

TILAPIA: THE NEXT INDONESIAN SEAFOOD RISING STAR

By Achmad Poernomo

Indonesia, the second-largest global producer of tilapia with an annual output of 1.4 million tonnes, aims to increase production to two million tonnes by 2029 and capture 15% of the global market. The country's tilapia industry has evolved through the adoption of superior strains and advanced aquaculture technologies, supporting both domestic consumption and export growth. However, challenges persist, including disease outbreaks, environmental sustainability, feed supply and global competition; as well as limited access to advanced technology and financing for small-scale farmers. To address these, Indonesia is prioritising infrastructure upgrades, sustainable practices, and targeted government programs, such as revitalising aquaculture areas and enhancing export capabilities.



Credit: Achmad Poernomo

Mujahir fish at a wet market in Jakarta

Tilapia, a popular and versatile group of cichlid fish, is expected to see increased production in the coming years. Known for its ability to thrive in a wide range of environments, rapid growth in both indoor and outdoor systems, resistance to disease, and ability to adapt to various protein sources in feed, tilapia has become the world's most widely farmed fish species. Among the various tilapia types, Nile tilapia (*Oreochromis niloticus*), especially stands out as the dominant variety. Its firm, tasty meat has earned it a broad consumer base worldwide.

Indonesia is currently the second-largest producer of tilapia globally, with an annual production of 1.4 million tonnes. China leads the world with 1.7 million tonnes, but experts believe Indonesia's production capacity is set to surpass that of China in the near future. In addition to its domestic production, Indonesia ranks fourth in the global tilapia export market, with a value of USD 82 million in 2023. Between 2017 and 2023, tilapia exports from Indonesia grew at an average rate of 7% annually, according to the Ministry of Marine Affairs and Fisheries (MMAF).

The Indonesian government has set an ambitious target to increase tilapia production to two million tonnes by 2029, aiming to meet both growing domestic demand and expanding export needs. As part of its food security plan, the government is working to boost fish consumption to over 62.5 kg per person by next year, and tilapia is expected to play a key role due to its affordability, availability, and ease of preparation. In terms of exports, Indonesia aims to capture 15% of the global tilapia market, which is projected to grow to approximately USD 13.05 million by 2030, reflecting an increase of about USD 2.7 million from its 2023 value, as reported by Research and Markets.

This article explores the history, national programs, targets, opportunities, and challenges within Indonesia's tilapia farming industry and examines how the country can position itself as a global leader in tilapia production and export.

Development of tilapia farming in Indonesia

Known locally as *nila*, tilapia has long been familiar to Indonesians, particularly on Java Island. The name 'nila' comes from the Nile River, where the species originated. The history of tilapia farming in Indonesia dates back to 1936 when a man named Mujahir first discovered the fish in a brackish water habitat at Serang Beach, Blitar, East Java. After a series of successful breeding experiments, Mujahir was able to cultivate tilapia in freshwater. He then distributed the fish seeds to local villagers, which led to its spread throughout Java. The fish became known as Mujahir, later identified as *O. mossambicus* (Figure 1), though the exact way this African species arrived in Indonesia remains unclear. In recognition of Mujahir's contribution, both the Dutch colonial administration and the Indonesian government officially adopted the name Mujahir for the fish.

Figure 1. Fixed specimen of *Oreochromis mossambicus* (Hb.Om.III.2019) found in Kangean Island (Indonesia) in the Java Sea



Source: Hasan V, Pratama FS, Malonga WAM, Cahyanurani AB (2019) First record of the Mozambique tilapia, *Oreochromis mossambicus* Peters, 1852 (Perciformes, Cichlidae), on Kangean Island, Indonesia. *Neotropical Biology and Conservation* 14(2): 207-211. <https://doi.org/10.3897/neotropical.14.e35601>

The modern era of tilapia farming in Indonesia began in 1969 with the introduction of Nile tilapia (*O. niloticus*) from Taiwan by the Bogor Freshwater Fisheries Research Centre. Within one year, the fish was distributed to various provinces to boost production and diversify Indonesia's aquaculture species. Over the next few decades, improved strains were introduced to enhance farming efficiency. In the 1970s and 1980s, two superior strains *Citrilada* and Red NIFI (National Inland Fish Institute) were brought in from Thailand. Then, between 1989 and 2000,

GIFT (Genetically Improved Farmed Tilapia) and GET (Genetically Enhanced Tilapia) strains from the Philippines were added to the mix. More than 12 strains have been released by the Ministry of Marine Affairs and Fisheries (formerly the Ministry of Agriculture), some of which are shown in Table 1.

Table 1. Tilapia strains released by MMAF during 2004-2023

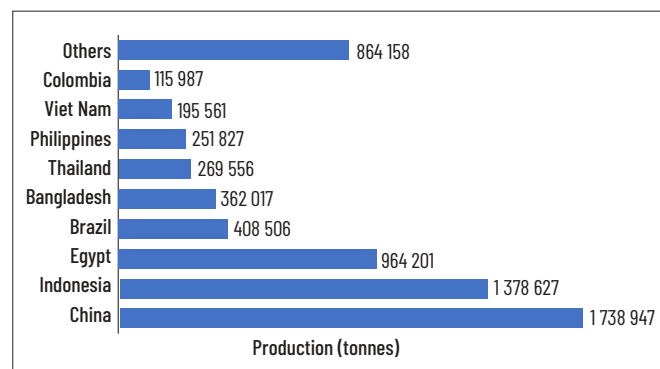
No.	Name of strains	Year of release
1	Nila Nirwana I, II, III and IV	2006, 2012, 2016, 2023
2	Nila Salina	2014
3	Nila Sultana	2012
4	Nila Srikandi	2012
5	Nila Anjani	2012
6	Nila Pandu (male) and Janti/Kunti (female)	2012
7	Nila Nilasa	2012
8	Nila BEST	2009
9	Nila Larasati	2009
10	Nila Jatimbulan	2008
11	Nila Gesit	2004
12	Nila JICA	2004

Current status of Indonesian tilapia production, processing, and marketing

Production

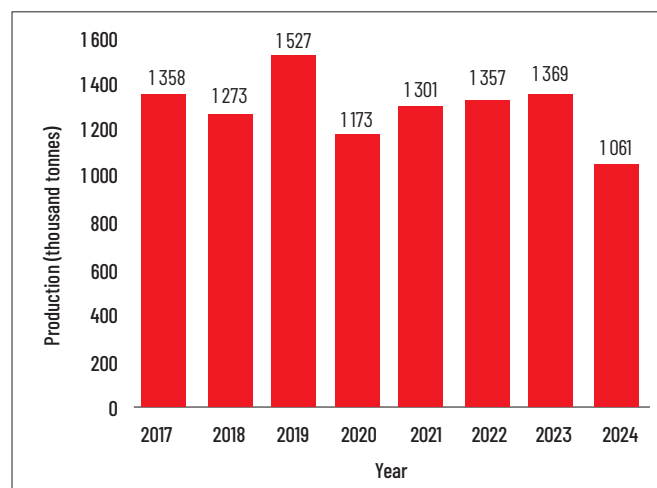
As a result of the introduction of new strains and the adoption of advanced farming technologies, including intensive and super-intensive farming systems, the tilapia aquaculture industry in Indonesia experienced rapid growth. This led to a steady increase in production, which reached nearly 1.4 million tonnes in 2023 (compared to 225 tonnes in 1975), making Indonesia the second largest tilapia producer in the world (Figure 2). Tilapia production for 2017-2023 is shown in Figure 3, while Figure 4 shows the top 10 provinces, which account for nearly 80% of total production.

Figure 2. World's leading tilapia producers (2022)



Source: FAO (2024)

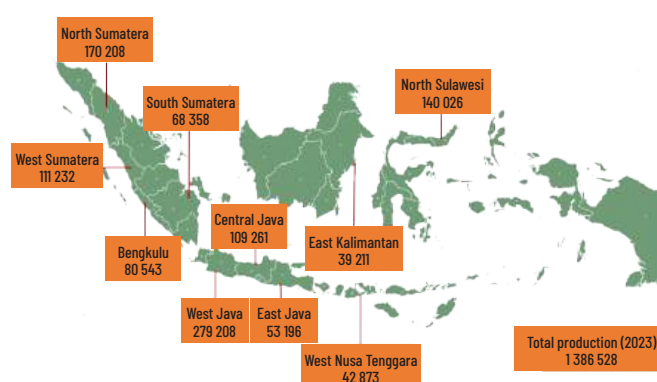
Figure 3. Tilapia production in Indonesia, 2017-2024



Note: 2024 up to the third quarter

Source: MMAF

Figure 4. Top ten tilapia producers, by province (tonnes)



Source: MMAF

Java and Sumatra dominate tilapia farming, especially in freshwater ponds and reservoirs, including lakes and man-made dams. Java, as the most populous island, has a high demand for tilapia and offers extensive infrastructure for fish farming. West Java ranks first in production, while North Sumatra ranks first in exports. The latter comes from tilapia farming in Lake Toba, where two major farming companies operate in an integrated system with processing plants, hatcheries, feed mills and feed factories. Lake Toba accounts for more than 90% of total exports.

Of the 1 145 km² of Lake Toba, approximately 0.4 percent of the area is used for tilapia farming. In addition to two large farms, there are currently about 8 000 tilapia fish farmers in seven districts around Lake Toba. Tilapia farming in the waters of Lake Toba has had a positive impact on improving the economy of the communities around the Lake, especially the fish farmers. Local farmers are able to harvest an average of 10-20 tonnes of tilapia every 6-8 months from the 50 000 seeds they stock.

While traditional pond culture remains common, more advanced modern practices are gaining traction, including intensive pond culture, recirculating aquaculture systems (RAS), floating cages, and integrated multi-trophic aquaculture (IMTA). These modern practices are mostly

used by large-scale farms that require higher capital investment and technologies that are more efficient and produce higher yields. Floating cages are mostly used for production in lakes and man-made dams.

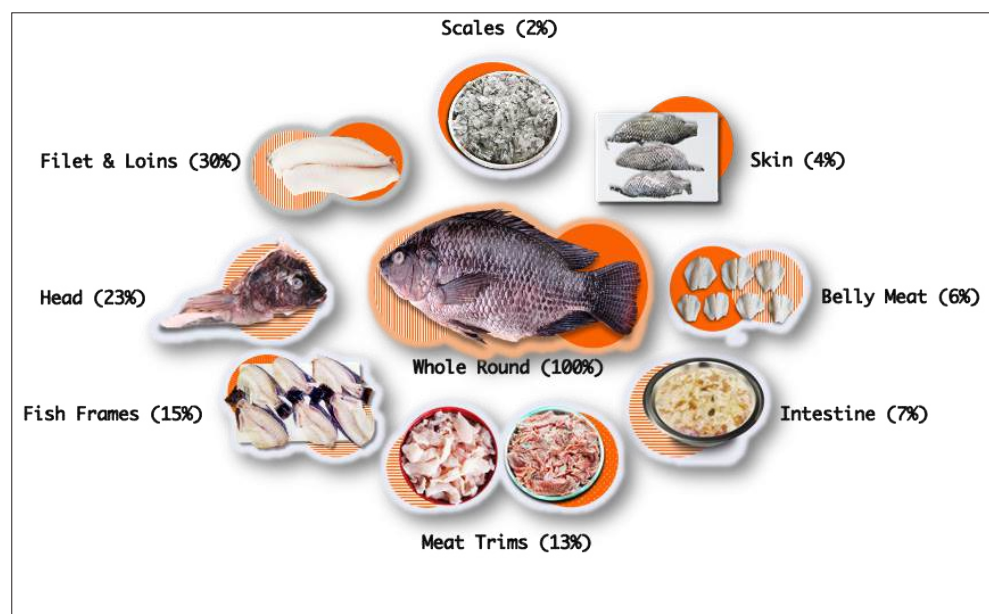
Processing

The processing of fillets generates a large amount of waste, which can be as high as 70%. This includes frames, belly, skin, head, trimmings and others in varying proportions (Figure 5). A zero-waste approach is common in modern processing plants in Indonesia, where these wastes are sold to users or converted into valuable products such as fishmeal and oil, fish jelly products, gelatine, collagen, mineral preparations and others, which have applications in the food, feed, pharmaceutical and cosmetic industries. The use of these wastes also benefits small businesses in the vicinity of the fillet processing plants that convert the edible wastes into food products. In addition, an integrated tilapia industry like the one in Lake Toba can create up to 4 000 jobs, while a smaller plant processing 15 tonnes of fillets per day is reported to create 50 direct and 150 indirect jobs.

Marketing

Tilapia is marketed both domestically and internationally, either fresh or processed. For domestic consumption, tilapia is mostly sold fresh or live through traditional and modern markets. Government campaigns promoting the nutritional value and benefits of eating tilapia have also attracted consumers. These campaigns highlight tilapia as contributing 95 calories per 100 grams and containing the following nutrients: 20 grams of protein, two grams of fat, 25 milligrams of magnesium, 170 milligrams of phosphorus, 300 milligrams of potassium, 40 micrograms of selenium, and 25 micrograms of folate. In addition, tilapia also contains omega-3 and omega-6 fatty acids, iron, zinc, choline, manganese, vitamin B12, vitamin D, and vitamin K.

Figure 5. Proportion of tilapia body parts



Source: DG Product Competitiveness MMAF and PT STP

Besides for household consumption, fresh or live tilapia has a large market in the thousands of roadside food stalls (*warungs*) or restaurants around the country that offer various preparations of tilapia gourmet dishes. In fact, tilapia is the most popular fish for diners eating out due to its taste and relatively cheap price. Figure 6 shows a fried tilapia dish, which costs USD 1-1.5 at a *warung* or by online order.

Figure 6. A popular fried tilapia dish priced at USD1-1.5, available at *warungs* (top) and by online order (bottom)



Credit: Achmad Poernomo



Credit: <https://sibakuljogja.jogjapro.gov.id/detail/produk-detail/12506>

Combined with the MMAF's push to increase fish consumption and a recent program launched by President Prabowo to provide free nutritious and healthy meals to students and expectant mothers across Indonesia, tilapia will soon see increased demand in Indonesia due to its nutritional value, abundance and low price.

With regard to global markets, Indonesian tilapia exports comprise 60% frozen fillets, 22% frozen whole, 14% chilled fillets, and 4% chilled whole. The tilapia is mainly exported to the United States (60%), Canada (21%) and the European Union (8%). Indonesia shares about 9.8% of the global export market, and ranks fourth after China (33%), Colombia (11%) and Honduras (10%).

Renewed focus on expansion

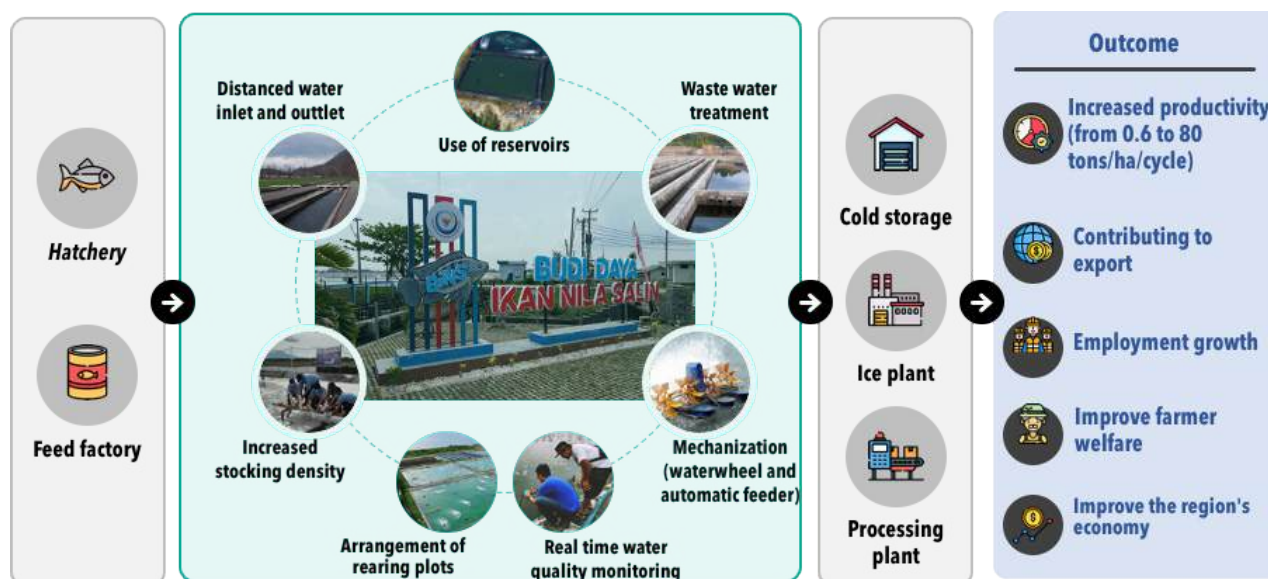
As one of the five leading commodities promoted by the MMAF, tilapia receives special attention both in terms of programs and funding. The programs that have been prepared for tilapia in the next five years are:

- development of superior strains;
- technology innovation;
- revitalisation of idle ponds and farming models;
- development of markets and marketing chains; and
- negotiation on import tariffs and export barriers in destination countries.

Superior strains are needed, as there have been reports that the available strains grow fast in the first 3–4 months and then slow down and thus take a longer time to reach 1 kg or more. For local consumption, this will be sufficient, while for export destinations, the size needed is more than 1.2 kg in order to produce a higher proportion of fillet. The breeding research units of MMAF, with the support of universities, are currently on their way to producing the targeted strains. Simultaneously, tilapia farming companies are speeding up their research to achieve the same goal.

The second program focuses on modernising traditional pond farming practices. The development units of MMAF will act as a liaison with the traditional farmers to help disseminate the technology. This will ultimately help the farmers to improve production in terms of quantity, quality and safety aspects, as well as preserve the environment and thus sustain the business. Programs number 4 and 5 are designed to assist the farmers in marketing the fish at the local and global level.

Figure 8. Modelling of Nila Salin farming (~80Ha), Karawang, West Java



Credit: DG Aquaculture, MMAF

The third program on revitalisation of idle ponds and farming models has attracted a great deal of attention due to the substantial initiatives by the MMAF. The Ministry's plans to revitalise idle shrimp ponds along the north coast of Java (Figure 7) will take five years to implement with a budget of Rp 78 trillion (equivalent to about USD 5.2 billion). In the first phase, about 13 000 hectares of ponds will be revitalised out of a total of 78 000 hectares along the coast. An 80-hectare pond at the Business Service Center for Aquaculture Production (BLUPPB) in Karawang, West Java, serves as a model. This pilot pond has been inactive for a long time and was previously used for shrimp farming. The project uses the Nila Salin strain, a saltwater tilapia that has a relatively fast growth rate, is disease-resistant, easier to farm and produces minimal waste.

Figure 7. Unproductive ponds on the north coast of Java (78 550 ha) for Nila Salin farming



Credit: DG Aquaculture, MMAF

In addition to the production ponds in the pilot project, other facilities have been set up such as wastewater treatment plants, separated canals for water intake and outfall, reservoirs, laboratories, ice plants and processing plants. The farm also uses the latest technology, such as the use of automatic feeders and real-time water quality monitoring (Figure 8). The estimated productivity of the Karawang Nila Salin Aquaculture Model is approximately 80 tonnes per cycle, with fish weighing one kilogram each at harvest after 8–9 months rearing.

With the right investments in training, infrastructure, and sustainable farming practices, Nila Salin farming in Karawang is therefore poised to significantly increase Indonesia's tilapia production, supporting both domestic consumption and export growth. Furthermore, it could serve as a model for other regions across Indonesia and beyond, paving the way for more resilient, sustainable, and profitable tilapia farming worldwide.

Strategic issues that need to be addressed

While the future of Indonesian tilapia farming is promising and could generate economic growth, there are strategic issues that must be addressed to fully realise its potential.

Disease management is a significant concern, as tilapia farms are vulnerable to outbreaks caused by vectors such as Tilapia Lake Virus (TiLV), which have impacted farms globally. Effective disease control, including strict biosecurity measures, disease surveillance, and vaccination programs, are essential to maintain healthy fish stocks.

The environmental impact of intensive farming, including water pollution, habitat loss, and ecosystem degradation, is another challenge. Climate change and unsustainable farming practices could exacerbate these issues by affecting water quality and the availability of fish feed. To mitigate this, sustainable practices such as improved waste management and recirculating aquaculture systems (RAS) are necessary.

Fish feed supply is another critical factor. The industry relies heavily on fishmeal and other ingredients; meanwhile, fluctuating prices and sustainability concerns are prompting interest in alternative feed sources like plant proteins, algae, and insect meal, to reduce dependency on traditional feed ingredients.

Global competition poses a challenge for Indonesian farmers. Countries like China, Vietnam, and Egypt, with their economies of scale and advanced production methods, create stiff competition. These countries can produce tilapia at a lower cost, making it difficult for Indonesian farmers to compete on price in international markets.

Quality control and standards are also issues. Many Indonesian farms are small-scale and lack access to advanced technology, leading to inconsistent fish quality and safety. Without adherence to international certifications like Global GAP and ASC, Indonesian tilapia struggles to access higher-value markets in the European Union and North America. Meeting global food safety and quality standards is crucial for market access.

Access to capital and financing is a major barrier for small and medium-sized tilapia farms. These farms often lack affordable financing for expansion, the adoption of new technology, or improving infrastructure. Without investment in innovative technologies such as RAS, automated feeding systems, and water treatment solutions, many farmers will struggle to compete with larger, more established producers.

Diffusing technology and building capacity continue to be challenging and need to be adequately addressed. These include limited resources, low

awareness of advanced practices, poor infrastructure, and resistance to change. Inadequate training, weak extension services, minimal private sector involvement, and unclear policies also slow progress.

Lastly, regulatory and policy challenges pose additional obstacles. Inconsistent local and national regulations create complexity for farmers, while the slow pace of bureaucracy hinders reforms. Government support exists, but targeted interventions like subsidies for sustainable practices and investment incentives are necessary. To meet the growing global demand, particularly from Western markets with a focus on sustainability, Indonesia must improve environmental policies, a process which could involve significant costs.

Addressing these challenges is essential for Indonesia to realise the full potential of its tilapia farming sector and become more competitive in the global market.

Conclusion

With a long history of tilapia farming, Indonesia possesses significant social capital to advance its tilapia industry. Furthermore, by implementing well-directed policies and strong leadership, the country has the potential to become the world's leading tilapia producer. However, several challenges could hinder this progress. Overcoming these obstacles will require coordinated efforts from both the Government and private sector. Key strategies include improving disease control, upgrading infrastructure, promoting sustainable farming practices, and investing in technology and human capital.

Additionally, implementing effective marketing strategies – such as branding Indonesian tilapia as a premium product, expanding export markets, and leveraging digital platforms for global outreach – will be essential to increase market penetration. Addressing these issues will enhance the competitiveness of Indonesian tilapia while ensuring the industry's resilience and sustainability amid rising global demand. 🌐



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