims to promote sustainable public procurement practices, support the development of sustainable tourism, and promote sustainable food systems. The United Nations in Indonesia is also supporting progress towards SDG 12 by implementing various key activities in the country. These activities include promoting sustainable consumption and production patterns, supporting the development of sustainable tourism (Widyastuty & Widiana, 2022), promoting sustainable public procurement practices, and supporting developing countries' scientific and technological capacity for sustainable consumption and production.

To achieve this goal, it is necessary to use and produce natural resources in sustainable ways that will reduce waste, pollution, and other negative environmental impacts (Imran, 2023). There are many targets associated with SDG 12, including implementing a 10-year framework of programs on sustainable consumption and production patterns, achieving the sustainable management and efficient use of natural resources, halving global per capita food waste, promoting sustainable public procurement practices, and supporting developing countries' scientific and technological capacity for sustainable consumption and production.

2.2. Marginal Land

According to the Soil Research Center of the Ministry of Agriculture in 2015, the area of marginal land in Indonesia reached 157,246,565 hectares. However, the potential land that can be utilized for agriculture is only 91,904,643 hectares, or about 58.4%. Many marginal lands in Indonesia are found on wetlands and drylands. Wetlands in the form of peatlands, acid sulphate lands and tidal swamps cover 24 million ha, while drylands in the form of Ultisol 47.5 million ha and Oxisol 18 million ha. Marginal lands can be caused by land degradation due to erosion, soil compaction due to the use of agricultural machinery, flooding, and inundation. In addition, it is also caused by the deterioration of chemical properties due to salinization, acidification, and agrochemical pollution, as well as depletion of plant nutrients. The development of marginal land use can be optimized with an ecosystem approach strategy through improving soil fertility and selecting various types of food crops that are suitable and profitable. Optimizing the use of dry marginal land can be done by increasing the availability of groundwater, land cultivation, and utilization of available natural resources. In addition, it can also be done by adding ameliorant materials, such as lime, organic matter, and natural phosphate rock (BFA)(Subrata & Abdillah, 2022).

The utilization of marginal land for food security can be improved by implementing several strategies. According to the World Bank Group, these strategies include raising agricultural productivity, linking farmers to markets, reducing risk and vulnerability, improving nonfarm rural employment, and making agriculture more environmentally sustainable. The Indonesian government has implemented various programs to support sustainable consumption and production patterns in Indonesia by reducing waste, promoting resource efficiency, and increasing the use of renewable energy(Karsam et al., 2022). The SCP program also aims to promote sustainable public procurement practices, support the development of sustainable tourism, and promote sustainable food systems. According to a study conducted in Wonogiri Regency, Central Java Province, Indonesia, porang farming is less sustainable. This implies that the indicators in each dimension have little or no support for the cultivation of this plant. However, there are strategies to improve the sustainability of porang farming as it plays an essential role in supporting the triple export policy

3. RESEARCH METHODS

This research tries to measure and develop a policy framework with a Responsible Consumption and Production approach model, by considering the following aspects:

1. Sustainability of natural resource management over the next 10 years.
2. Management of waste and waste generated during production by diverting it to reduction, recycling or reuse so as to minimize the waste generated.
3. Reducing the global waste impact per capita from a series of processes from upstream to downstream. From farm to plate.
4. Long-term reduction of chemicals that are harmful to soil nutrients.
5. Diversification of porang products and processed products so that it becomes a new alternative.

The model of this research activity can be presented briefly in the figure below:

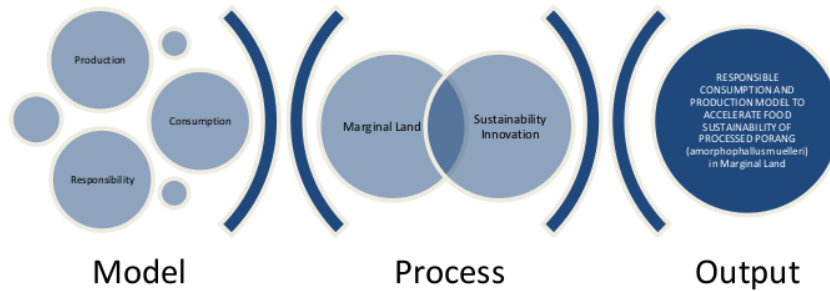


Figure 1. Research model and output goals.

This research uses a multidisciplinary applied quantitative method approach that looks at problems from various points of view in order to get a more holistic view. With data collection techniques from surveys, observation, documentation, and focus group discussions. The data analysis technique used uses quantitative descriptive analysis through secondary data.

In detail, this research tries to find the common thread of modeling responsible consumption production models on marginal land by combining the process of innovation to support food security in the region. The detailed model of the factors of this research can be presented in Figure 2.

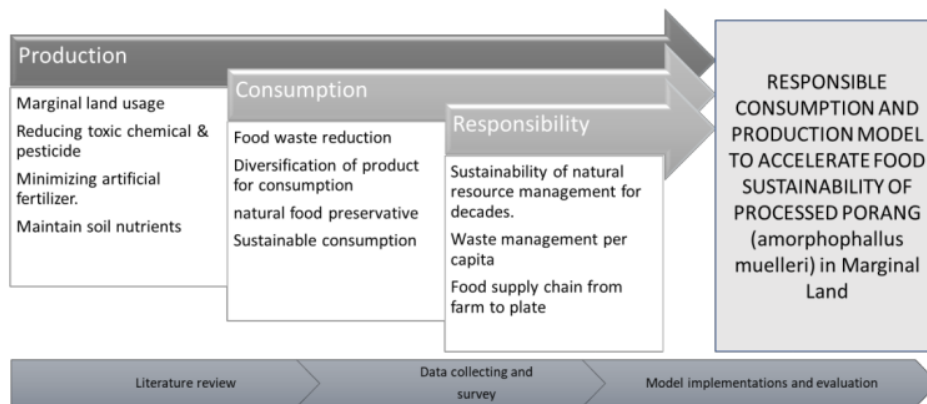


Figure 2. Details of factor and research process.

This research was conducted with respondents from SMEs and porang artisans in Madiun city, East Java, Indonesia. This location was chosen because the largest porang production is in Madiun city. As well as being a national food barn for food security on the island of Java.

4. RESULTS AND DISCUSSIONS

Food Security in Madiun City involves efforts to develop diverse and sustainable local food sources. One food commodity that attracts attention is porang. Porang is a tuberous plant that can grow well in various types of soil, including in the Madiun area.

The development of porang in Madiun City has several benefits that can contribute to food security. Porang is an alternative food source that is rich in fiber, low in calories, and has a low glycemic index. This makes porang suitable as a food for people who want a

healthy and diverse diet. Porang has promising economic potential. Porang tubers can be processed into various products, such as porang flour, porang crackers, and other preparations. This provides opportunities for the people of Madiun to develop micro and medium enterprises in the agro-industrial sector. In addition, the growing porang market both at home and abroad provides bright prospects for porang farmers in Madiun City.

Porang development also contributes to local food diversification. By optimizing the potential of porang in Madiun, the community can reduce dependence on imported food and increase the availability of diverse local food. This is important to achieve sustainable food security in the face of climate change and global food price fluctuations. The Madiun city government and related agencies need to provide tangible support for porang development. This includes the provision of training, technical assistance, financing, and better market access for porang farmers and businesses. In addition, research and innovations related to porang processing and utilization also need to be carried out to increase the added value of products and expand market share.

With the sustainable development of porang, Madiun City can become one of the regions that contribute to achieving food security nationally. In addition to providing economic benefits and local food diversification, porang can also be one of the solutions in maintaining the availability of quality and sustainable food for the people of Madiun and its surroundings.

Madiun City is ranked first in the best food security index compared to other cities in East Java. This is in accordance with the National Food Agency (Bapanas) report on the 2022 Food Security and Vulnerability Map. The data shows indicators in 2021.

Reporting from Katadata.co.id, the food security indicator of a region is measured by eight main indicators assessed by Bapanas. Starting from the percentage of people living below the poverty line, households with a proportion of expenditure on food > 65% of total expenditure, households without access to electricity and clean water, life expectancy at birth. Then the ratio of the number of people per health worker to the population density level, the average length of schooling for women over 15 years. And the percentage of toddlers with height below standard or stunting.

The indicators are then processed by Bapanas and scored on a scale of 0-100. The higher the score, the better a city's food security is assumed to be. From this method, Madiun City achieved a score of 85.32 in 2021. This figure is the best among the nine East Java cities researched by Bapanas. Or higher than the capital city of East Java Province, namely Surabaya, which only scored 81.59.

In Madiun, there are a number of porang craftsmen who are dedicated to producing high-quality porang products. Porang is a type of tuber that is widely used as a raw material in the food, pharmaceutical, and cosmetic industries. Porang artisans in Madiun have the knowledge and skills in processing porang into ready-to-use products. Porang craftsmen in Madiun can produce various processed porang products, such as porang flour, porang noodles, porang crackers, and porang dodol. These products have a high selling value because porang has a high fiber content and various health benefits.

Porang craftsmen in Madiun also strive to improve product quality and innovation in porang processing. They continue to conduct research and development to present more varied and value-added porang products. With the existence of porang craftsmen in Madiun, it is expected to contribute to the development of the porang industry in Indonesia. In addition, porang craftsmen can also help increase the income of local communities through increased production and marketing of porang products. Documentation of this activity can be seen in Figure 3. Implementation of research to porang processing umkm in Madiun.



Figure 3. Implementation of research on porang processing umkm in Madiun

The porang farmers in Madiun use the best farming techniques, from the selection of superior seeds to good plant maintenance. They fully understand the needs of porang plants, such as optimal soil conditions, proper watering patterns, and appropriate fertilization. Porang farmers also pay attention to climate and seasonal factors so that the plants can grow well.

Facing challenges in the agricultural industry, porang farmers in Madiun strive to continuously improve their skills and knowledge through training and farmer group meetings. They share their experiences and best techniques in overcoming problems such as pests, plant diseases, and weather changes that can affect porang production. In addition, porang farmers in Madiun also play a role in maintaining environmental sustainability. They are aware of the importance of environmentally friendly and sustainable agricultural practices. The farmers strive to reduce the use of harmful pesticides and apply organic methods in porang cultivation.

However, recently, a number of porang farmers in Madiun Regency, East Java, have switched to growing tobacco to avoid losses due to the uncertain and declining selling price of porang tuber harvests. Chairman of the Gotong Royong Farmer Group Ahmat Dilam in Bodag Village, Kare Subdistrict, said that previously he and dozens of farmers in his village planted their land with corn and porang. "But because the price of porang harvest in the market fluctuates and tends to fall sharply, we finally decided to switch to tobacco," he said in Madiun, Thursday (11/5/2023). According to him, in addition to the declining price of porang, the decision to switch to planting tobacco was also based on the commodity's clear market share after harvest. Entering the dry season in 2023, as an initial stage, he and other farmer group members planted tobacco on 2 hectares of terraced land. "Before planting on hectares of land, we tried planting 100-200 stems on our own land for personal consumption. After learning about the marketing methods and flow, we decided to make the switch because it turned out to be a more promising prospect," he said. At harvest time, members of his farming group will be facilitated by a third party to collect the harvest. Most importantly, the selling price of the harvest is also high. Kare Subdistrict Field Agricultural Extension Coordinator Agung Setyo Nugroho said he wanted to change the thinking of farmers in his area so that fertile land did not only have to be planted with food or horticultural commodities. "Existing fertile land can also be planted with strategic plantation commodities, one of which is tobacco," Agung said. The selling price of the tobacco harvest per kilogram varies according to its quality or 'grade'. For the lowest quality, the price of knitted tobacco leaves ranges from IDR 15-18 thousand per kilogram. Then the standard quality ranges from IDR 25-30 thousand per kilogram, while the best quality reaches IDR 40-45 thousand per kilogram. Meanwhile, the price of porang tubers in Madiun Regency has fallen to around Rp2 thousand to Rp3 thousand per kilogram. A few years earlier, the price of porang tubers could reach Rp10-12 thousand per kilogram.

The success of this effort is contingent upon the establishment of collaborative partnerships with local communities, farmers, non-governmental organizations (NGOs), and governmental entities. The ongoing adoption of responsible farming methods

necessitates the important involvement of local stakeholders through knowledge-sharing, training, and capacity-building measures. This methodology facilitates the cultivation of a perception of possession, encourages self-reliance, and enhances the resilience of food availability at the local level.

The potential to establish resilient food systems can be realized through the integration of processed Porang cultivation with principles of responsible consumption and production. This technique effectively tackles various difficulties, such as food scarcity, malnutrition, land degradation, and climate change, by leveraging the adaptability of Porang to marginal lands and implementing construction management practices.

5. CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

Given the ongoing increase in the world population, it is crucial to prioritize sustainable food production in marginal lands. The implementation of responsible consumption and production approaches in the construction management of processed Porang serves as an empowering strategy that is in line with the ideals of environmental conservation and food security. By adopting innovative approaches, fostering collaboration, and actively engaging with the community, this initiative lays the foundation for a future that is both sustainable and equitable. It envisions a scenario where even the most disadvantaged areas may thrive and prosper with ample resources.

5.2 Suggestions

To establish resilient food systems can be realized through the integration of sustainable food production. Therefore, we need to research further about the variety of sustainable alternatives food, especially in marginal land. Further integration from local communities, farmers, NGOs, and governmental bodies need to be implemented and make this one of the targets to reduce poverty and increase the sustainability of food alternatives in their area.

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