OPTIMIZING PORANG UTILIZATION IN INDONESIA: LESSONS FROM JAPAN FOR NUTRITION AND DISABILITY SUPPORT

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Abstract
Porang (Amorphophallus oncophyllus Prain) is a strategic commodity with significant potential to improve nutrition for pregnant women and children with special needs. Its high glucomannan content supports prenatal health reducing risks associated with intellectual disabilities and provides a foundation for gluten-free, casein-free diets for managing Autism Spectrum Disorder (ASD). This article examines porang's nutritional role, explores consumer-accepted products like shirataki noodles and analog rice, and analyzes recent Indonesian innovations. Despite its promise, challenges persist, including low productivity from traditional farming, inferior processing infrastructure, and limited market access. To optimize its potential, we recommend a multi-strategy approach: transferring cultivation technology from Japan, digitalizing supply chains, developing superior varieties, and fostering partnerships between farmers, industry, and government. This integrated effort positions porang as a halal and thayyib food source capable of enhancing nutritional status, supporting specialized diets, and contributing to Indonesia's food security and preventive health strategies. This study serves as a critical reference for sustainable agricultural development and local food innovation.

Keywords: Porang, Prenatal Nutrition, Intellectual Disability, Autism Spectrum Disorder

1. Introduction
In Indonesia, ensuring welfare and adequate nutrition remains a challenge, particularly for vulnerable families and children with special needs. According to the latest data from the Indonesian Nutritional Status Survey (SSGI), cited from an article by the Indonesian Ministry of Health, the national stunting prevalence has decreased from 21.5% in 2023 to 19.8% in 2024. However, many lower-middle-class families continue to face nutritional problems. A UNICEF bulletin, Volume 6 (April-June 2025) on the Indonesian nutrition update, highlights that significant disparities persist across provinces, with half of all stunted children approximately 2.3 million concentrated in just six provinces (Update Gizi Indonesia Volume-6 UNICEF, n.d.). "Stunting prevalence varies greatly. For instance, it is far higher in the lowest income group compared to the highest. This is a crucial point for sharpening our interventions," added Prof. Asnawi Abdullah, Head of the Public Health Development Board at the Indonesian Ministry of Health.

The Indonesian Minister of Health, Budi Gunadi Sadikin, stated that stunting does not begin after birth but originates in the womb. Therefore, interventions for pregnant women are vital, and it is crucial to prevent them from suffering from malnutrition or anemia. This is because poor maternal nutritional status is correlated with the risk of low birth weight and impaired intellectual development, including intellectual disability (mental retardation), which has an estimated prevalence of 4.6% among children in developing countries like Indonesia. The incidence of children with intellectual disabilities is around 19 per 1000 live births (D.P, 2023). This aligns with the word of Allah in the Qur'an, Surah Al-Baqarah: 168, which commands the consumption of food that is halal (lawful) and thayyib (good/wholesome), a principle whose wisdom resonates profoundly with contemporary life.

In addition to the impact of nutrition on intellectual disability, this article will also discuss Autism Spectrum Disorder (ASD) in relation to a casein-free and gluten-free diet. According to research by Nastiti & Christyaningsih (2019), children with ASD often experience gastrointestinal issues. A common problem is increased intestinal permeability (leaky gut), which allows their bodies to more easily absorb partially digested protein peptides, such as casein from milk and gluten from wheat. Furthermore, another study by Postorino and colleagues (2015) showed

that children with ASD who followed a casein-free, gluten-free (CFGF) diet experienced a significant reduction in their autism symptoms (Rahmaris & Ratnaningsih, 2022).

Porang, scientifically known as Amorphophallus oncophyllus Prain, is a tuber-producing plant that thrives in tropical and subtropical environments. It is typically cultivated as an intercrop in community forests or plantation forests, as its growth requires shade, making it one of Indonesia's valuable biological resources. At a glance, porang resembles other tuber plants such as suweg, walur, or iles-iles. However, its distinguishing characteristic is the presence of bulbils or 'frogs' (katak) that grow at each branch junction and leaf axil.

In Indonesia, porang has long been known as a tuber crop. It commonly grows wild in forests, under bamboo clumps, and on mountain slopes. Recently, porang has gained significant popularity and public discourse. Its production centers are now spread across various regions, including East Java, Central Java, West Java, Yogyakarta (DIY), North Sumatra, Banten, South Sulawesi, and Riau (Zendrato et al., 2024). Cultivating porang holds highly promising prospects because this commodity is in great demand by various countries for both food and industrial raw materials. Currently, Indonesian porang is exported in the form of flour or dried chips (gaplek) to numerous countries, including Japan, Italy, Pakistan, the United Kingdom, Australia, Malaysia, New Zealand, Korea, and Sri Lanka. Market demand continues to increase for both dried chips and fresh tubers (Dewati et al., 2023).

The porang tuber contains carbohydrates, fat, protein, minerals, vitamins, dietary fiber, and is gluten-free. Due to its comprehensive nutritional profile, porang has long been used as a food ingredient and is also a major export commodity for industrial applications (Hamdhan, 2021). Various studies indicate that the porang tuber has a complete nutritional content. Porang flour contains water, protein, fat, starch, minerals, calcium oxalate, and is particularly high in glucomannan. Research shows that the glucomannan content in white porang is higher than in yellow porang, whether extracted with water or ethanol solvents. This high glucomannan content is what gives porang significant potential as a fiber-rich food source and an industrial raw material. For instance, it can be used to make edible films environmentally friendly, consumable food packaging. In Japan, glucomannan is widely used as a healthy diet food, known for its ability to lower cholesterol, blood sugar, and high blood pressure. Furthermore, glucomannan can also be utilized as an alternative material in the production of edible films (Nurhaeni, 2021).

In Japan, konjac a plant similar to porang has long been a part of traditional cuisine and an industrial raw material. Its cultivation is carried out intensively, primarily in the Gunma region, which contributes approximately 90% of the national production. Japan has also developed superior varieties, such as Harunakuro and Akagi-Odama. The konjac tuber processing typically takes three to four years, involving special storage during the winter. Thanks to modern processing techniques, konjac can yield flour with a very high glucomannan content, reaching up to 90% (Devnakata et al., 2024).

In contrast, many porang farmers in Indonesia still use traditional methods for cultivation and processing. Limitations in knowledge regarding proper cultivation techniques, the use of modern technology, and efficient processing methods can hinder the productivity and quality of porang yields (Elsa, 2024), among other challenges.

Therefore, to improve and enhance the quality of nutritious food sources in Indonesia—inspired by Japan as an advanced, innovative nation and an expert in konjac production—this article formulates three key points: (1) the role of porang in fulfilling nutritional needs and reducing the prevalence of intellectual disability and in autism diets, (2) forms of porang-based products that are easily accepted by the community, and (3) an analysis of productivity challenges and improvement strategies. It is hoped that the discussion in this article will serve as a useful idea and reflection for Indonesia's future improvement.

2. Methods

This study employed a qualitative approach using a literature review design. The research focused on synthesizing and analyzing secondary data related to porang utilization, prenatal nutrition, intellectual disability, autism dietary management, and konjac development in Japan.

Data sources were obtained from scientific journal articles, government reports, conference proceedings, books, and credible online publications published between 2015 and 2024. The literature was selected based on relevance to three main themes: (1) the nutritional role of porang in prenatal health and autism dietary intervention, (2) forms of porang-based products accepted by communities, and (3) productivity challenges and development strategies in Indonesia compared to Japan.

The data were analyzed using descriptive-analytical techniques. Information was categorized according to thematic focus and then interpreted to identify patterns, challenges, and strategic opportunities. A comparative perspective was applied to examine differences in cultivation systems, processing technology, and value-chain management between Indonesia and Japan, particularly in relation to konjac production in Gunma Prefecture. The findings were synthesized to formulate integrated recommendations for optimizing porang utilization in Indonesia, emphasizing nutrition improvement, disability support, and sustainable agricultural development.

3. Results and Discussion

The Role of Porang in Fulfilling Nutritional Needs, Reducing Intellectual Disability, and in Autism Diets

Intellectual disability can be caused by various factors, both biological and psychosocial. Biologically, causes can be genetic or non-genetic. Non-genetic factors include elements such as maternal age during pregnancy, inadequate nutritional intake during pregnancy, and conditions during or near birth for instance, premature birth, low birth weight, or birth trauma. All these conditions can increase a child's risk of intellectual disability.

The nutritional status of the mother during pregnancy significantly influences the health of the newborn. Good nutrition can help prevent low birth weight, which in turn can reduce the risk of intellectual disability. Conversely, maternal malnutrition during pregnancy can impact the child's health in both the short and long term, leading to nervous system disorders, learning difficulties, and delayed mental development (Purwiyanti et al., 2017). Therefore, prenatal nutritional intervention is crucial. Furthermore, intellectual disability can also be caused by metabolic disorders (e.g., carbohydrate and protein metabolism issues), growth disorders, and severe malnutrition. Chronic malnutrition occurring before the age of four significantly affects brain development and can result in intellectual disability. Such conditions can be ameliorated by providing adequate nutrition before the child reaches six years of age. After this critical period, even with an abundance of nutritious food, it is exceedingly difficult to improve the resulting low intelligence. However, efforts to minimize the impact through nutritional fulfillment remain important (Sefrida, R et al., 2015).

Here, porang plays a beneficial role in fulfilling these nutritional needs. The porang tuber contains carbohydrates, fat, protein, minerals, vitamins, dietary fiber, and is gluten-free. Numerous studies have been conducted to reveal the nutritional content of porang tubers. Research by Widjanarko (2014) showed that porang flour contains 8.71% water, 4.47% ash, 3.09% starch, 3.34% protein, 2.98% fat, 22.72% calcium oxalate, and 43.98% glucomannan. Meanwhile, Aryanti and Abidin (2015) reported that white porang flour has a starch content of approximately 7.54%. Another study by Rosalina (2015) stated that the starch content in fresh porang tubers reaches 7.65%, while in flour form it increases to 10.24%. Interestingly, the glucomannan content in white porang flour is higher than in yellow porang flour. Using a water solvent, white porang flour yielded 73.70% glucomannan, and 63.20% with an ethanol solvent. Yellow porang results were slightly lower, at 72.54% with a water solvent and 64.67% with ethanol (Nurhaeni, 2021). This high glucomannan content makes porang highly potential as a food ingredient rich in fiber. Furthermore, glucomannan is widely used as a healthy diet food, known for its ability to lower cholesterol, blood sugar, and high blood pressure. Based on the aforementioned nutritional content, porang can significantly contribute to fulfilling required nutrients, especially for pregnant women during the prenatal period to support ideal fetal growth. Although its content of protein and micronutrients like iron and folic acid is relatively low, porang can be fortified or combined with local ingredients rich in protein and micronutrients (e.g., soybeans, katuk leaves) to meet the needs of pregnant women and reduce the risk of premature birth and low birth weight—key risk factors for intellectual disability (Sefrida, R et al., 2015).

Additionally, porang can be processed into complementary foods for breast milk, such as baby porridge. Research by Wardhani et al. (2015) demonstrated that adding fermented porang flour affects the quality of baby porridge by improving bulk density, water absorption capacity, viscosity, and swelling power. Longer fermentation tended to increase density and water absorption but decrease viscosity and swelling power. The best formula was obtained from a mixture of 60% porang flour fermented for 3 days and 10% red rice flour, although its nutritional content—

protein 2.24%, fat 0.67%, water 13.13%, carbohydrates 66.82%, with an energy of 536 kcal—still did not meet the nutritional standards set by the Indonesian Ministry of Health Regulation. This can be balanced with other food components as complements.

Similarly, for the diet of autistic children, which requires food that is low in gluten, free from allergens, and high in fiber; porang products can serve as an alternative gluten-free, low-calorie diet that is easily digestible, helping to reduce common gastrointestinal issues in autistic children. Integrating porang into daily meals can support glucose stability, gut health, and microbiota balance, which are believed to be positively correlated with autistic symptoms. An example of an innovative porang-based product that meets the needs of an autism diet is soft cookies, developed by (Rahmaris, L.D. et al., 2022), which replace gluten-containing wheat flour with a blend of gluten-free porang flour and mocaf (modified cassava flour).

Forms of Porang Products that are Easily Accepted and Processed by the Community
To date, in Indonesia, porang is generally only processed into dried chips rather than being developed into finished products for export. However, processed final porang products have a significantly higher market value. Porang itself is widely used as a raw material for flour, water purifiers, cosmetics, glue, and jelly, and in recent years has been routinely exported to Japan (Dewati et al., 2023)

Noodle and analog rice-based products are more readily accepted by the community because their form resembles daily staple foods and they are practical to cook. Meanwhile, innovative products like snacks and boba drinks have their own appeal, especially among younger demographics, which can diversify offerings and increase consumer interest (Rabbani & Junita, 2023). For children with autism, easily digestible, low-allergen foods, such as shirataki noodles, can be suitable options aligned with the specific diets often recommended by clinical nutritionists. Furthermore, recipe education and community-based support programs are essential to help families prepare porang into healthy meals for daily consumption.

Fortunately, in Indonesia, there are now many local innovators developing and processing porang into various food products. These include complementary foods for breastfed infants (MP-ASI) (Wardhani et al., 2015), analog rice, glucomannan flour, porang noodles (Dewati et al., 2023), meatballs, jelly, noodles, dawet (a traditional beverage), porang nuggets developed by the Abmas ITS team (Itsojt, 2021), and gluten-free soft cookies that can serve as an alternative for autistic individuals (Rahmaris & Ratnaningsih, n.d.), among others. This demonstrates a significant potential for improving national nutritional status and the economy.

Analysis of Productivity Challenges and Improvement Strategies
According to Hidayat et al. (2022), porang has many supporting factors for its development. The plant can grow in shaded conditions, is easily cultivated without intensive care, and can be processed into various products such as rice analogues, flour, and shirataki noodles which offer superior health benefits compared to non-porang ingredients. Many regions in Indonesia are also suitable for its cultivation, both in community-owned and state forests.

However, several challenges remain. Porang has a long initial growth period, harvesting and marketing costs are relatively high, public knowledge and product promotion are still limited, the variety of derivative products on the market is low, and its price tends to be higher than similar products. From an external perspective, market opportunities for porang are substantial due to high export demand, widely available land, and increasing government support for the porang business. Nevertheless, challenges include a limited number of farmers, insufficient market transparency, fluctuating prices at the farmer level, and suboptimal socialization and assistance programs.

As noted by Aldillah R. et al. (2023), several strategies can be implemented to develop the porang commodity based on internal and external factors. First, increase productivity by optimizing seeds and fertilizers to maintain competitive pricing. Second, maximize the use of marginal lands as well as community and state forests, since porang can be cultivated easily without intensive management. Third, expand marketing through social media and public outreach, given the growing domestic and international demand. Fourth, strengthen education and promotion of porang-based products to enhance public awareness. Fifth, address the slow initial growth phase through improved fertilization and pest control. Finally, establish partnerships, cooperatives, and financial support from both government and private sectors to strengthen the porang value chain. This could include organizing learning

exchanges to Gunma, Japan, for training in cultivation, processing, superior varieties, storage cellar techniques, and quality control with the expectation that this knowledge can be adopted by local farmers and other relevant stakeholders.

4. Conclusion

The porang tuber is a strategic commodity that can improve the nutritional status of pregnant women and meet the specific dietary needs of autistic children, thereby contributing to the reduction of intellectual disability and autism spectrum disorder prevalence in Indonesia. Various processed porang products have gained public acceptance and can be further adapted to support health and the adoption of nutritious foods. Although productivity and quality challenges persist, strategies integrating technology transfer, social education, digitalization, and supportive policies can optimize porang's potential for sustainable food security and health. It is hoped that in the future, increased innovation and development regarding porang productivity in Indonesia will be driven by academics, the government, and community elements, all of whom play crucial roles in this endeavor. Consequently, Indonesia can achieve equitable prosperity in terms of food security, nutrition, and economy through the optimization of locally-sourced, accessible resources available to all societal levels, including the lower-middle class.

References

Aldillah, R., & Bakti, I. G. M. Y. (2023, Desember). Strategi pengembangan komoditas porang di Indonesia dari perspektif produsen dan konsumen. Dalam Forum Penelitian Agro Ekonomi (Vol. 41, No. 1, pp. 65-78).

D.P, T. T. (2023). Pengembangan media audio visual dalam pembelajaran keterampilan motorik kasar pada anak tunagrahita ringan [Skripsi/Tesis tidak dipublikasikan].

Devnakata, Devnakata, & Devnakata. (2024, 20 Desember). From the cultivation of the fantastic "Harunakuro" variety to popular processed products. NIHONMONO - Discovering Japan Through Authentic Craftsmanship. https://nihonmono.jp/en/article/31136/

Elsa, R. (2024, 25 Juni). Peluang usaha komoditas porang dan tantangannya! Asterra.id. https://www.asterra.id/artikel/peluang-usaha-komoditas-porang-dan-tantangannya-menggali-potensi-keuntungan/

Hamdhan, R. A. (2021). Dampak usahatani komoditas porang terhadap kesejahteraan masyarakat di Desa Klangon, Kecamatan Saradan, Kabupaten Madiun. Agricore: Jurnal Agribisnis dan Sosial Ekonomi Pertanian Unpad, 5(2). https://doi.org/10.24198/agricore.v5i2.30614

Itsojt. (2021, 30 November). ITS bantu kembangkan produk olahan porang di Nganjuk - ITS News. ITS News. https://www.its.ac.id/news/2021/11/27/its-bantu-kembangkan-produk-olahan-porang-di-nganjuk/

Nastiti, A. N., & Christyaningsih, J. (2019). Pengaruh substitusi tepung ikan lele terhadap pembuatan cookies bebas gluten dan kasein sebagai alternatif jajanan anak autism spectrum disorder. Media Gizi Indonesia, 14(1), 35–43. https://doi.org/10.20473/mgi.v14i1.35-43

Nurhaeni. (2021). Pengaruh glukomannan porang (Amorphophallus oncophyllus Prain) dan minyak kanola pada sifat fisik mekanik edible film komposit dan aplikasinya pada buah apel (Malus sylvestris Mill) terolah minimal [Skripsi/Tesis tidak dipublikasikan].

Purwiyanti, R. E., Soemanto, R., & Dewi, Y. L. R. (2017). Factors affecting the occurrence of mental disability in Ponorogo District, East Java. Journal of Maternal and Child Health, 2(3), 257–269. https://doi.org/10.26911/thejmch.2017.02.03.07

Rabbani, N. F., & Junita, N. (2023, 28 Juli). Umbi porang, tanaman berpotensi ekonomi tinggi. Bisnis.com. https://ekonomi.bisnis.com/read/20230728/99/1679333/umbi-porang-tanaman-berpotensi-ekonomi-tinggi

Rahmaris, L. D., & Ratnaningsih, N. (2022). Inovasi produk soft cookies bebas gluten dari tepung mocaf dan tepung porang sebagai alternatif cookies untuk penderita autis. Prosiding Pendidikan Teknik Boga Busana, 17(1).

Sefrida, R., Reliani, S. K., & Mukarromah, N. (2015). Pengaruh metode pembelajaran dengan bermain kartu remi terhadap peningkatan kemampuan berhitung pada tunagrahita ringan di SDLB/C AKW Kumara II Surabaya [Doctoral dissertation, Universitas Muhammadiyah Surabaya].

Wamentan rayu Jepang transfer teknologi pertanian ke Indonesia. (n.d.). Indonesiainfo.id. https://www.indonesiainfo.id/artikel/64581/wamentan-rayu-jepang-transfer-teknologi-pertanian-ke-indonesia/

Wardhani, D. H., Irfandy, F., Winda, D., & Meiliana, T. (2015). Karakteristik fisik makanan pendamping ASI terfortifikasi prebiotik dari tepung umbi porang (Amorphophallus oncophyllus) terfermentasi. METANA, 11(1).

Zendrato, D. P., Tafsin, M., Hanafi, N. D., Sadeli, A., & Julianti, E. (2024). Potensi umbi porang (Amorphophallus oncophyllus Prain) sebagai pakan ayam broiler. Jurnal Ilmiah Universitas Batanghari Jambi, 24(1), 24–30. https://doi.org/10.33087/jiubj.v24i1.4703