



JOURNAL OF TECHNOLOGY AND OPERATIONS MANAGEMENT

<https://e-journal.uum.edu.my/index.php/jtom>

How to cite this article:

Wan Norhana, MN & Liyana, R. (2026). Strengthening intellectual property management and commercialisation in Malaysian research institutes: Lessons from the Fisheries Research Institute. *Journal of Technology and Operations Management*, 21 (2), 15-25. <https://doi.org/10.32890/jtom2026.21.2.2>

STRENGTHENING INTELLECTUAL PROPERTY MANAGEMENT AND COMMERCIALISATION IN MALAYSIAN GOVERNMENT RESEARCH INSTITUTE: EXPERIENCES FROM THE FISHERIES RESEARCH INSTITUTE

¹Wan Norhana Md Noordin & ²Liyana Ramli

^{1,2}Innovation, Promotion and Commercialization Unit, Fisheries Research Institute, Penang,
Malaysia

¹Corresponding author: liyana@dof.gov.my

Received: 6/2/2026

Revised: 16/6/2026

Accepted: 30/6/2026

Published: 30/7/2026

ABSTRACT

While transitioning public research outputs into socio-economic value is a global priority, Government Research Institutes in developing economies face distinct statutory and structural constraints compared to autonomous universities. This study investigates the institutional governance pathways executed by the Fisheries Research Institute of the Department of Fisheries Malaysia, to systematically formalise its intellectual property and commercialisation frameworks. Employing a qualitative single-case study method across four operational stages, ranging from boundary setting to systemic lesson extraction, this study data-triangulated procedural records, financial registries, and system milestones spanning 2006 to 2026. The resulting thematic synthesis maps a comprehensive six-layer strategic framework tracking FRI's evolution from an internal administrative foundation to external capability sourcing and downstream value realisation. The findings reveal that successful public sector technology transfer cannot manifest via ad-hoc actions; rather, it requires a chronological transition across interconnected internal and external governance layers. Ultimately, this study formalises a repeatable operational model, providing actionable policy insights and a transferable framework for public sector line agencies in developing nations to manage and commercialise R&D outputs effectively.

Keywords: Government Research Institute (GRI), intellectual property governance, technology transfer, public sector innovation, case study methodology

INTRODUCTION

The Fisheries Research Institute (FRI), a government research institute (GRI) established in 1957 in Penang, operates under the Department of Fisheries (DOF), Ministry of Agriculture and Food Security (MAFS) to support the fisheries sector through science-based research. As the sector expanded, FRI developed a decentralised structure through its branch institutes (FRI, 2025). Its R&D portfolio eventually expanded to address emerging challenges like pollution and conservation, sharing findings through publications that guide policy and sustainable development (FRI, 2022, 2023, 2024).

Systematic attention to innovation and commercialisation (I&C) gained prominence from the mid-2000s, catalysed by the National Policy on the Commercialisation of Intellectual Property (MOSTI, 2009) and the New Economic Model (NEM, 2010). A key milestone was achieved in 2009 with the registration of FRI's first granted patent application for *Tor* sp. cryopreservation (DOF, 2015), marking a transition towards structured IP governance. Strategic emphasis on commercialisation increased after 2017, leading to technology licensing agreements for DOFia Red, ECOCIM Feed, and Break and Protect 2.

However, managing IP registration presents obstacles such as limited awareness among researchers, delays in invention disclosure, and funding constraints (Mustafa et al., 2021). Commercialisation poses additional hurdles. Public-sector GRIs face strict statutory constraints, rigid financial frameworks, and restricted organisational structures, operating under vastly different administrative realities than universities, which profit from flexible pathways like spin-offs and joint ventures (Baharudin & Mohd Farid, 2020; Hailu, 2024; Martínez-Ardila et al., 2023). GRIs often lack the foundational know-how, industry incentives, and clear legal mechanisms required to successfully bring research outputs to market (Catibog, 2016; Mustafa et al., 2021). Globally, these issues are compounded by weak science–industry linkages and policy constraints (World Intellectual Property Organization (WIPO), 2024).

Despite these barriers, empirical investigations into how a resource-constrained public line agency builds institutional IP capacity remain scarce, as mainstream technology transfer literature remains heavily biased toward higher education institutions (Hailu, 2024; Martínez-Ardila et al., 2023). To address this gap, this study examines the institutional evolution of IP governance within FRI. Specifically, we evaluate the strategic initiatives, standardised procedures, and capacity-building frameworks executed to formalise its IP pipeline, providing an empirical operational framework that demonstrates how public research units navigate structural rigidities to bridge the gap between high-level state innovation policy and grass-roots execution.

METHODOLOGY

To explore the systematic institutionalisation of IP governance within a public research environment, this study adopts a qualitative, descriptive single-case study design. The single-case approach is highly appropriate for examining unique organisational transitions, operational adaptations, and policy compliance mechanisms within their real-world administrative contexts.

The unit of analysis is the Fisheries Research Institute (FRI) of Malaysia. Data collection was conducted through non-probability purposive sampling of institutional frameworks and administrative records from 2006 to 2025. To ensure our findings are reliable, we gathered three different types of data to compare against each other:

1. Institutional Policy and Standard Operating Documents

2. Financial and Allocation Records
3. Outputs and Structural Milestones

Data analysis was executed using qualitative thematic synthesis. Documents were chronologically mapped to track organisational change across six analytical layers: (1) structural institutionalisation, (2) procedural standardisation, (3) funding, (4) capacity building, (5) technology promotion and knowledge dissemination, and (6) asset governance. Figure 1 illustrates the simple methodological flowchart and design of the study.

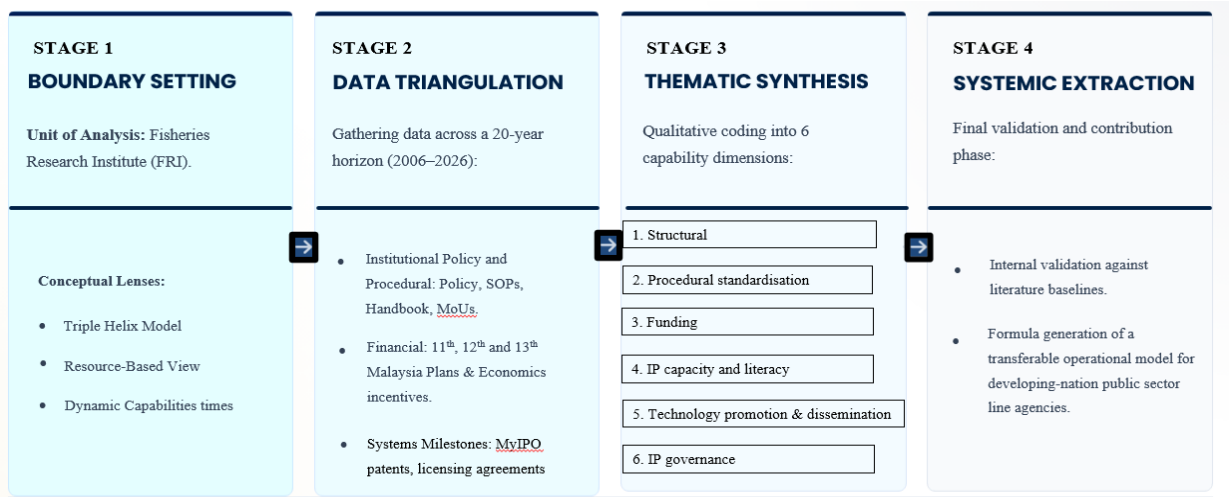


Figure 1

Methodological Flowchart and Research Design of the Qualitative Single-Case Study

RESULTS AND DISCUSSION

Effective governance of IP registration and commercialisation is a critical enabler of translating publicly funded research into tangible socioeconomic outcomes. Strong IP governance ensures that research outputs are systematically captured, protected, and strategically leveraged for market and societal impact (OECD, 2015). FRI's evolution illustrates that distinct, interconnected governance layers facilitate capability development, as depicted in Figure 2 and elaborated upon in the sections below.

Layer 1: Structural institutionalisation via dedicated unit

The data shows that systematic IP management cannot manifest without a dedicated administrative unit to prevent ad-hoc and inconsistent implementation. The establishment of the Innovation, Promotion, and Commercialisation Unit (InProKom) in 2007 formalised this need. Though InProKom is structurally small, staffed by two research officers and three support personnel, its focus functions similarly to that of a specialised Technology Transfer Office (TTO). By consolidating innovation disclosures and managing registrations, this small unit keeps all institutional knowledge in one place and cuts through the bureaucratic delays of a large organisation.



Figure 2
The Six-Layer Strategic Framework of FRI

Layer 2: Internal procedural and governance standardisation

According to the WIPO (2021), establishing formal policies, procedures, and institutional capacity for IP management facilitates technology transfer and commercialisation, as GRIs could maximise the public value of R&D investments. Empirical evidence also highlights the importance of institutional IP policies in clarifying ownership, standardising commercialisation pathways, and fostering researcher engagement, which collectively enhance the potential for innovations to generate economic and social benefits (Mashoto, 2022). At the FRI, initiatives to strengthen governance have focused on formalising IP management processes, developing standardised procedures for commercialisation, and aligning institutional practices with national innovation policies, thereby creating an enabling environment for sustainable knowledge translation. The data reveals a distinct maturation process in FRI's operational protocols:

1. Development and Formalisation of a Standard Operating Procedure (SOP) for IP Management

FRI first developed an SOP related to IP registration in 2006. At that time, the SOPs were general in nature and not comprehensive, reflecting the institute's limited experience in IP management. In 2024, this SOP was updated to align with current practices, presented to the DOF top management, and formally endorsed for official implementation. Formalising this procedure ensures operational consistency and sustainable IP management besides maintaining credibility by promoting transparency, accountability, and adherence to national policies and governance.

2. Development of an SOP for IP Commercialisation

In 2020, FRI initiated the development of its SOP for commercialisation in response to growing interest from private companies in commercialising IPP's intellectual property. This was

particularly challenging, as there were no existing procedures, licensing templates, or commercialisation know-how within the institute. The SOP that was eventually developed was not comprehensive; it reached only the minimum requirements necessary for the process to be implemented, given the inherent limitations of FRI as a GRI. With technical support from the Malaysian Agricultural Research and Development Institute (MARDI) and NUKLEAR Malaysia, FRI also developed a standardised template for licensing agreements, providing a basic framework for engaging with industry partners while ensuring compliance with national regulations. Despite its limitations, this initial SOP laid the groundwork for formalising IP commercialisation and enabled FRI to begin structured and transparent engagement with the private sector.

Key elements of the IP registration and commercialisation SOPs centre on a two-tiered evaluation process coordinated by the InProKom through the establishment of the technical committee (*Jawatankuasa Teknikal Pendaftaran Harta Intelek dan Pengkomersialan* (JTPHIP)) chaired by the FRI Senior Director, which has been held annually since 2017. Following the committee's review and endorsement, all proposals for IP registration and commercialisation are forwarded to the top management of DOF (*Jawatankuasa Dasar dan Pengurusan*, JKDP) for final approval (Liyana and Wan Norhana, 2024). This two-tiered process ensures that proposals are thoroughly evaluated at the technical level before receiving strategic oversight and formal authorisation at the highest level of DOF management.

3. Policy on Inter-Agency and External Collaboration

Collaboration with external entities involves engagement with multiple divisions within DOF and requires proper approvals as well as formal documentation, such as Memoranda of Agreement (MOA), Memoranda of Understanding (MOU), or licensing agreements. To ensure that such collaborations are conducted in a structured, transparent, and timely manner, a clear and practical guideline is essential. To formalise this process, DOF published the handbook *Buku Panduan Dasar Kerjasama Jabatan Perikanan Malaysia Dengan Pihak Luar* in 2023 (Figure 3). The handbook provides a clear framework for inter-agency and external collaboration in R&D and commercialisation, serving as an official reference to ensure that all activities are coordinated, compliant, and documented appropriately. This is further operationalised through the SOP for Collaboration with External Partners.



Figure 3

Cover page of Buku Panduan Dasar Kerjasama Jabatan Perikanan Malaysia dengan Pihak Luar

4. Securing funds for IP registration and pre-commercialisation activities

Following the establishment of InProKom and the development of procedures, another vital move was to secure dedicated funding to support IP registration and technology validation. To this end, FRI successfully obtained allocations under the 11th Malaysia Plan (Rancangan Malaysia Ke-11) to facilitate IP registration and pre-commercialisation activities. This approach was maintained through the 12th and 13th Malaysia Plans, with funding consistently approved for each phase (Table 1). These allocations, although modest, enabled InProKom to carry out key IP activities, including the registration and renewal of intellectual property as well as the validation of several technologies, providing a foundation for the gradual development of IP management and preliminary commercialisation despite limited prior experience.

Table 1

Longitudinal Distribution of Development Allocations for IP Registration and Pre-Commercialisation Validation

Malaysia Plan (MP)	Title of project	Amount (RM)	Specific purpose
11 th MP (2016-2020)	Penyelidikan Akuakultur & Pra-pengkomersialan (P21225010370001)	600,000	IP registration
2 th MP (2021-2025)	Penyelidikan, Pembangunan dan Pengkomersialan Teknologi Akuakultur Mapan (P2130004 017 0501)	700,000	IP registration
	Dana Insentif Ekonomi Madani	1,500,000	Technology verification
13 th MP (2026-2030)	Penyelidikan, Pembangunan, Inovasi Dan Pemindahan Teknologi Akuakultur Mampan Untuk Keterjaminan Makanan (P21300040170520)	308,000	IP registration and technology validation

5. Amendments to FRI Trust Fund Account

FRI maintains a Trust Fund Account (*Akaun Amanah Penyelidikan, Latihan dan Perkhidmatan Institut Penyelidikan Perikanan Malaysia (Kod Amanah 84516)*), established under subsection 9(1) of the Financial Procedure Act 1957, to finance joint research projects conducted by the institute. Initially, the account could only be credited with funds contributed by local or international universities; the private sector; associations; international or local organisations; and agencies not fully funded by the Government of Malaysia. Proposals to amend the account to allow receipts and disbursements from commercialisation activities were initiated in 2016 through several engagement sessions with the Ministry of Finance (MOF) and the MAFS. In 2021, amendments permitting commercialisation activities were conditionally approved. In 2025, a new effort was launched to extend the scope of commercialisation to other government development initiatives, recognising that the earlier conditional approval applied only to Trust Fund projects.

Layer 4: Enhancing IP Capacity and Literacy

Effective management and commercialisation of IP require not only robust procedures and governance structures but also sufficient capacity and awareness among staff and researchers. Enhancing IP literacy ensures that researchers understand the value of their innovations, are able to disclose inventions

appropriately, and can engage effectively in technology transfer and commercialisation activities.

To address the unique landscape and challenges of government research institutes (GRIs), FRI sought collaboration with other established GRIs, such as MARDI and Nuclear Malaysia, to support the development of IP and commercialisation capacity. These partnerships provided opportunities to learn from best practices, gain technical expertise, and adapt proven approaches to IP management and commercialisation within FRI's context. In addition, the institute has leveraged its professional network with IP agents to deliver free webinars and knowledge-sharing sessions, empowering research officers with practical skills and up-to-date insights on IP management, patent filing, and commercialisation processes.

FRI also actively participates in national and international courses, seminars, and workshops. These initiatives are organised by MOSTI, MyIPO, WIPO, and the ASEAN Secretariat. Through these initiatives, FRI ensures that research officers remain informed, skilled, and prepared to manage IP effectively and contribute to the gradual commercialisation of research outputs. From the lectures, workshops, and interactive discussions, officers not only gain new knowledge on innovation and commercialisation management but also have the opportunity to build collaborative networks with participants from various institutions.

Layer 5: Technology Promotion and Knowledge Dissemination

Managing intellectual property requires more than just behind-the-scenes office rules; it requires actively reaching out to the market. FRI bridges the gap between research and business by using several promotional approaches:

1. Participation in innovation exhibitions and social media outreach

InProKom actively promotes and disseminates FRI's developed intellectual property through social media channels and participation in innovation exhibitions and trade fairs. Recent exhibitions participated in by FRI include the Malaysia Agriculture, Horticulture and Agrotourism Exhibition (MAHA) 2024 at MAEPS Serdang, one of Malaysia's largest agricultural exhibitions; the Malaysia Commercialisation Year (MCY) Summit 2024 at PWTC; Hari Penternak, Peladang dan Nelayan Kebangsaan (HPPNK) 2023 in Meru, Ipoh; and the Outstanding Inventors and Innovators for the Malaysia Inventor and Innovator Convention (MYIIC) Awards 2025. These events provide platforms for showcasing FRI's innovations; engaging with industry, academic, and community stakeholders; and raising the Institute's visibility both nationally and internationally. In combination with social media outreach, these initiatives help attract potential collaborators, promote FRI's R&D outputs, and support the gradual translation of research into practical and commercial applications.

2. Presentations to funding agencies

Another key initiative in the introduction and promotion of technologies developed at FRI is through strategic engagement with relevant ministries and technology development entities. Sessions on funding facilitation on commercialisation were arranged with the MAFS and agencies under MOSTI such as Yayasan Inovasi Malaysia (YIM), Malaysian Research Accelerator for Technology & Innovation (MRANTI), Malaysian Technology Development Corporation (MTDC) and also the Northern Corridor Implementation Authority (NCIA). These engagements provided researchers and project managers with valuable insights into available financial support

mechanisms, helping to bridge the gap between research outputs and effective commercialisation.

3. Knowledge sharing

Given the limited knowledge and experience in Malaysia regarding IP management and commercialisation within GRIs, and the challenges researchers often face in accessing guidance or reference materials, FRI has taken steps to share its experiences with the wider research community. FRI has published articles offering practical insights for researchers. Notable examples include Liyana and Wan Norhana (2024), which provides an overview of FRI's intellectual property portfolio, and Wan Norhana et al. (2025), which presents a case study on the commercialisation of an agro-based R&D technology, the Break and Protect 2 marine leech trap. These publications serve as valuable reference points for researchers in GRIs facing similar challenges, complementing FRI's internal documentation and knowledge dissemination efforts.

Layer 6: Intangible Asset Governance

Effective IP administration requires a strict balance between organisational security and ecosystem data transparency. FRI manages its intellectual property documentation through a combination of manual and digital systems, with appropriate access controls to ensure both ease of reference and information security. All physical IP files are securely stored in locked cabinets within restricted-access rooms.

A digital IP registry is maintained and updated every six months to ensure information remains current, accurate, and easily accessible. Recorded details include the IP title, brief description, category, protection status, ownership ratio (if jointly held), filing date, approval date, certificate date, inventor name, and reference officer. Access to these records can be requested through InProKom. The updating process includes verification of registration status, protection expiry dates, and any changes in ownership or usage rights.

In 2022, FRI published a booklet, listing patent numbers and reader-friendly descriptions of all developed IPs alongside the direct contact information of the respective inventors (Wan Norhana, 2022) (Figure 4). This publication serves as an official source to ensure IP management is systematic, transparent, and accessible to stakeholders. In addition, a niche-specific innovation booklet focusing exclusively on fish health R&D was prepared and strategically distributed during the 11th International Conference on Disease in Asian Aquaculture (DAA11) in 2022 (Figure 4), where international scientists, commercial farmers, and multinational aquaculture stakeholders gathered. Furthermore, IP records are made available through digital platforms such as the FRI website (FRI, 2025c), Technology Market, and Knowledge Resource for Science and Technology Excellence, Malaysia (TECHMart, KRSTE) (MOSTI, 2025). KRSTE is a Malaysian national portal and initiative by MOSTI to centralise and share S&T information, research, and innovation data across the country for better accessibility and collaboration and the government's intangible asset inventory, facilitating wider access and supporting knowledge dissemination.



Figure 4

Institutional IP and R&D Innovation Booklets Published by FRI

CONCLUSION

This study evaluated how public-sector GRIs build IP management and commercialisation capabilities within rigid administrative structures. By tracing the evolution of FRI, DOF Malaysia, over two decades, this research highlights that the absence of autonomous university ecosystems does not completely preclude technology transfer success. Rather than viewing institutional barriers as immovable obstacles, this case demonstrates how public bodies can systematically build legal and operational capabilities step-by-step.

For policymakers and administrators in developing and emerging economies, this case offers clear, scalable structural lessons:

1. **Prioritise Structural Anchors over Scale:** Initial institutional progress inside a line ministry should not be judged prematurely against large-scale commercial revenues. The early phase must focus on creating a functional, transparent ecosystem, cultivating internal IP literacy, and mitigating public risk.
2. **Execute Multi-Agency Benchmarking:** Rather than inventing legal frameworks independently, nascent public bodies should actively leverage the mature intellectual capital of established sister organisations (e.g., MARDI and Nuclear Malaysia) to standardise licensing architectures.
3. **Engage in Proactive Fiscal Engineering:** Overcoming public accounting rigidities requires early, persistent collaboration with central ministries to structurally adapt existing trust funds, unlocking sustainable revenue recycling mechanisms.

Ultimately, FRI's institutional trajectory confirms that structured administrative adjustments, policy-backed development funding, and cross-agency integration can enable line-ministry research units to successfully translate public science into long-term socioeconomic value.

ACKNOWLEDGEMENT

This paper does not receive financial assistance from governmental, private, or non-profit organisations.

DECLARATION OF THE USE OF GENERATIVE AI

Authors declare that AI tools such as ChatGPT and Grammarly were used only to improve the language and grammar of this manuscript. They were not used to generate content, analyze data, or make scientific decisions. All ideas, analysis, and conclusions are the authors' own work.

REFERENCES

- Baharudin, K., & Mohd Farid, S. (2019). A case study analysis of Typhidot: An example of market-oriented R&D commercialization in Malaysia. *International Journal of Financial Research*, 10(5), 75–81. <https://doi.org/10.5430/ijfr.v10n5p75>
- Catibog, N. A. (2016). Challenges faced by government research institutions and public universities in the commercialization of agricultural innovation in the Philippines. *FFTC Agricultural Policy Platform*. <https://ap.ffc.org.tw/article/1136>
- Department of Fisheries. (2015). *Method for semen cryopreservation and in vitro fertilization of Tor sp.* (MY Patent No. MY-189637-A). Intellectual Property Corporation of Malaysia.
- Fisheries Research Institute. (2022). *Annual report 2021*. Department of Fisheries Malaysia. <https://fri.dof.gov.my/penerbitan-laporan-tahunan/>
- Fisheries Research Institute. (2023). *Annual report 2022*. Department of Fisheries Malaysia. <https://fri.dof.gov.my/penerbitan-laporan-tahunan/>
- Fisheries Research Institute. (2024). *Annual report 2023*. Department of Fisheries Malaysia. <https://fri.dof.gov.my/penerbitan-laporan-tahunan/>
- Fisheries Research Institute. (2025a). *About us*. Department of Fisheries Malaysia. <https://www.fri.gov.my/about-us>
- Fisheries Research Institute. (2025b). *Annual report 2024*. Department of Fisheries Malaysia. <https://fri.dof.gov.my/penerbitan-laporan-tahunan/>
- Fisheries Research Institute. (2025c). *Innovation and IP list*. Department of Fisheries Malaysia. <https://fri.dof.gov.my/>
- Hailu, A. T. (2024). The role of university–industry linkages in promoting technology transfer: Implementation of triple helix model relations. *Journal of Innovation and Entrepreneurship*, 13(1), 25. <https://doi.org/10.1186/s13731-024-00370-y>
- Liyana, R., & Wan Norhana, M. N. (2024). An overview on the intellectual properties of the Fisheries Research Institute, Department of Fisheries, Malaysia. *Malaysian Journal of Invention and Innovation*, 3(6), 46–59. <https://digit360.com.my/mjii/index.php/home/article/view/101/91>
- Martínez-Ardila, H., Castro-Rodríguez, Á., & Camacho-Pico, J. (2023). Examining the impact of university–industry collaborations on spin-off creation: Evidence from joint patents. *Heliyon*, 9(9), e19533. <https://doi.org/10.1016/j.heliyon.2023.e19533>
- Mashoto, K. (2022). Review and assessment of intellectual property policy implementation in Tanzanian universities and research institutions of health and sciences. *East African Health Research Journal*, 6(1), 43–51. <https://doi.org/10.24248/eahrj.v6i1.678>
- Ministry of Science, Technology and Innovation, Malaysia. (2009). *Intellectual Property Commercialisation Policy for Research & Development (R&D) Projects funded by the Government of Malaysia* (June 2009). Government of Malaysia. <https://mastic.mosti.gov.my/storage/2024/07/Intellectual-Property-Commercialization-Policy-June->

[2009.pdf](#)

- Ministry of Science and Technology (MOSTI). (2025). *TechMart*. <https://krste.my/v2/module/techmart>
- Mustafa, F. N., Salahuddin, N. M. S., & Abu Dardak, R. (2021). Commercialization of public funded agrobased technologies to SMEs in Malaysia: The roles of government research institutions and private firms. *FFTC Agricultural Policy Platform*. <https://ap.ffc.org.tw/article/2940>
- National Economic Advisory Council. (2010). *The new economic model for Malaysia: Part 1*. Prime Minister's Office, Malaysia. http://www.pmo.gov.my/dokumenattached/nEM_Report_I.pdf
- Organisation for Economic Co-operation and Development. (2015). *Boosting Malaysia's national intellectual property system for innovation*. OECD Publishing. <https://doi.org/10.1787/9789264239227-en>
- Wan Norhana, M. N. (2022). *Harta Intelek Institut Penyelidikan Perikanan* [Flipbook]. Jabatan Perikanan Malaysia. https://fri.dof.gov.my/penerbitan-buku-dan-manual/#flipbook-df_864/1/
- Wan Norhana, M. N., Liyana, R., & Kua, B. C. (2025). A case study on commercialization of agro-based R&D technology in Malaysia: Break and Protect 2, a marine leech trap. *International Journal of Innovation and Business Studies*, 20(1), 16–25. <https://doi.org/10.11113/ijibs.v20.173>
- World Intellectual Property Organization. (2021). *Harnessing public research for innovation in the 21st century: Impacts and policy challenges*. WIPO.
- World Intellectual Property Organization. (2024). *Models of intellectual property governance and administration*. WIPO. <https://doi.org/10.34667/tind.49741>