PENANG GREEN AGENDA 2030

Title: Agriculture

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EXECUTIVE SUMMARY

Although agriculture contributes only around 2% to Penang's GDP, it is nevertheless an important sector for delivering food security in Penang. Currently, Penang's agricultural land accounts for around 40% of the landmass although it has been declining steadily and is expected to continue to decline going forward.[1] The agriculture sector consists of three subsectors: crop farming, livestock farming and fishery. Together, they provide a rich local selection of produce and contribute to Penang's reputation as a 'food haven'. There is currently no reliable data on the breakdown of locally-produced and imported food, although there is an assumption that Penang will increasingly rely on imported food due to the continuous reduction of agricultural land.

The main food crop grown in Penang is rice with most of the paddy fields located on the Mainland. In 2016, Penang was in the top three states that recorded the highest rice production per annum in Malaysia although it increasingly depends on rice import from countries like Thailand and Vietnam. Penang also imports most of the vegetables and fruits consumed locally. Penang produces more than enough poultry and pigs for its own consumption but not enough ruminant (cow and goat) products, which are more land-intensive. In terms of fishery, Penang is one of the main contributors of marine aquaculture products in Malaysia, a large part of which are for the export market. Conversely, marine catches and seafood harvest (including cockles) have seen signs of decline.

Penang's agriculture sector faces numerous challenges. First and foremost, the understanding of the concept of food security is very limited in scope – currently only focussing on the self-sufficiency level (SSL) of main agricultural products, rather than keeping track of food safety, affordability and accessibility, and nutritional intake. As a result, a comprehensive plan to tackle the different aspects of food security, and the role of agriculture in achieving the goals, has not been put in place. Continuous loss of agricultural land presents another big challenge to the sector. As Penang continues to urbanise and the value of land rises, it is very tempting for farmers to convert agriculture land, both legally and illegally. The continuous loss of agricultural land coupled with the threats brought by climate change will put the sector under enormous pressure in the future.

The agriculture sector is expected to be negatively affected by climate change in various ways: rising sea-level (flooding or increased water salinity in coastal fields), heat wave and drought, as well as increased pest attack and new diseases. Although work has started to produce resilient seeds for rice, steps have not been taken to build resilience across the whole sector. Even without the threat of climate change, water security is already a major concern for the sector at the moment as the source of irrigation water comes from outside Penang (Sungai Muda in Kedah). Fishery also faces serious threats such as marine pollution, climate change, habitat destruction and the loss of fishing grounds that mainly results from the various reclamation projects past and present. A lack of reliable data on marine resources means it is difficult for Penang to get a complete picture of how sustainably fish and seafood (including aquaculture) are being harvested and how to manage this going forward.

[1] PLANMalaysia@ Pulau Pinang

Also, agriculture is also not seen as an attractive sector for young people to get into mainly due to low profitability, prevalence of conventional farming methods and the lack of a 'technology edge'. An absence of new and young blood makes it harder for Penang to transition to the use of information technology (IT) in the agriculture sector (or Agriculture 4.0). On the other hand, the agriculture sector also contributes to environmental problems in Penang such as soil and water pollution although very little data has so far been collected.

The Agriculture Working Group proposes the following six recommendations to strengthen the agriculture sector and increase food security in Penang:

1. Masterplan for Urban Farming (2020)

As agriculture land continues to dwindle in Penang, it is important that Penang starts to take urban agriculture and farming seriously. The Masterplan for Urban Farming should set out the short, medium- and long-term objectives of urban agriculture in Penang, and identify the types of farming and incentives that can be deployed. More importantly, urban agriculture needs to be **incorporated into local plans,** so that this type of land use or buildings can be taken up in the future. It needs to identify existing by-laws and guidelines that might affect the adoption of urban farming. The Masterplan should also look into how to promote urban farming not only for self-sufficiency but also as an alternative income stream for communities. This involves establishing a digital platform for marketing and sales of agriculture produce, which will help promote campaigns like Usahawan Tani Pelapis and Jom Tanam Sayur Sendiri in the urban context to supply and promote healthy and safe consumption of food. The Masterplan should also set out the vision of how Penang can promote commercial urban farming in the form of "vegetable factories" and so on.

2. "Buy Penang" Campaign and Agrotourism (2020)

To promote agriculture in Penang, we need to develop a supportive local market for local produce. The "Buy Penang" campaign will focus on promoting the consumption of both fresh produce and processed local food by creating a unique selling point. Local produce should be promoted by the state government because they provide unique tastes, are of higher quality, are generally safer to consume and more environmentally friendly compared to imported produce. In addition, this is a scheme where Penangites can show their solidarity and support for local farmers who have contributed to food security in Penang. To make this happen, the State Government needs to set out a strategy that addresses the whole **value chain of the agriculture sector**, from farm to plate. Once it is established, stakeholders can decide how to enhance the different parts of the value chain and determine the types of incentives as needed.

The "Buy Penang" brand needs to be safeguarded through **strict standards, monitoring and traceability**. It can also be paired up with MyBestBuy, launched by FAMA, whereby FAMA is allowed to undertake the grading, packaging and labelling of agricultural products. The process can be improved through the use of technology (barcode, blockchain etc.) and setting up of a robust supply chain for local produce. Farms participating in a "Buy Penang" scheme would need to adhere to a set of standards (such as MyGap) and to comply with all rules and regulations. To further promote the "Buy Penang" campaign, the State

Government can help set up a marketing and sales platform (like “Grab” for agriculture) through which farmers can directly sell their produce. The “Buy Penang” scheme can also be promoted to tourists who are looking to experience local produce. This can be tied to agrotourism to create multiple benefits. The campaign should also highlight its impact in reducing the ecological footprint. Campaign and exhibition hubs are recommended in order to create the momentum and provide the information needed by the public.

3. Penang State Fishery Action Plan and Mandatory Fishery Impact Assessment (2023)

As an island state, the fishery sector contributes enormously to food security in Penang. To further protect the fishery sector in Penang, the State Government should produce a Penang State Fishery Action Plan that is aligned with the Federal laws / guidelines. The Action Plan can complement Federal policy by identifying and prioritising local issues and challenges, and providing locality-specific solutions. For example, the Action Plan should contain a detailed mapping of current and future fishing and fishermen livelihood ‘hotspots’ and establish safeguards to protect them. It should also set up a robust process to collect data and monitor fish and seafood resources and catches in Penang. Future fish landing forecasting needs to be carried out and should account for the impact of dietary changes, climate change, land use changes and habitat destruction. The Action Plan can also contain specific measures to improve the market access of fishermen, including setting up centralised wholesale and retail markets, or an online platform where fishermen can sell their produce directly. The promotion of Penang’s seafood and fish can also be included in the “Buy Penang” campaign. The Action Plan can also promote programmes to encourage best practices and raise public awareness about sustainable fishing, including the types of fish that are under threat and need to be avoided. It can also facilitate women’s participation in Small Scale Fisheries (SSF). The Action Plan should also mandate Fishery Impact Assessment for coastal and sea development projects.

4. Water Security Plan (2023)

One of the biggest challenges of Penang’s agriculture is that it relies on a major water source not owned by Penang, namely Sungai Muda. This means it has no control over upstream management of water sources (rivers, catchment areas etc). Although Penang does have a working irrigation system that meets most of the current demand, it may not be sufficient in times of stress or in the face of climate change. Penang has demonstrated in the past that it will prioritise drinking water over agricultural needs in the event of a water shortage. To further tighten up water management for agriculture, there is a need for a Water Security Plan in Penang (akin to what PBAPP is doing for drinking water). Among other things, the Plan can identify priority areas and technologies for water security, as well as introducing and implementing water efficiency measures. Penang can enhance its collaboration with MARDI to roll out water-saving production techniques (including water recycling) and introduce crop species that require less water. The Plan can include medium- and long-term water infrastructure upgrades to reduce water wastage and increase irrigated land. Furthermore, it can also integrate components of the National Water Balance Management System (NAWABS) that contain supply augmentation measures and demand management options (e.g. real time data, climate forecast and basin-wide management), which is utilized as a tool for dam management.

5. Comprehensive Regulatory Framework and Support Scheme for Aquaculture (2024)

Penang's aquaculture sector is an important and growing sector and accounts for more than 10% of national aquaculture production. Currently, aquaculture focuses on high value export-oriented fish and seafood species, and is mainly dominated by marine aquaculture. With the dwindling wild fish stocks and catches, aquaculture can potentially play an important role in providing food security for the people of Penang in the future. However, while Penang wants aquaculture to reach its full potential, it also needs to make sure that aquaculture is carried out in a safe and sustainable manner.

A comprehensive regulatory framework targeting the aquaculture sector in Penang should be adopted to further develop the sector. The regulatory framework should identify the suitable zones for aquaculture activities (taking into account social, environmental and ecological impact on land and marine resources), and mandate the adoption of **Best Aquaculture Practices Guidelines / Standards** (for example MyGap) coupled with routine inspections. The high standards currently imposed on exported produce should also be extended to locally consumed fish / seafood.

The State Government should introduce an **aquaculture support scheme** to help further expand the role of aquaculture in providing food security to local people as well as providing an income stream to local fishermen. The Working Group proposes that the State Government should help establish a favourable environment (such as gazetting an Aquaculture Industry Zone and setting up a cluster system in the Zone providing appropriate facilities) not only for commercial investors, but also community-based operations. Specifically, aquaculture can learn from the existing support schemes for paddy farmers (e.g. establishment of cooperatives, technical and financial help etc) and create a viable livelihood for the fishing communities. Other incentive schemes may include a start-up fund, risk-sharing instruments and R&D support to help community-based aquaculture and domestic consumption-oriented production.

6. Gazette Agricultural Land and Effective Enforcement and Punishment (2025)

The most serious threat facing Penang's agriculture sector is the **steady loss of agricultural land**. Due to pressure from development and the increase in land value, more agricultural land is expected to be converted into non-agriculture land in future. Therefore, the Working Group feels that it is imperative that the State and Local Governments introduce strict protection of agriculture land. The Working Group recommends that the Government **gazette existing agriculture land** to prevent its further decrease. For pending land gazettement, the Government should change the "first grade" status of agriculture land to minimise land conversion. The protection of agricultural land is the first step towards achieving food security in Penang. Apart from gazetting agriculture land, the Government should also **increase the punishment for illegal conversion of agriculture land** and strengthen enforcement and monitoring. For example, much higher fines and prison sentences should be imposed in serious cases. The Government should also strengthen enforcement of land rehabilitation following illegal conversion of land. In addition to gazetting land, adequate infrastructures need to be maintained and provided to support agriculture activities.

1. Background

1.1 Penang Green Agenda 2030 and Agriculture

Agriculture is one of the ten key focus areas that can be used as a tool for Penang to achieve its sustainable development goals by 2030. In 2017, agriculture in Penang contributed to 2.0% of Penang's GDP after manufacturing, services and construction sectors, and registered the highest growth rate at 2.2%, compared to 2016.[2] Even though the agriculture sector is not a main economic sector in Penang, it is nevertheless important in terms of providing food security and a main source of income for rural residents.

The agriculture sector in Penang consists of four main activities: crop farming, livestock farming, fishing and aquaculture. Penang's aquaculture is expanding rapidly and its paddy yield is also the second highest in the country. In terms of livestock farming, chicken and pig farming in Penang contributed to nearly 85% of the overall industry.[3] Over the next decade, land allocated to agriculture in Penang is expected to be reduced but the State Government intends to maintain agriculture output, which means the focus will be on further increasing productivity and yield.

The agriculture sector in Penang faces several challenges. They include: its ability to improve food security and boost income for farmers, high production cost and labour shortage, unsustainable farming practices causing negative impacts on the environment, and more. In addition to these challenges, the agriculture sector will also be adversely affected by climate change, which includes sea-level rise and more extreme weather events.

The Agriculture Working Group aims to identify the major challenges and mechanisms to improve food security in Penang. To begin with, the group will define what food security means for Penang and identify its main components. Among the issues it looks at are the potential of aquaculture, welfare of the farming community and how to attract new entrants, urban agriculture, and the use of technology to improve food security. The working group also looks at the environmental impact of agriculture as well as the impact of climate change.

1.2 Current Situation

1.2.1 Crop Farming

Agriculture in Penang is strongly dependent on paddy, a plant essential to food security. However, land allocated for paddy planting has shown a steady decrease due to land being converted for development purposes, either legally or illegally. The lack of law and enforcement towards the conversion is one contributing factor. Another is that in Penang, paddy field is a first-grade land which can be converted to any other uses. Under *Kanun Tanah Negara*, usually the landowner has to apply for approval before changing the type of

[2] Penang Institute, "Penang Economic and Development Report 2017/2018", Published in 2019. <https://www.penang.gov.my/images/penerbitan/Data%20Sosio%20Ekonomi%202017-2018/Penang%20Economic%20&%20Development%20Report%202017-2018_1-160_edit.pdf>

[3] Penang Institute, "Penang Statistics: Quarter 4", Published in 2018, <https://penanginstitute.org/wp-content/uploads/jml/files/quarterly_penang_statistics/2018/PQS-Q42018.pdf>

land use. However, this does not apply to 'first grade' land, which is a unique form of ownership that only exists in Penang and Malacca (although still subjected to regulations and laws on development including local plans and planning permission). If it is developed illegally, the fine incurred is usually too small in amount compared to potential profit from developing the land.

Currently, there are 12,782 hectares of paddy farming in Penang, with a reduction of almost 800 hectares from a year before due to development and other plantation activities especially on the Mainland.[4] Even though yield-per-hectare recorded in Penang is the second highest after Selangor, the demand for rice in Penang alone is not yet met locally. Most of the rice supply in Penang is imported from Vietnam, Pakistan and Thailand.[5] The cost of importing rice is cheaper compared to growing it here in Penang. However, Thailand and Vietnam are predicted to be negatively affected by sea-level rise in the future, and if this happens, food security will become a huge issue for Penang.[6]

The total number of farmers in Penang is estimated to be around 6,954 people.[7] The farmers are categorized by the Department of Agriculture (Jabatan Pertanian or DOA) into Groups A, B and C based on their preparedness to be upgraded to *Koperasi*.

Group A represents a well-coordinated group and is a step away from being upgraded to *Koperasi*. Another term used is *Kelompok Padi,* where the farmers will collectively decide when they should start aerating the soil, seeding, planting and so on. Each *kelompok* will have representatives that will be working directly with the DOA officer assigned to each district in Penang. In some cases, *Kelompok Padi* successfully obtains MyGap certification and even becomes a rice producer for the local market. In terms of farming, the current practices are a mixture of conventional and modern practices. This, however, is heavily dependent on the incentives, subsidies and programmes given by the Federal and the State Government.

There are programmes that help farmers improve their farming activities, such as MyGap and MyOrganic. MyGap certification nurtures good agriculture practices among the farmers. DOA has been working to promote this by giving incentives to farmers who join the programme. On the other hand, MyOrganic promotes organic farming. Both are monitored and enforced by the DOA. In terms of food safety, the DOA is responsible for controlling the

[4] Stephanie Kee, "Penang – A Rice Bowl State under Threat?", *Penang Monthly*, January 2018. <https://penangmonthly.com/article.aspx?pageid=9947&name=penang_a_rice_bowl_state_under_threat#fnt4a>

[5] Khazanah Research Institute, "The status of the Paddy and Rice Industry in Malaysia", Published in 2019. <http://www.krinstitute.org/assets/contentMS/img/template/editor/20190409_RiceReport_Full%20Report_Final.pdf>

[6] Susmita Dasgupta, "Risk of sea-level rise: high stakes for East Asia & Pacific region countries", 9th March 2018. <http://blogs.worldbank.org/eastasiapacific/risk-of-sea-level-rise-high-stakes-for-east-asia-pacific-region-countries>.

[7] Stephanie Kee, "Penang – A Rice Bowl State under Threat?", *Penang Monthly*, January 2018. <https://penangmonthly.com/article.aspx?pageid=9947&name=penang_a_rice_bowl_state_under_threat#fnt4a>

Maximum Residual Level (MRL) of the produce that is caused by the use of fertilizers and pesticides.

DOA Penang has also invested in *Program Tanam Ara Kuda,* where land for farming is provided on the condition that participants follow the rules and regulations stated under the agreement. This programme promotes and assists newcomers to start getting involved in agriculture activities and also reduce the risks faced by new farmers. The profit margin for small scale farming is low, hence farmers are very exposed to weather-related hazards as well as diseases. In the past, there had been discussion about creating group insurance for farmers in order to create a safety blanket that might reduce the impact of such hazards. The process was halted, however, after the change of government and the current status of the project is unknown. A group insurance will provide assurance for farmers and at the same time encourage new involvement in the agriculture sector.

Research and development is mainly headed-up by Malaysia Research and Development Institute (MARDI). MARDI is responsible for seed innovation, from breeding to foundation seeds. Seeds registered under MARDI are certified seeds that are legally safe to use. Currently, there are 43 varieties of paddy seeds available.[8] MARDI also acts as a centre for pest and diseases control for the paddy farming industry. Exploration of new techniques and instruments is carried out based on local demand, and some promising technology has been imported for local use. MARDI is also implementing technologies such as: land alignment system, seed scattering treatment map, tempering system, image data retrieval, variable rate application, and farming precision technology. However, knowledge transfer from MARDI to farmers faces few challenges such as farmers' acceptance, time and cost restrictions as well as technology barriers.

1.2.2 Fishery

Fishery activities in Penang involve around 5,000 to 6,000 fishermen and fall under the jurisdiction of the Department of Fisheries (Jabatan Perikanan or DOF), along with aquaculture activities.[9] Within the fishery sector in Penang, the revenue breakdown is as follows: captured fisheries (77%), aquaculture (22%) and inland fisheries (0.3%).[10]

There is currently no official plan around how to increase fishery-based food security. However, DOF Penang is looking into incorporating the matter into the Fisheries Act 1985 which will be re-drafted in the near future. The DOF is also in the midst of planning to set up concentrated areas for localised markets and high value species. Currently, estuaries along the riverbank around Penang and Kedah (Kuala Muda) are well known for high value fishery products. Juru, on the other hand, focuses on permanent food production that contributes to food security in Penang.

[8] Khazanah Research Institute, "The status of the Paddy and Rice Industry in Malaysia", Published in 2019. <http://www.krinstitute.org/assets/contentMS/img/template/editor/20190409_RiceReport_Full%20Report_Final.pdf>

[9] Department of Fisheries, "Industri Akuakultur Di Negeri Pulau Pinang" [Powerpoint presentation], 9th April 2019.

[10] Ibid.

As for fishermen's welfare, the government provides fuel subsidies to fishermen in Penang The Federal Government also invested in *Sistem Penyampaian & Khidmat Sokongan Akuakultur* (SPeKS) to support the aquaculture sector. It focuses on new projects where site suitability inspection and advice along with training supports will be given to aquaculturists. However, SPeks is only responsible for helping aquaculture farmers in the industry who are already well established, rather than complete beginners. TKPM Juru is one of the biggest fish farming sites supported by the government that caters to all three aspects of agriculture (i.e. crop farming, fishery and livestock farming). For fishery, it includes prawn farming, fish hatchery and marine fish product.

1.2.3 Livestock Farming

Major livestock products in Penang are poultry and pigs, the production of which exceeds the demand of Penang's current population – over 100% of self-sufficiency level (SSL).[11] However, ruminant (cow and goat) products are hardly increasing and this might be due to the limitation of land and lack of full-time farmers involved in this particular business.

The Department of Veterinary Services (DVS) keeps a close observation on the SSL, which is used as a benchmark to calculate per capita demand. Like crop farming, livestock farming in Penang faces the constraint of land availability. Currently, an intensive farming system is used for poultry and pigs but not the others, which results in the high reliance on imported ruminant products. To create an intensive farming system, farmers need to be well-equipped with not only knowledge and technology but also relevant and up-to-date information in order for the venture to be profitable.

The State Government along with other related agencies such as DOA have invested a huge amount in sustaining current agriculture practice including subsidies, training, instruments, programmes and tools such as TPKM, SPeKS, MyGap etc. All these practices have helped Penang improve its agriculture sector. Nevertheless, the support system needs to be updated, monitored and enforced regularly in order to ensure that it fits with current needs, demands and interest of those involved in the sector. The State Government has recently started to work on a food security policy paper. Current measurement of food security is calculated based on consumption / capita / year and the current stockpile volume for food crisis for the whole of Malaysia can only last for 45 days.[12] Currently, there is no target or action plans involving the consumption of nutritious food and nutrition rate if food crises arise in the future.

1.2.4 Penang Agriculture Policy Plan by Penang Institute

Penang State Government recently commissioned Penang Institute to draft a Penang Agricultural Policy Plan (2019- 2021) that is aligned with the Penang2030 vision and national food agricultural policy. The main focus of this policy planning is to increase local food production while working towards the vision to transform the agriculture sector into a productive, modern, sustainable, high value, competitive and knowledge intensive sector. It

[11] Jabatan Perkhidmatan Veterinar Negeri Pulau Pinang 2019.

[12] "Country's food stock can last only for 45 days: Prof. Datuk Dr. Mad Nasir." *Universiti Putra Malaysia*, 21st June 2016.
<https://upm.edu.my/news/countrys_food_stock_can_last_only_for_45_days_prof_datuk_dr_mad_nasir-25333>

is currently in the final phase of drafting and will be made public once it is finalised and approved by the Penang State Government. The policy plan aims to develop a detailed understanding of current and historical agricultural capacity, and determine the long-term success factors while recommending policy that may improve productivity, sustainability, farmer's income, food security and competitiveness of the sector.

2. Long-Term Goals

As Penang aims to become a sustainable state, the state Government should set up a medium term (2030) and long term (2050) food security target encompassing quantity/adequacy, affordability and accessibility, food safety and nutrition. The present, narrowly-defined food security outlook relies solely on self-sufficiency level that will be updated annually depending on the estimation of Penang's population.

3. Main Challenges and Gaps

3.1 Land Issues

3.1.1 The main concern of the Agriculture Working Group lies in the **steady decrease in agriculture land** in Penang. The size of agriculture land had decreased from 47,440 ha in 2011 to 43,278 ha in 2015, and is expected to drop to 36,405 ha in 2030.[13] There are limited lands available for farming, livestock and inland aquacultures. Rising sea level also threatens existing low-lying agriculture land especially near Seberang Perai Utara (SPU).

3.1.2 Based on the National Land Code, agriculture land is **'first grade' land** that can be converted for any other purpose. 'First grade' land is a unique form of land ownership that is only found in Penang and Malacca. Although 'first grade' land is still subjected to land-related regulations and the usual planning processes, there is no restriction on use as long as it complies with local planning zones. In Penang, urbanisation has resulted in much agricultural land being converted into residential or commercial use.

3.1.3 **Zoning of land** for agriculture use may not always be based on sound scientific research or properly enforced. For example, suitable areas for aquaculture have not plotted properly in both the State Structure Plan and Local Plans. Weak or illogical planning will disrupt and increase vulnerability of the ecosystem.

3.1.4 Previous efforts were made to request to **gazette the paddy area** in the first *Rancangan Struktur Negeri (RSNPP 2020)*. However, these areas are only listed as sensitive areas instead of being gazetted. The unprotected status of the land will deter **long term investment**.

3.2 Water and Rivers

3.2.1 Penang agriculture activities, especially crop farming are **overly dependent on Kedah's water source**. In the event of a crisis such as drought, Kedah can cut off or reduce water supply to Penang for its own use. The adequacy and availability of water sources for Penang

[13] Rancangan Struktur Negeri Pulau Pinang 2030

in the future will also be affected by Kedah's continuous economic and population growth, which will see more water retained within the State.

3.2.2 Unlike drinking water where Perbadanan Bekalan Air Pulau Pinang (PBAPP) is in charge of planning and actively managing water resources, there is no such body for agriculture water use in Penang. In Kedah, a body called Lembaga Sumber Air Negeri Kedah (LSANK) is tasked with taking care of and also **searching for new alternative water sources.**

3.2.3 In Penang, **river water quality has decreased** and agriculture pollution occurs on a seasonal basis. MyGap can be utilised as a tool to control pollution from agriculture activities. However, its use has not yet been **made mandatory** to all agricultural farms.

3.2.4 Currently, the monitoring of river quality is done 6 times annually and only some of the rivers are equipped with **automatic sensors**. The sensors can help to provide near-real time data and at the same time save manpower and reduce the risks posed by manual sample collection.

3.3 Local Food Supply and Accessibility

3.3.1 High value species receive better prices in China and other countries, which encourages local fishermen to export their products, causing the local market to end up with **low supply of the high-quality fishery products.**

3.3.2 Agriculture produce middlemen usually receive a higher profit margin compared to the farmer or fisherman.

3.3.3 In terms of paddy farming, at times, farmers have to travel far to get good quality paddy seeds.

3.3.4 Penang relies a lot on **imported vegetables** as local supply fails to meet the demand.

3.3.5 Fishery products are also **not sufficient to support** the demand of Penangites.

3.4 Production Cost and Affordability

3.4.1 Fish production in Penang will most likely increase, which will particularly impact small players (both fishermen and aquaculturists) who are critical to local fish supply. They might need some form of assistance or protection to stay in business.

3.4.2 Most farmers / consumers are sacrificing food quality and best practices because of **concern over cost** (organic food is very costly).

3.4.3 The challenges of both labour shortage and high input cost will further affect the profitability of the agriculture sector.

3.4.4 Penang's agriculture activity and productivity are very much **influenced by external factors** such as the weather, diseases and market demand. These factors will determine the

yield and cost of production as well as the market price of the produce. Without a strong safety net, the exposure and uncertainty they cause puts farmers in a precarious position.

3.5 Governance

3.5.1 A problem faced by the DVS is that the ***Enakmen Penternakan Babi*** (Pig Breeding Enactment) is still under the jurisdiction of the local authority. Effort is currently being made to transfer the jurisdiction to DVS by the end of the year.

3.5.2 The **regulations and approval process** related to agriculture or livestock are enforced by local authorities, which have different standard operating procedures (SOPs). This results in inconsistent or unstandardized enforcement.

3.6 Climate Change

3.6.1 Current **unpredictable weather** poses a serious threat to farmers and fishermen since their daily activities are mainly dependent on the weather. Paddy farmers will face huge losses if the rain is too little or too much during the planting season.

3.6.2 **Seepage of saline water** into paddy fields is already occurring, and will get worse from sea-level rise, especially in the low-lying coastal paddy area (e.g. Parit Buntar, Bagan Serai and Nibung Tebal). Penang Mainland will be hugely impacted from the high **sea-level rise** as seen in some global simulations.

3.6.3 Climate change and changing weather conditions also expose paddy crops and livestock to more **diseases**.

3.6.4 There is no state or national policy on an **agriculture adaptation plan** yet.

3.7 Fertilizer and Pesticide Use

3.7.1 Uncontrolled use of chemical fertilizer and pesticides can **affect food security** in Penang. Even though the DOA is tasked with monitoring the MRL (Maximum Residual Level) on the agriculture products, lack of manpower for enforcement affects the efficiency of monitoring.

3.7.2 Excessive use of fertilizers can also **harden the soil** and makes it unsuitable for farming.

3.7.3 **Fertigation technique** (supplying dissolved fertilisers through the irrigation system) has only been practised in Penang on a small scale.

3.8 Diseases

3.8.1 Paddy is **prone to bacteria** diseases (bacterial panicle blight (BPB) & bacterial leaf blight (BLB)) that cause huge losses to farmers.

3.8.2 Even if Penang manages to promote safe farming, there are still risks for those who consume imported vegetables from outside of Penang. Penang has to identify a good mechanism **for the food supply chain.**

3.8.3 **'Padi Angin'** or weedy rice is also one of the issues that affects farmers in Penang. It can cause considerable losses since it affects huge areas of the paddy field.

3.9 Technology Adoption

3.9.1 Farmers find **it hard to upgrade** the current farming methods as it incurs high cost and there are also the matters of possessing the right knowledge and willingness to adapt to new methods.

3.9.2 While new technologies have been developed locally to improve farming, there are some restraints that halt the process of **transferring the technology** to farmers. For example, MARDI developed a water-recycling technology for the irrigation system; however, it could not be implemented because proper infrastructure in the paddy field area was lacking.

3.9.3 Farming technology usually focuses on big-scale intensive farming, which may not suit the farming practices in Penang.

3.10 Farmer's Welfare

3.10.1 In Penang, there are three categories of farmers based on the scale of the farming operation – traditional, semi commercial and commercial. So far most of the contribution to SSL comes from commercial farms although farming is generally not seen as a good business opportunity.

3.10.2 In Penang, involvement in the agriculture sector is usually seen as the last choice for a good **income source**. There is **low interest** among young people to get involved in agriculture activities, resulting in the average age of farmers in Penang being around 50-70 years old. Efforts to groom new talents in the agriculture sector have not been too successful.

3.10.3 Subsidies play an important role in sustaining farmers' income especially paddy farmers, and many would consider leaving the profession if subsidies were to be axed. As of now, the main objective of the Government subsidies is to retain the interest of farmers to remain in the industry.

3.11 Sustainable Activities

3.11.1 Usage of high quality and environmentally friendly **feed for fish** will produce high value fishery products while at the same time taking care of the environment. However, it will also push up the production cost as well as retail price. This will raise the issue of affordability of local produce.

3.11.2 Penang's marine aquaculture is polluting the seawater because of the feed and other waste that is dumped into the sea.

3.11.3 **Fishing methods** need to be improved so that they are environmentally friendly.

3.11.4 **Pesticides and fertilizers** used in agriculture will affect the carbon dioxide and nitrogen level of the soil if there is no proper control. It also contributes to air pollution that can cause health problems to the local population. Modern farming practices may be able to address some of these challenges.

3.12 Data, Awareness and Education

3.12.1 **Holistic data collection** for fisheries is lacking and current data is scattered.

3.12.2 There is generally a lack of awareness among the farming community on the **diversity of crops** that can be used in farming. There is also a lack of awareness and knowledge among fishing communities and consumers about what types of fish and fishing methods to avoid.

3.12.3 The knowledge of **nutrition intake** among citizens is also lacking.

4 Proposed Solutions

4.1 Land

4.1.1 **Gazettement of agriculture land** is necessary in order to reduce the conversion of agriculture land for other uses. The State Government should prioritise agricultural land in order to secure Penang's food sources and sustain the demand of Penangites without depending too much on imported supply. This will also attract long-term investment in the agricultural sector.

4.1.2 Effective enforcement and **more severe punishment** should be imposed, such as higher fines or longer prison sentences, for illegal conversion of agriculture land. Culprits should be required to rehabilitate the land and bear the cost, which also serves as a warning to future offenders.

4.1.3 **Land use reform** - combining smaller plots of agriculture land to be managed centrally - will allow more efficient and commercial use of land, which can be implemented either through cooperatives or private businesses. This type of reform will also open opportunities for better management and technological advancement in agriculture.

4.1.4 **Price control and restricted use** of agricultural land will help to avoid illegal conversion and land speculation, which will also make it affordable for farmers to buy / stay on agricultural land.

4.1.5 The State Government should work with DOA to Develop an **agriculture online platform** that incorporates the current technological trends into the agriculture sector (akin to the e-hailing concept) in order to facilitate direct sales of agriculture produce. The platform can also open opportunities for landowners to rent out or sell their land for agriculture purposes.

4.2 Water

4.2.1 The State Government should adopt an **Agriculture Water Security Plan**, to include:

- Increase **water use efficiency** – working with MARDI to roll out water saving production techniques (including water recycling).
- **Infrastructure upgrade** that can help to reduce water wastage and increase irrigated land.
- A **River Policy or River Act** is necessary in order to ensure that Penang's river quality will be maintained for the future.

4.2.2 The **National Water Balance System** managed by the Department of Irrigation and Drainage (DID) that focuses on water monitoring, can be utilized in managing the agricultural water needs in Penang.

4.2.3 Penang should do **segmentation of the river water quality classes** in relation to uses. For example types of community such as industrial, urban / commercial, and suburban. The quality of rivers needs to remain high – **certain activities need to be kept out of the river system**. For example in Korea, a separate drainage system is created for urban / commercial / industrial uses so wastewater is not discharged directly into the river.

4.2.4 It is important to promote **water demand management** within the agriculture sector. R&D for water-saving tools and methods, along with awareness and education on water-saving will prepare the community to preserve water in their daily activities.

4.2.5 The relevant Government departments should explore the **possibilities of utilizing greywater and stormwater** for agriculture usage.

4.3 Food Security (Quantity, Accessibility, Safety and Nutrition)

4.3.1 The State Government should have a **medium and long-term food security target** (up to 2050), and perhaps a composite index consisting of the following:

- Food adequacy – SSL, import and export policy.
- Food affordability and accessibility – price and physical access to fresh food.
- Food safety – farming practices, standards, traceability.
- Nutrition – variety, processing, education and awareness.

4.3.2 The State Government should launch a **"Buy Penang"** campaign that emphasises the benefits of buying local produce including the reduction of the environmental footprint of food transportation and packaging. Effective campaign and educational hubs are needed in order to increase awareness among the public

- Farmers should be given training, investment, access to market, risk-sharing facilities etc.
- Create a smooth supply chain for local produce through public-private partnership e.g. outlets, an online platform, promoting cooperatives.

- Provide technical training and technology upgrade for farmers – consider commercial scale production; adoption of climate-resilient technology; equip farmers with market and market access information.
- Introduce risk-sharing instruments to lessen the risks faced by farmers:
  - Agriculture Trust Fund
  - Insurance for farmers that will function as a security assurance and also reduce the impact that the farmer faces in the event of a disaster. This might also attract potential investment and increase the participation rate in the agriculture sector.
- Encourage higher production standards and practices.
- Ensure food safety by establishing a food traceability programme; promote MyGap & MyOrganic as tools in ensuring food safety.
- Reduce food miles.

4.3.3 Penang State Government should provide **education and awareness-raising** on the importance of diversifying nutrient intake among Penangites. A guideline on healthy and safe daily intake of food can guide the public accordingly.

4.3.4 The State Government should introduce measures to increase the **competitiveness of Penang's produce.** Creating a '**Premium Penang**' brand to support unique local produce, production processes and philosophy e.g. organic farming, inter-cropping, biodiversity protection etc.

4.3.5 Penang should adopt and adapt the '**One Village One Product**' programme, one of the successful regional economic programmes. The success lies in its approach to transforming local products into competitive products in local, national, as well as global markets. This movement has been proven as an effective tool in improving the welfare of rural people, village economic dynamism, local income, and social solidarity by creating unique and value-adding products.

4.3.6 Penang should promote **diversification of crops** to make sure that citizens have a balanced diet and increased dietary nutrition. To increase diversity and adapt to future land use and climate change, the responsible authority should introduce **underutilised crops or species**. The process to introduce underutilised crops depends on the type of crop, objectives, how to begin, and identifying the parties that should be involved in the process. There is a need to focus on **produce that is using less land & cost** while bringing in higher revenue.

- The Penang State Government should work with the Federal and the neighbouring State Governments to produce a **regional plan on food diversification and a mutual support system**. However, this may be difficult as farmers will always aim to plant high value crops for bigger profit.

4.3.7 The State Government should work with DOA to lay out a plan on integrating technological advancement into the agriculture sector in Penang. **Digitalization of agriculture** will not only ease daily transactions by providing near-real-time data but will also help in attracting young people to the industry.

4.3.8 DOA Penang should engage with the private sector and academia to **develop talent and increase capacity** especially among young entrepreneurs in the agriculture sector.

4.4 Paddy and Other Crops

4.4.1 The State Government can consider **overhauling the subsidy packages** to incentivise farmers to engage in sustainable agriculture practices and adopt technology etc. The objective of agriculture subsidies should be to help achieve the policy targets of the sustainable agriculture sector at state and national level.

4.4.2 Penang should have a more **proactive disease control plan** taking into account future climate change threats.

- **Biosecurity division** – a division that helps control the spread and transfer of bacteria, viruses or pathogens (for all agricultural products) should be set up in both DVS and DOF as it currently only exists in DOA for crops.

4.4.3 Promote **inter-cropping** in agriculture practices starting from state-owned agriculture land.

4.4.4 The State Government should work with the relevant departments to develop and promote **tourism-oriented agriculture**. This can increase exposure to good agriculture practices adopted by local farmers and introduce iconic local produce. The "Buy Penang" campaign can also help promote the tourism sector in Penang.

4.4.5 The State Government should collaborate with MARDI to design a **specific R&D programme for Penang** based on local needs and demands. The technical team should work closely with research institutes and the private sector to focus on new resilient species, underutilised crops, efficient production methods and so on.

- MARDI is currently working on a soil-profiling project for paddy fields. With the soil data, MARDI can work with farmers to decide on the type and quantity of fertilizers that would be suitable for a particular plot of land. This will reduce unnecessary or over usage of fertilizers for paddy.

4.4.6 The State Government should also work with DOA to conduct behavioural studies to find out the level of **interest among young people** in the agriculture industry and what prevents them from getting involved in the sector.

4.5 Livestock

4.5.1 A **closed system waste management** should be enforced for all livestock farming to guarantee zero waste and discharge.

4.5.2 Penang should have an **integrated governing and regulatory framework** for livestock farming.

4.5.3 The State Government should push for **mandatory implementation of MyGap** for livestock farming in order to reduce the impact on the environment.

4.6 Aquaculture

4.6.1 The State Government must set up a **comprehensive oversight and regulatory framework** for all aquaculture activities:

- Carry out **complete survey of coastal and marine environment** (including types of water, prevailing coastal and marine activities, surrounding ecosystem etc i.e. integrated coastal management approach) of the whole of Penang to identify the most suitable places for aquaculture.
- Identify the **capacity of the ocean** to support the aquaculture sector now and in the future.
- Conduct **feasibility studies** of areas suitable for sustainable aquaculture.
- **Develop a Best Aquaculture Practices Guideline** / Standard together with all stakeholders (DOF, Industry, NGO) that focuses on environmental well-being, social well-being and good management.

4.6.2 The State Government should also introduce a **comprehensive incentive/support scheme** for aquaculture with the aim to increase aquaculture production for Penang's local food security as well as to promote sustainable techniques and practices:

- Establish an **"Aquaculture in Penang"** programme to actively promote **collaboration between private sectors and academia** to identify species and production processes that are most suitable to Penang's natural and regulatory environments. For example identifying profitable species that can cater to local needs as well as having export value, and would not depreciate the natural environment.
- Current health and environmental certification of aquaculture farms and produce should be made mandatory for all aquaculture and not just those destined for export. **Stricter quality control** can also help open overseas opportunities and create a niche market for Penang's aquaculture.
- **Gazette the area once identified as Zon Industri Akuakultur.**
- **Implement a cluster system for the farms in the ZIA** for better cost and infrastructure sharing. This system will also enable an easier transfer of information and best aquaculture practices tool among the farmers.

4.7 Fishery

4.7.1 Penang should make **Fishery Impact Assessment mandatory** for any project related to coastal and sea development.

4.7.2 There should be a **Penang State Fishery Action Plan**, which should include:

- Designated **centralized wholesale and retail markets** for local fishermen to sell their produce to increase diversification of catches and establishment of economic value of the fishes.
- Identify current and future **fishing 'hotspots'** and establish safeguards to protect or replace them.
- Carry out **future fish landing forecast**, taking into account the impact of dietary changes, climate change, land use changes (e.g. reclamation), as well

as habitat destruction or protection (e.g. brackish water, mangroves, coral reefs).
- **Public awareness and education programmes** should be promoted to encourage the correct fishing practices and also **facilitate participation of women** in Small Scale Fisheries (SSF).

4.7.3 Penang should have stricter **zoning enforcement and patrol** to stop trawlers in unsuitable areas, and enforcement of illegal fishing by non-Penang or even international vessels. The relevant departments should also strengthen enforcement and licensing of vessels and fishing methods.

4.7.4 **Compensation** given by the State Government to fishermen (for land reclamation or development projects) should take into account not only economic losses but also safety issues and emotional impact.

4.8 Urban Agriculture

4.8.1 DOA Penang should introduce programmes such as **Usahawan Tani Pelapis and Jom Tanam Sayur Sendiri in the urban context** to supply and promote a healthy and safe food products consumption (vegetables).

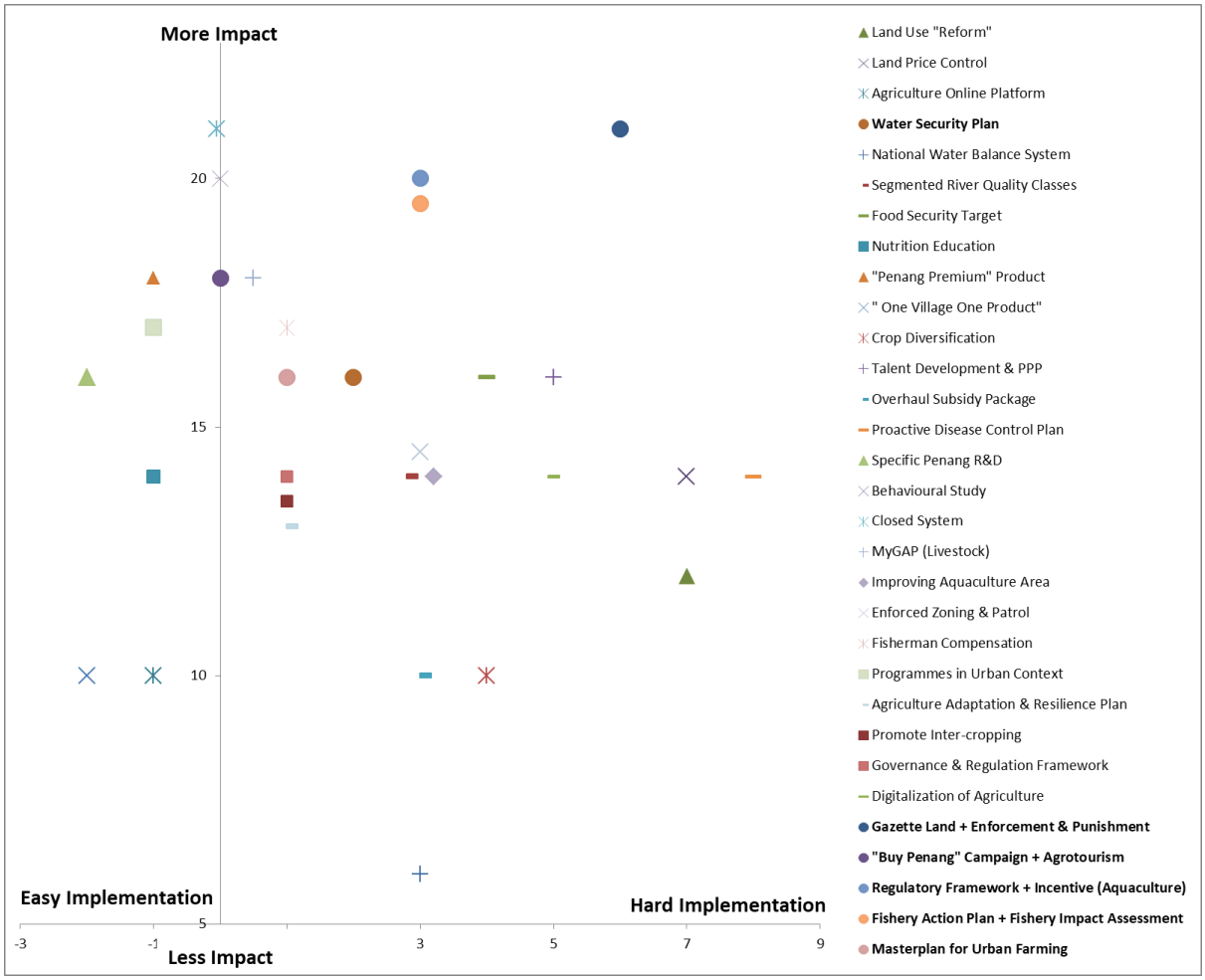
4.8.2 The State Government should create a **Masterplan for Urban Farming** for Penang to explore the potential of urban farming, identify the best way forward and provide a useful framework.

- Local Plans should include urban farming elements (e.g. urban agriculture land use, vertical farming etc) to prepare for its future expansion.
- Establishment of **vegetable factories** by working with the IT sector and young entrepreneurs.
- Working with the banking sector to identify **funding venues for urban agriculture investment.**

4.9 Climate Change

4.9.1 Penang needs a **state-wide Agriculture Adaptation and Resilience Plan** that prepares Penang for socio-economic impacts of climate change on the food trade, consumers and the farming community. There is also a need to focus on the research around saline tolerant crops.

5. Major Policy Recommendations and Milestones



1. Masterplan for Urban Farming (2020)

As agricultural land continues to dwindle in Penang, it is important that Penang starts to take urban agriculture and farming seriously. The Masterplan for Urban Farming should set out the short, medium- and long-term objectives of urban agriculture in Penang, and identify the types of farming and incentives that can be deployed. More importantly, urban agriculture needs to be **incorporated into local plans,** so that this type of land use or buildings can be taken up in the future. It needs to identify existing by-laws and guidelines that might affect the adoption of urban farming. The Masterplan should also look into how to promote urban farming not only for self-sufficiency but also as an alternative income stream for communities. This involves establishing a digital platform for marketing and sales of agriculture produce, which will help promote campaigns like Usahawan Tani Pelapis and Jom Tanam Sayur Sendiri in the urban context to supply and promote healthy and safe consumption of food. The Masterplan should also set out the vision of how Penang can promote commercial urban farming in the form of “vege factories” and so on.

Think City is already in the process of drafting a Masterplan for Urban Farming for Penang. Additional elements identified by the Working Group can be included into the plan soon.

2. “Buy Penang" Campaign and Agrotourism (2020)

To promote agriculture in Penang, we need to develop a supportive local market for local produce. The “Buy Penang” campaign will focus on promoting the consumption of both fresh produce and processed local food by creating a unique selling point. Local produce should be promoted by the state government because they provide unique tastes, are of higher quality, are generally safer to consume and more environmentally friendly compared to imported produce. In addition, this is a scheme where Penangites can show their solidarity and support for local farmers who have contributed to food security in Penang. To make this happen, the State Government needs to set out a strategy that addresses the whole **value chain of the agriculture sector**, from farm to plate. Once it is established, stakeholders can decide how to enhance the different parts of the value chain, and determine the types of incentives as needed.

The “Buy Penang” brand needs to be safeguarded through **strict standards, monitoring and traceability**. It can also be paired up with MyBestBuy launched by FAMA, whereby FAMA is allowed to undertake the grading, packaging and labelling of agricultural products. The process would be improved through the use of technology (barcode, blockchain etc.) and setting up of a robust supply chain for local produce. Farms participating in the “Buy Penang” scheme need to adhere to a set of standards (such as MyGap) and to comply with all rules and regulations. To further promote the “Buy Penang” campaign, the State Government can help set up a marketing and sales platform (like “Grab” for agriculture) through which farmers can directly sell their produce. The “Buy Penang” scheme can also be promoted to tourists who are looking to experience local produce. This can be tied to agrotourism to create multiple benefits. The campaign should also highlight its impact in reducing the ecological footprint. Campaign and exhibition hubs are recommended in order to create the momentum and provide the information needed by the public.

3. Penang State Fishery Action Plan and Mandatory Fishery Impact Assessment (2023)

As an island state, the fishery sector contributes enormously to food security in Penang. To further protect the fishery sector in Penang, the State Government should produce a Penang State Fishery Action Plan that is aligned with the Federal laws/guidelines. The Action Plan can complement Federal policy by identifying and prioritising local issues and challenges, and providing locality-specific solutions. For example, the Action Plan should contain a detailed mapping of current and future fishing and fishermen livelihood ‘hotspots’ and establish safeguards to protect them. It should also set up a robust process to collect data and monitor fish and seafood resources and catches in Penang. Future fish landing forecasting needs to be carried out and should account for the impact of dietary changes, climate change, land use changes and habitat destruction. The Action Plan can also contain specific measures to improve the market access of fishermen, including setting up centralised wholesale and retail markets, or an online platform where fishermen can sell their produce directly. The promotion of Penang’s seafood and fish can also be included in the “Buy Penang” campaign. The Action Plan can also promote programmes to encourage best practices and raise public awareness about sustainable fishery, including the types of fish that are under threat and need to be avoided. It can also facilitate women’s participation in Small Scale Fisheries (SSF). The Action Plan should also mandate Fishery Impact Assessment for coastal and sea development projects.

4. Water Security Plan (2023)

One of the biggest challenges of Penang's agriculture is that it relies on a major water source not owned by Penang, namely Sungai Muda. This means it has no control over upstream management of water sources (rivers, catchment areas etc). Although Penang does have a working irrigation system that meets most of the current demand, it may not be sufficient in times of stress or in the face of climate change. Penang has demonstrated in the past that it will prioritise drinking water over agricultural needs in the event of water shortage. To further tighten up water management for agriculture, there is a need for a Water Security Plan in Penang (akin to what PBAPP is doing for drinking water). Among other things, the Plan can identify priority areas and technologies for water security, as well as introducing and implementing water efficiency measures. Penang can enhance its collaboration with MARDI to roll out water-saving production techniques (including water recycling) and introduce crop species that requires less water. The Plan can include medium- and long-term water infrastructure upgrades to reduce water wastage and increase irrigated land. Furthermore, it can also integrate components of the National Water Balance Management System (NAWABS) that contain supply augmentation measures and demand management options (e.g. real time data, climate forecast and basin-wide management), which is utilized as a tool for dam management.

5. Comprehensive Regulatory Framework and Support Scheme for Aquaculture (2024)

Penang's aquaculture sector is an important and growing sector and accounts for more than 10% of national aquaculture production. Currently, aquaculture focuses on high value export-oriented fish and seafood species, and is mainly dominated by marine aquaculture. With the dwindling wild fish stocks and catches, aquaculture can potentially play an important role in providing food security for the people of Penang in the future. However, while Penang wants aquaculture to reach its full potential, it also needs to make sure that aquaculture is carried out in a safe and sustainable manner.

A comprehensive regulatory framework targeting the aquaculture sector in Penang should be adopted to further develop the sector. The regulatory framework should identify the suitable zones for aquaculture activities (taking into account social, environmental and ecological impact on land and marine resources), and mandate the adoption of **Best Aquaculture Practices Guidelines/Standards** (for example MyGap) coupled with routine inspections. The high standards currently imposed on exported produce should also be extended to locally consumed fish/seafood.

The State Government should introduce an **aquaculture support scheme** to help further expand the role of aquaculture in providing food security to local people as well as providing an income stream to local fishermen. The Working Group proposes that the State Government should help establish a favourable environment (such as gazetting an Aquaculture Industry Zone and setting up a cluster system in the Zone providing appropriate facilities) not only for commercial investors, but also community-based operations. Specifically, aquaculture can learn from the existing support schemes for paddy farmers (e.g. establishment of cooperatives, technical and financial help etc) and create a viable livelihood for the fishing communities. Other incentive schemes may include a start-up fund,

risk-sharing instruments and R&D support to help community-based aquaculture and domestic consumption-oriented production.

6. Gazette Agricultural Land and Effective Enforcement and Punishment (2025)

The most serious threat facing Penang's agriculture sector is the **steady loss of agricultural land**. Due to pressure from development and the increase in land value, more agricultural land is expected to be converted into non-agriculture land in future. Therefore, the Working Group feels that it is imperative that the State and Local Governments introduce strict protection of agriculture land. The Working Group recommends that the Government **gazette existing agriculture land** to prevent its further decrease; For pending land gazettement, the Government should change the "first grade" status of agriculture land to minimise land conversion. The protection of agricultural land is the first step towards achieving food security in Penang. Apart from gazetting agriculture land, the Government should also **increase the punishment for illegal conversion of agriculture land** and strengthen enforcement and monitoring. For example, much higher fines and prison sentences should be imposed in serious cases. The Government should also strengthen enforcement of land rehabilitation following illegal conversion of land. In addition to gazetting land, adequate infrastructures need to be maintained and provided to support agriculture activities.