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S E A M E O
SEARCA

SUSTAINABILITY OF MALAYSIAN FISHERIES: Issues, Challenges & Future Prospects

2017/2018 SEARCA Regional Professorial Chair Lecture

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Institute of Agricultural and Food Policy Studies

March 21, 2018

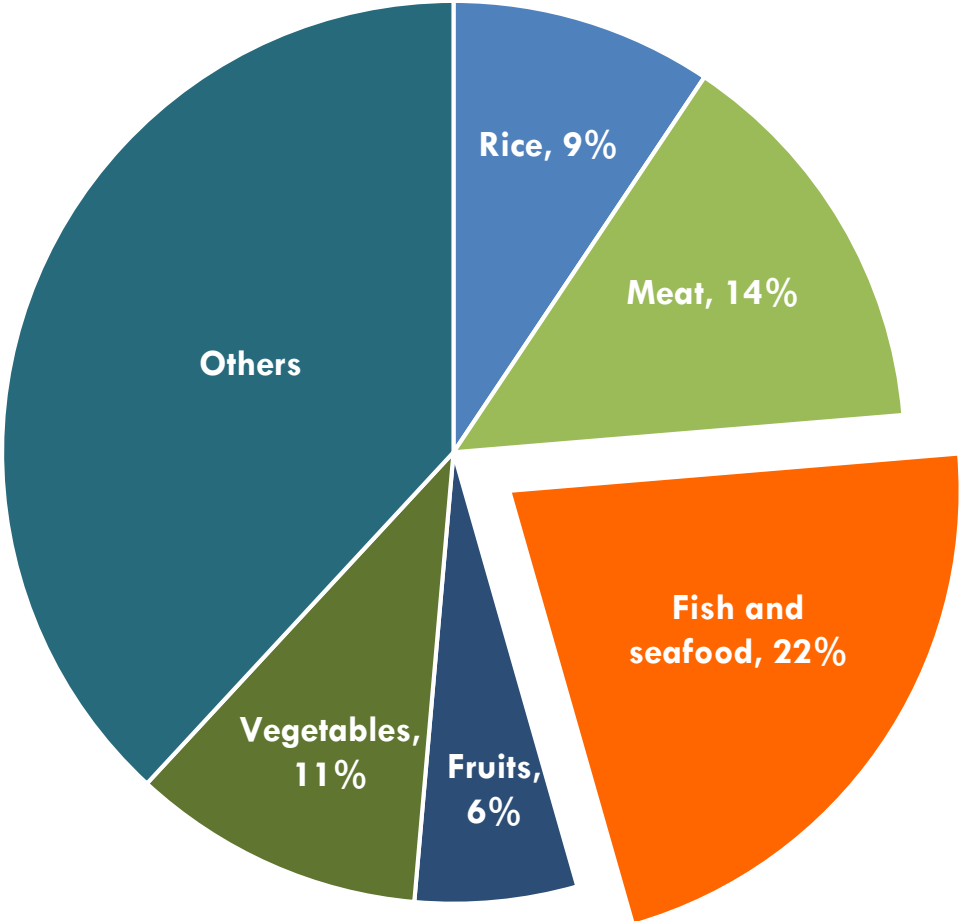
Phillip Kotler Hall, Faculty of Economics and Management

Universiti Putra Malaysia

UPM Serdang, Selangor, Malaysia

FISH IS THE MOST IMPORTANT FOOD IN MALAYSIA

Household Expenditure on Food in 2016



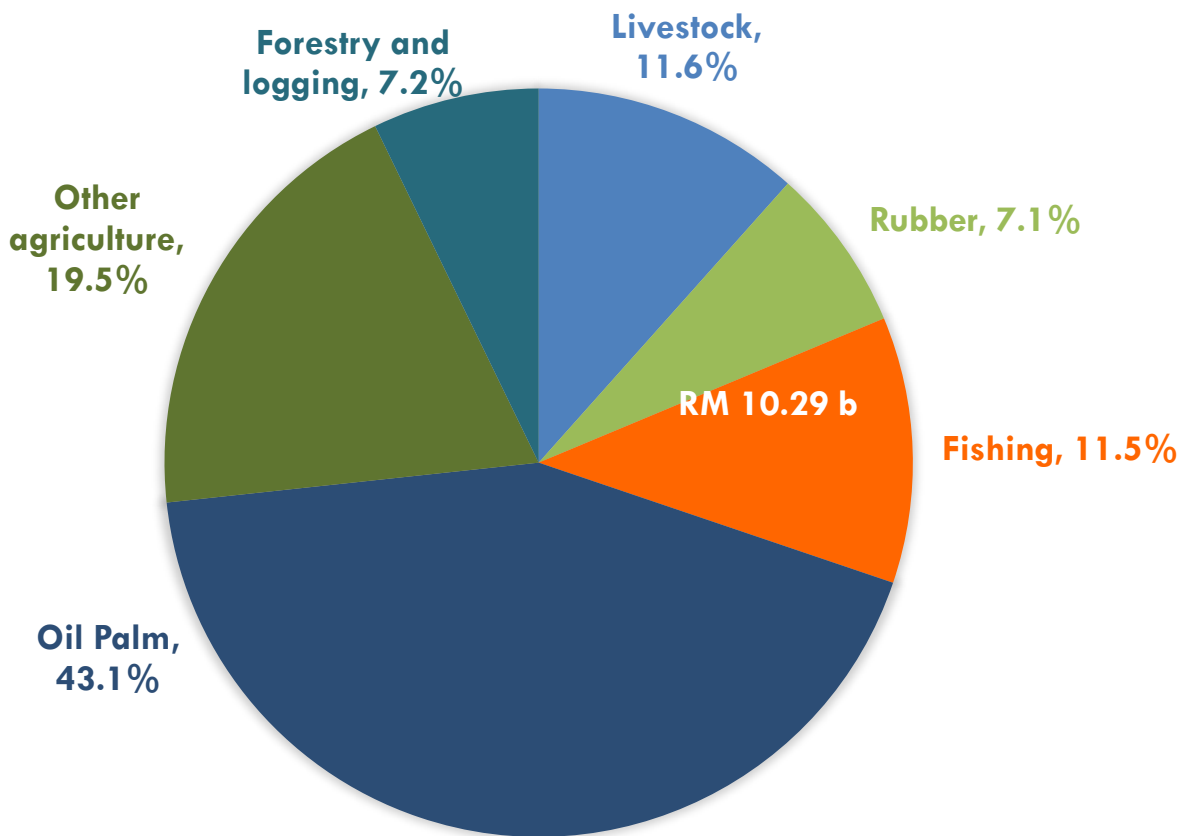
4% of total household expenditure is on fish and seafood
RM158 for a household with expenditure of **RM4033** a month

Source: DOS (2016)



ECONOMIC CONTRIBUTION OF FISHERIES

Share of Agriculture GDP 2016 by Different Sub Sector
(Constant 2010 Prices)



98,279 licensed fishers in 2016
Export value of **RM 2.8 billion** in 2016

Source: DOS (2016), MoA (2016)

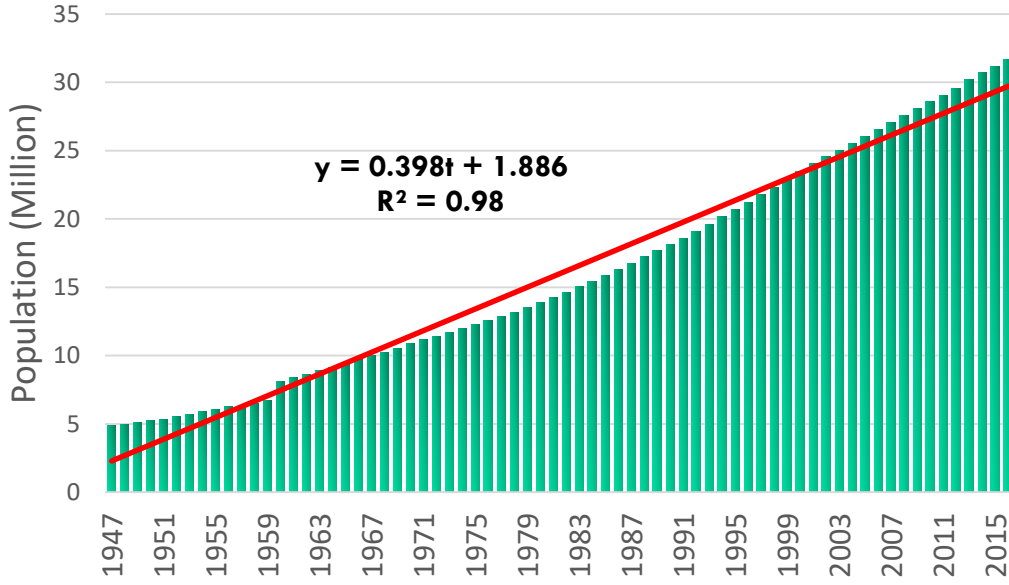


PRIMARY ISSUES

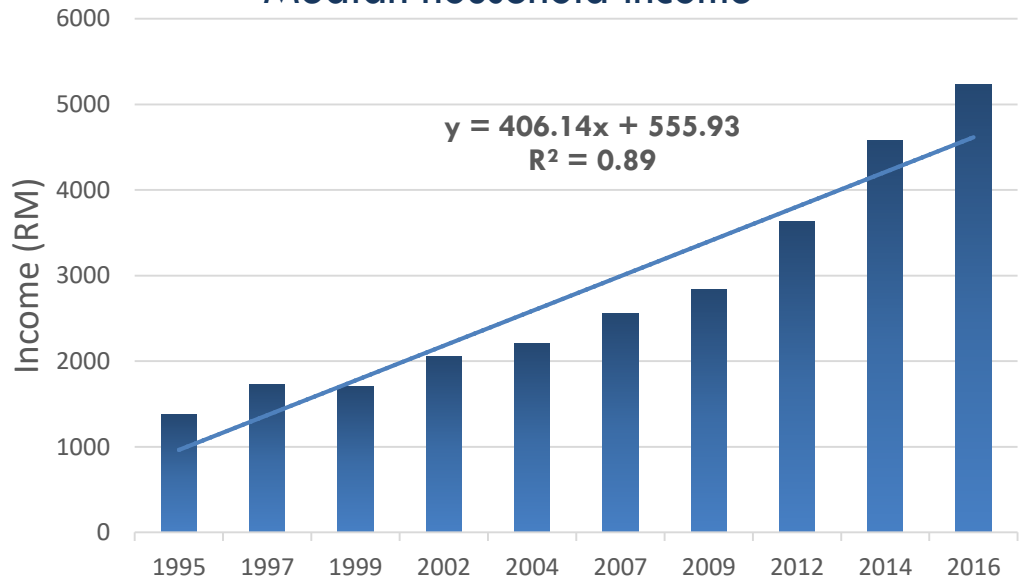
- Changes in **Population, Income, Consumption** (dietary patterns), **Technological Adoption**, and **National Agricultural Policy** necessitate an updated account of the current progress of the sector and a critical assessment of its sustainability based on the prevailing practice and policies

DEMOGRAPHIC & ECONOMIC CHANGES

Malaysian population over the years



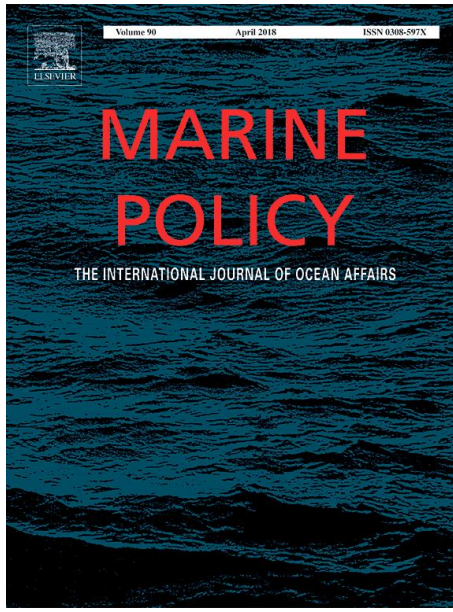
Median household income



Source: DOS (2016)

MAIN GAP

LIMITED STUDIES DONE SO FAR



BUTTERWORTH
HEINEMANN

1995

Marine Policy, Vol. 19, No. 2, pp. 115-126, 1995
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0308-597X/95 \$10.00 + 0.00

Development and management of Malaysian marine fisheries

Technical conservation measures

Abdul Hamid Saharuddin

The development and management of marine fisheries in Malaysia is described. The first section describes the development of the capture fisheries from the early stages until the present day, and is followed by a discussion of the problems and conflicts faced by the industry as a result of this development. The key issues regarding fisher conservation measures that need to be addressed are considered. In the final section, a conceptual model of fisheries with a management and development

Introduction

1992

Malaysian fisheries policy

Search for new grounds

Ishak Hj Omar, Kusairi Mohd Noh, Nik Mustapha Raja Abdullah and K. Kuperan

Past fisheries development policies in Malaysia are assessed and new grounds for managing the Malaysian fisheries are explored. Some incompatibility in the goals for fishery development are discerned, especially those of increasing domestic landings through mechanization and resource conservation. Future management efforts should be based on a fuller understanding of the fishery stock and regional management of fish stocks. Aquaculture is

The importance of the fisheries sector to the Malaysian economy is widely acknowledged. Its significance lies in three main areas: (1) as a source of animal protein, (2) as a source of employment, and, to a lesser extent, (3) as an earner of foreign exchange. Compared to capture fisheries, marine landings account for over 90% of national fish production. Catches more than doubled in the period 1965-85, rising from 198 377 tonnes in 1965 to 462 861 tonnes in 1985.¹ Most of this increase was due to technological developments; through the use of better fishing techniques, the replacement of fibre by

National management of Malaysian fisheries

1991

Mohd Ibrahim Hj Mohamed

The myth that fish in the sea are inexhaustible was shattered by the collapses of the anchovy fishery of Peru, the menhaden fishery of the USA and the serious depletion of the world's whale stocks. Although the collapses of these fisheries have been attributed to several factors – such as the climate, the el Nino current, environmental factors and interspecies relationships – the common denominator is that the effort directed to the fishery stock was much greater than that which would allow the fishery to regenerate itself, ie the stock was overfished.

As a renewable resource, fish can be exploited in perpetuity provided that harvesting does not destroy their capability for self-renewal. A prerequisite for the management of any particular resource is that somebody has the right, means and interest to control access to it. Clearly defined property rights to resources, ultimately enforced

OBJECTIVES

- The aim of this paper is to answer this question: **How sustainable is Malaysian fisheries?**
- This study employs an analytic framework of sustainable fisheries built on the three dimensions of sustainable development, namely economic, social, and environment.
- Conducts **systematic analysis of the sustainability of Malaysian fisheries** across its value chain from the production to consumption and trade.
- To account for the role of institutions, this study **evaluates the functions of fisheries-related agencies in the country**
- **Identify areas that should be further researched** and developed to ensure the sustainability of Malaysian fisheries

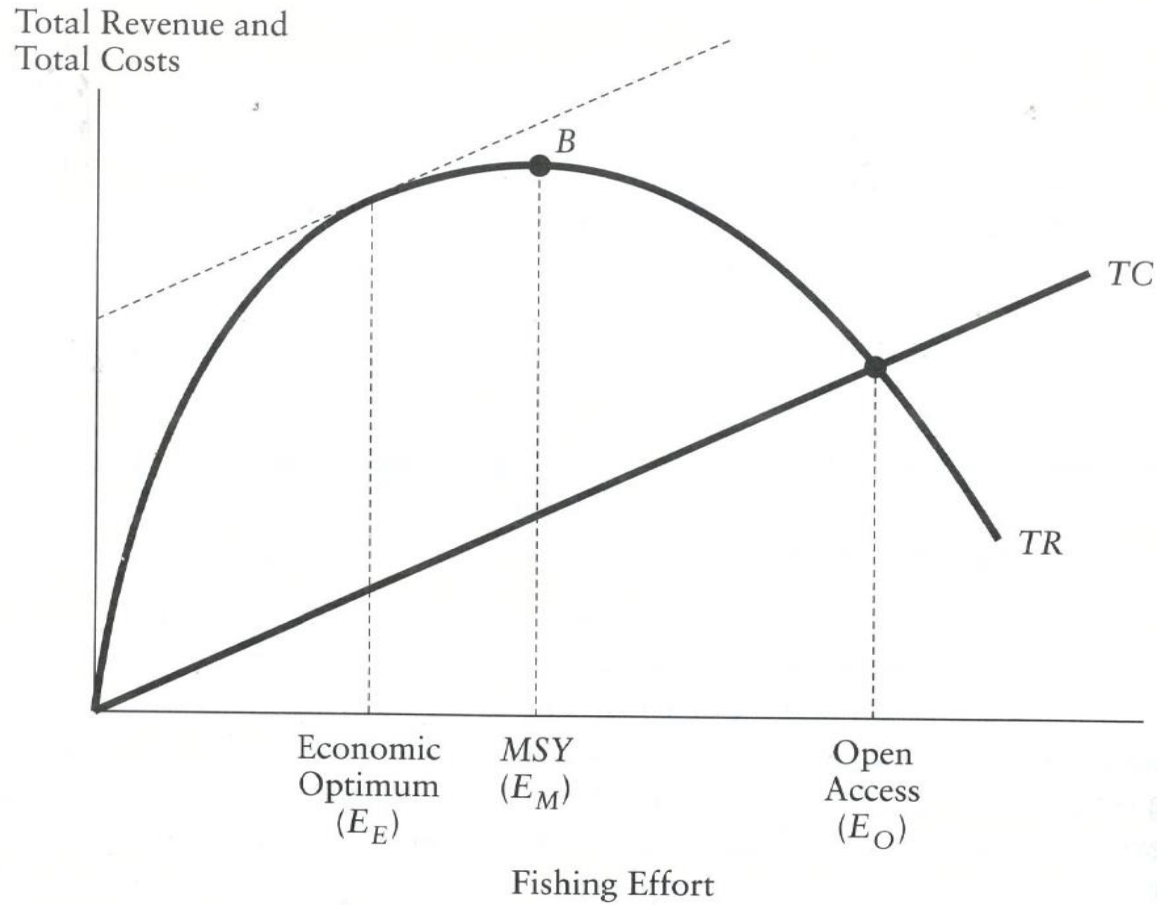
THEORY OF SUSTAINABLE FISHERIES

DEFINITION OF SUSTAINABILITY

- Brundtland Report (1987) defines sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”
- In fisheries management, sustainability is often referred to maintaining the catch level not to exceed the maximum sustainable yield

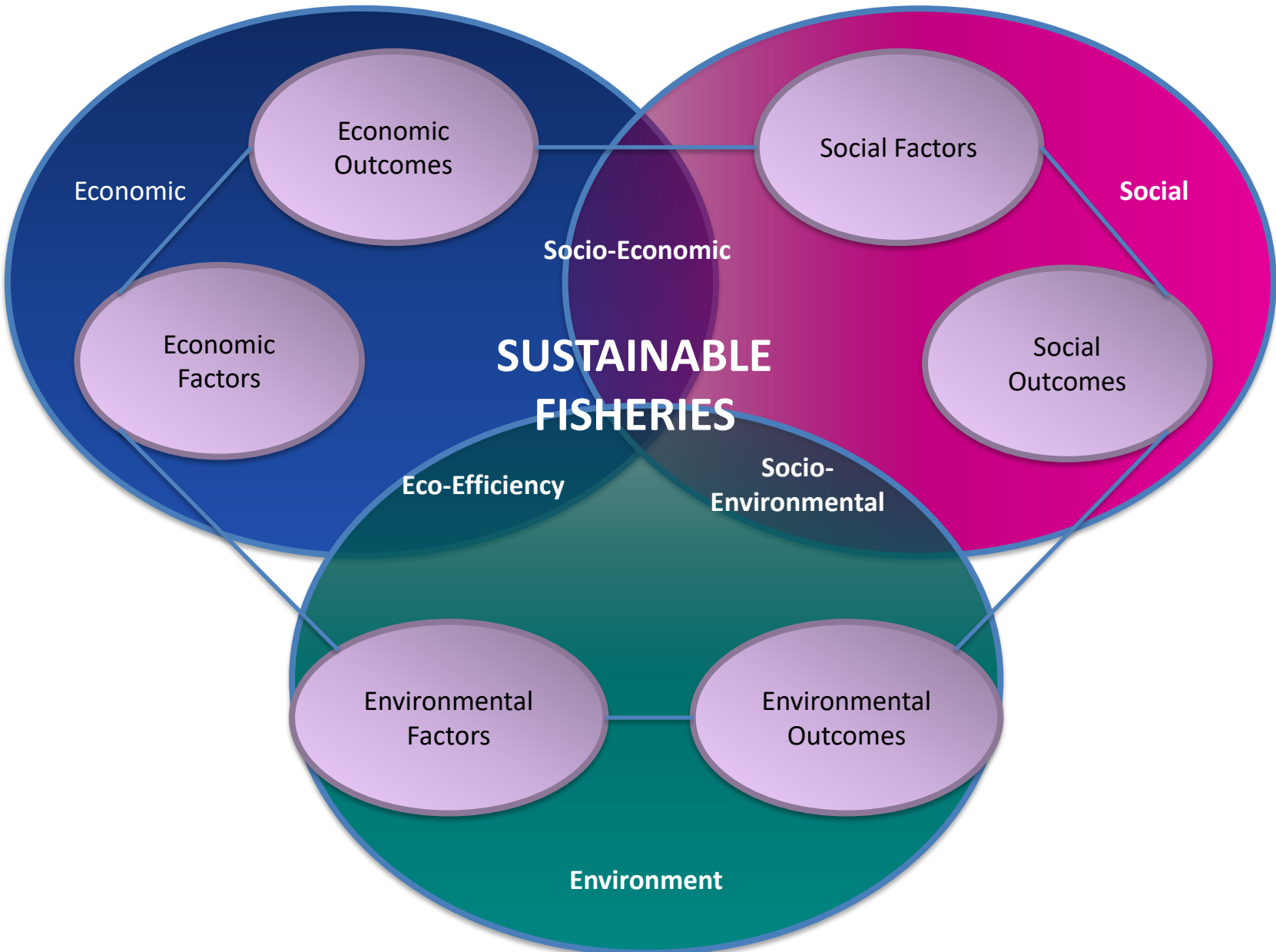
THEORY OF SUSTAINABLE FISHERIES

MAXIMUM SUSTAINABLE YIELD



METHODOLOGY

FRAMEWORK FOR SUSTAINABLE FISHERIES



THE THREE-DIMENSION FRAMEWORK

Economic, social, and environmental elements across fisheries value chain

	Economic	Social	Environment
Production	<ul style="list-style-type: none"> Physical capital ^(F) Technology ^(F) Labour & employment ^(F,O) Infrastructure ^(F,O) Industry's earning ^(O) 	<ul style="list-style-type: none"> Governance ^(F) Social capital ^(F) Demography ^(F) Community development ^(O) 	<ul style="list-style-type: none"> Fish stock ^(F,O) Water & climatic conditions ^(F,O) Ecosystem ^(F,O) Habitat ^(F,O)
Domestic Consumption	<ul style="list-style-type: none"> Price of fish ^(O) 	<ul style="list-style-type: none"> Food security ^(O) Taste ^(F) 	<ul style="list-style-type: none"> Waste ^(O)
Trade	<ul style="list-style-type: none"> Export earning ^(O) 	<ul style="list-style-type: none"> Health concerns ^(F,O) 	<ul style="list-style-type: none"> Uneven exploitation ^(O)

F: Factor

O: Outcome

ECONOMIC DIMENSION

- The economic dimension of sustainable fisheries concerns with efficient allocation of fisheries resources over time to maximize total welfare i.e. producer profits and consumer utility
- Open-access resources like fisheries present two external costs, **contemporaneous** cost and **intergenerational** cost
- Other economic goals of sustainable fisheries include **reducing poverty** especially among fishing community, **maintaining employment**, protecting **rural businesses** that are linked to fisheries sector, and ensuring fish **affordability**

SOCIAL DIMENSION

- The social dimension captures the human and communal elements of fisheries sector
- Social sustainability in the fisheries sector recognizes the fishermen as a community rather than merely a collection of individuals
- Thus, social goals include ensuring general welfare of the community, strengthening social cohesiveness, and ensuring public safety and health

ENVIRONMENTAL DIMENSION

- Environmental sustainability in fisheries involve maintaining
 - individual species stock at levels that would ensure their availability in the future
 - the quality of the ecosystem and habitat for fish growth
- The environmental factors can be roughly divided into two categories:
 - **Endogenous factors** are the results of the agents' behavior in the fisheries sector. For example, overfishing leads to diminishing fish stocks. Fishing activities may also produce externalities such as pollution and environmental degradation that also reduce fish stocks
 - **Exogenous factors** are factors from outside the system, for example coastal development, externalities from activities of other sectors such as oil and tourism industries, and anthropogenic global warming

ANALYSIS & DISCUSSION

INSTITUTIONAL FRAMEWORK & POLICY

Fisheries policy in Malaysia emphasizes the optimization of social yield, which essentially underlines two main elements:

- a. Managing and regulating the harvesting of fisheries resources to achieve optimum production for national food needs
- b. Increasing productivity, income, and socio-economic condition of fishermen and fish farmers (Mohamed, 1991)

ANALYSIS & DISCUSSION

INSTITUTIONAL FRAMEWORK & POLICY

Emphases placed by various agencies involved in Malaysian fisheries

Organization	Economic	Social	Environment
Department of Fisheries Malaysia (DOFM)	X		X
Fisheries Development Authority of Malaysia (LKIM)	X	X	
Malaysian Quarantine and Inspection Services (MAQIS)			X
Tekun Nasional	X	X	
Bank Pertanian Malaysia Berhad (Agrobank)	X	X	
Department of Marine Park Malaysia			X
Malaysian Maritime Enforcement Agency (MMEA)			X

ANALYSIS & DISCUSSION

INSTITUTIONAL FRAMEWORK & POLICY

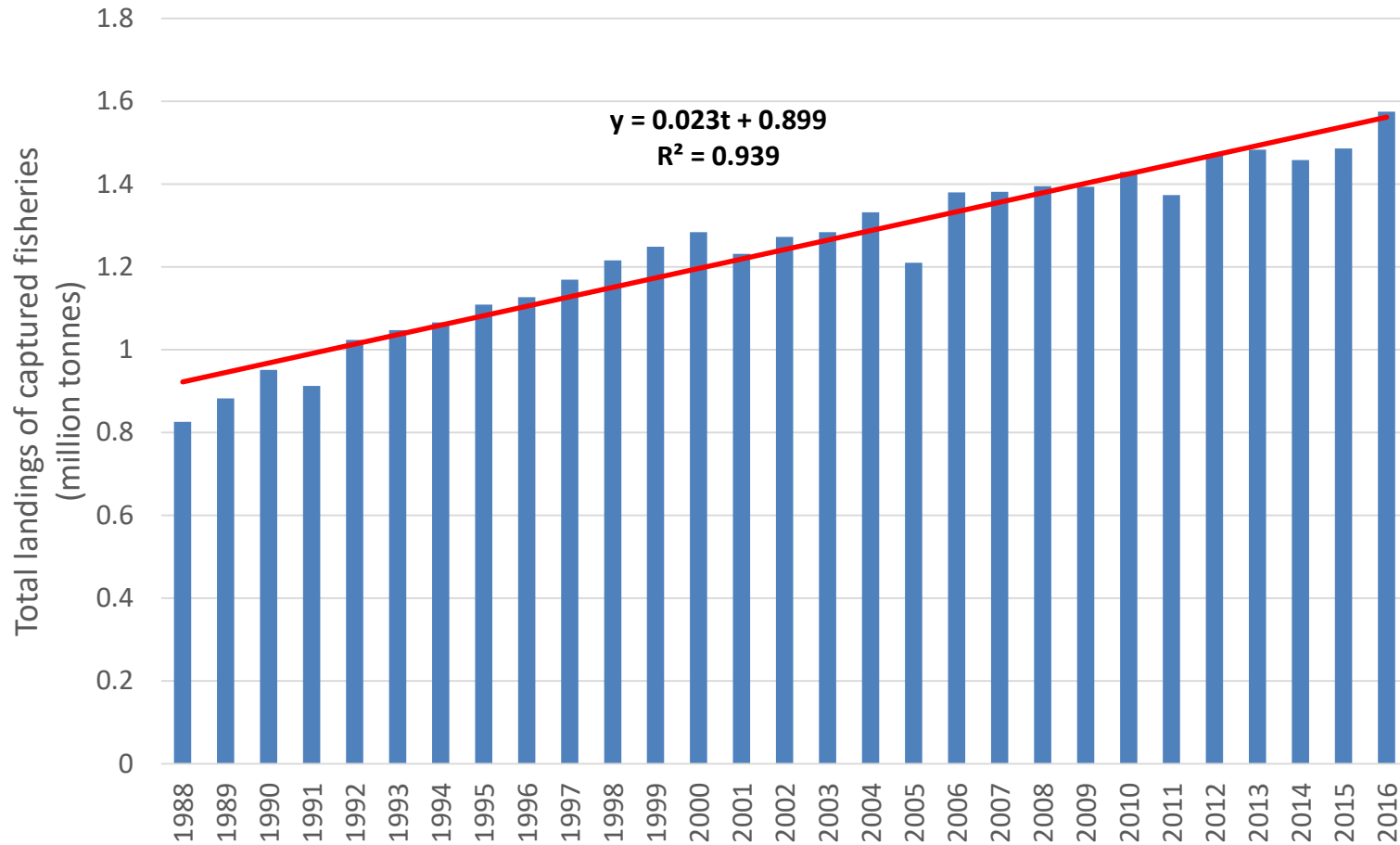
Economic, social, and environmental elements across fisheries value chain

Policy	Economic	Social	Environment
Economic Transformation Programme (ETP)	<ul style="list-style-type: none"> To transform small-scale production-based sector into large-scale agribusiness 		
National Agro-Food Policy (NAFP) 2011-2020	<ul style="list-style-type: none"> To improve the infrastructure of marine fisheries To develop human capital for offshore fisheries 	<ul style="list-style-type: none"> To realign the functions of DOFM and LKIM 	<ul style="list-style-type: none"> To develop efficient and sustainable capture fisheries
NPOA for the Management of Fishing Capacity in Malaysia - Plan 2 (NPOA 2)			<ul style="list-style-type: none"> To strengthen capacity and capability for monitoring and surveillance To implement effective conservation and management measures To promote public awareness and education program
NPOA to Prevent, Deter and Eliminate IUU Fishing (NPOA-IUU)	<ul style="list-style-type: none"> To ensure fair economic advantage 	<ul style="list-style-type: none"> To protect the security, safety and sovereignty of the country 	<ul style="list-style-type: none"> To ensure effective management for sustainable fisheries
Strategic Plan of Action for ASEAN Cooperation on Fisheries 2016-2020	<ul style="list-style-type: none"> To tackle the issues of quantity and quality of production and trade 	<ul style="list-style-type: none"> To tackle the issues of food security and small producers 	<ul style="list-style-type: none"> To tackle climate change issues

ANALYSIS & DISCUSSION

PRODUCTION

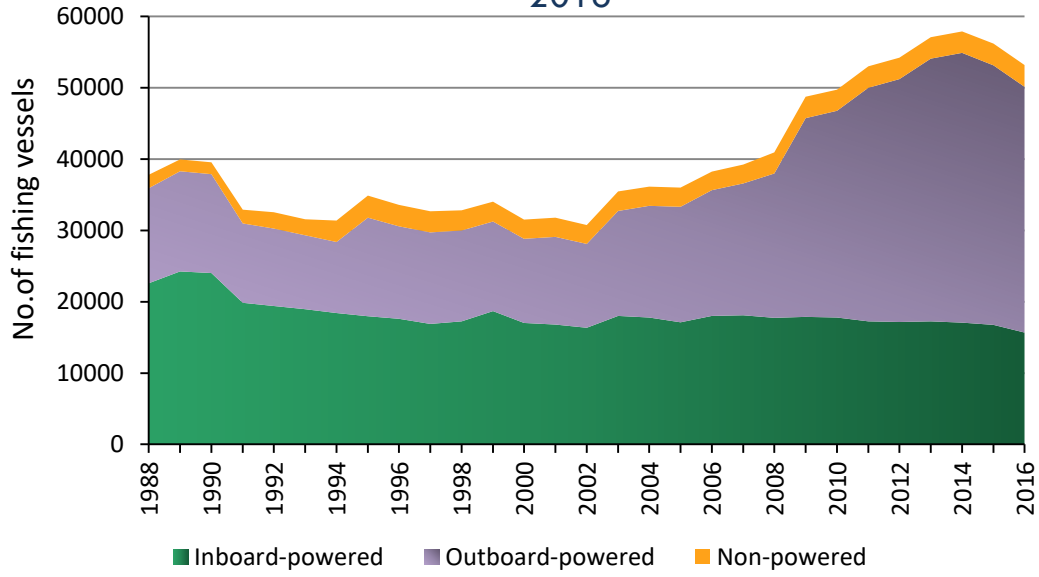
Marine capture landings in Malaysia, 1988-2016



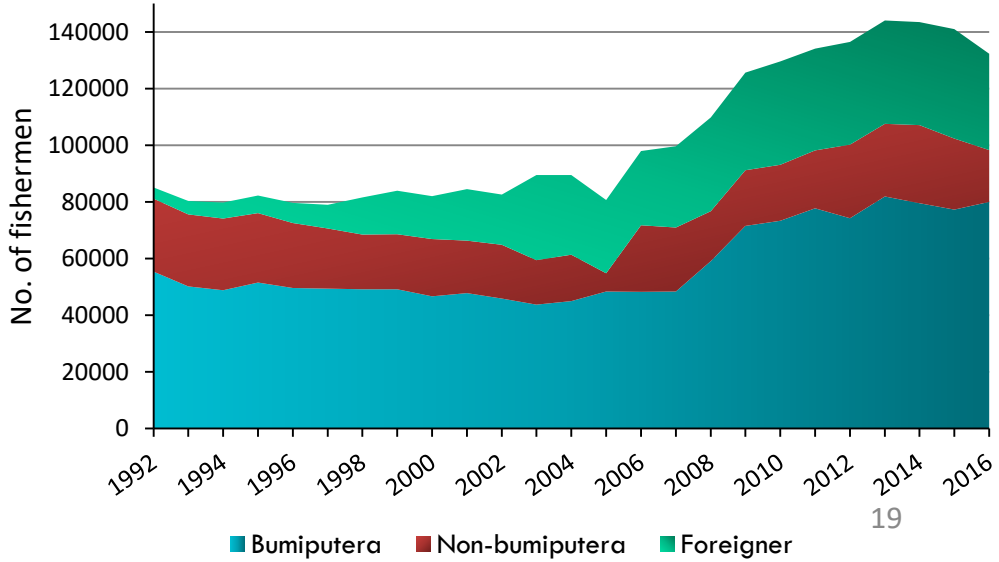
ANALYSIS & DISCUSSION

PRODUCTION

Number of fishing vessels in Malaysia, 1998 - 2016



Number of fishermen in licensed fishing vessels in Malaysia, 1992 - 2016

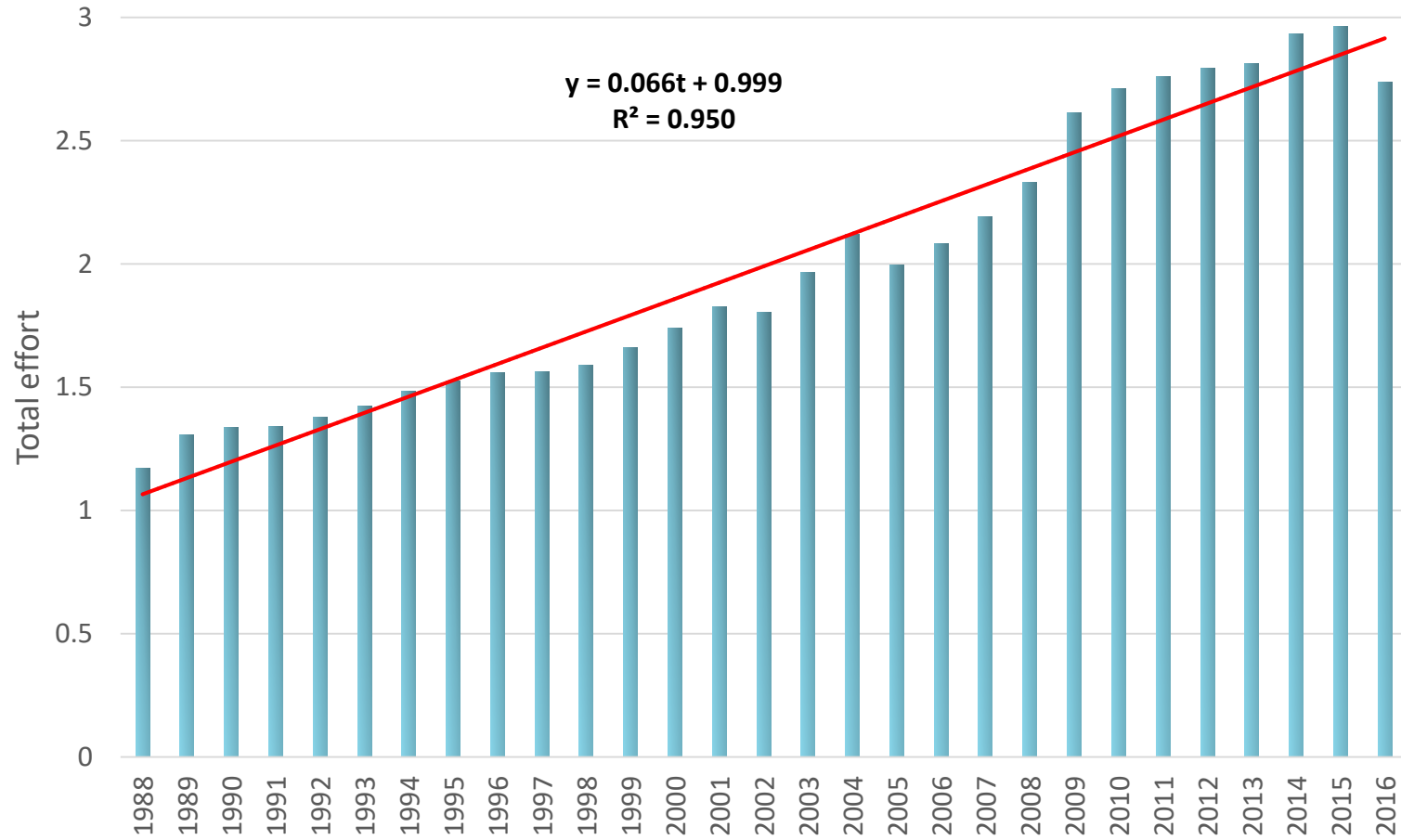


Source: DOFM (1992 - 2016)

ANALYSIS & DISCUSSION

PRODUCTION

Fishing effort in Malaysia, 1988 – 2016



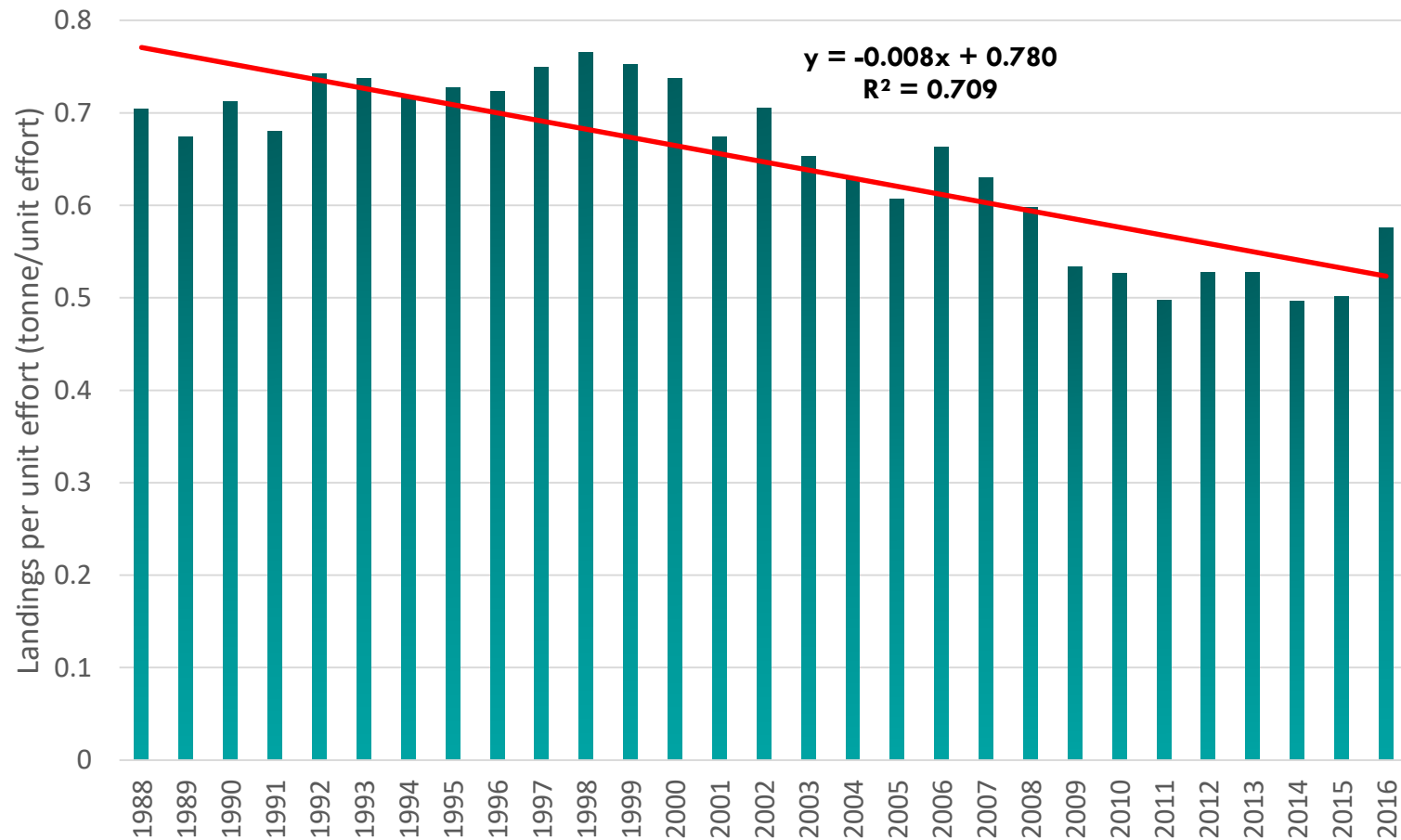
$$\text{Effort} = \sum_{i=1}^n V_i W_i$$

n : no. of vessels; V : vessel; W : weightage based on engine capacity

ANALYSIS & DISCUSSION

PRODUCTION

Landings per unit effort in Malaysia, 1988 – 2016



ANALYSIS & DISCUSSION

PRODUCTION

LKIM's fuel subsidy for fishermen, 2012 -2016

Year	No. of vessels receiving subsidy	Total amount (RM)
2012	52,309	1,603,112,302
2013	52,868	1,582,953,360
2014	53,389	1,237,539,863
2015	53,499	160,590,252
2016	54,107	70,589,565

ANALYSIS & DISCUSSION

PRODUCTION

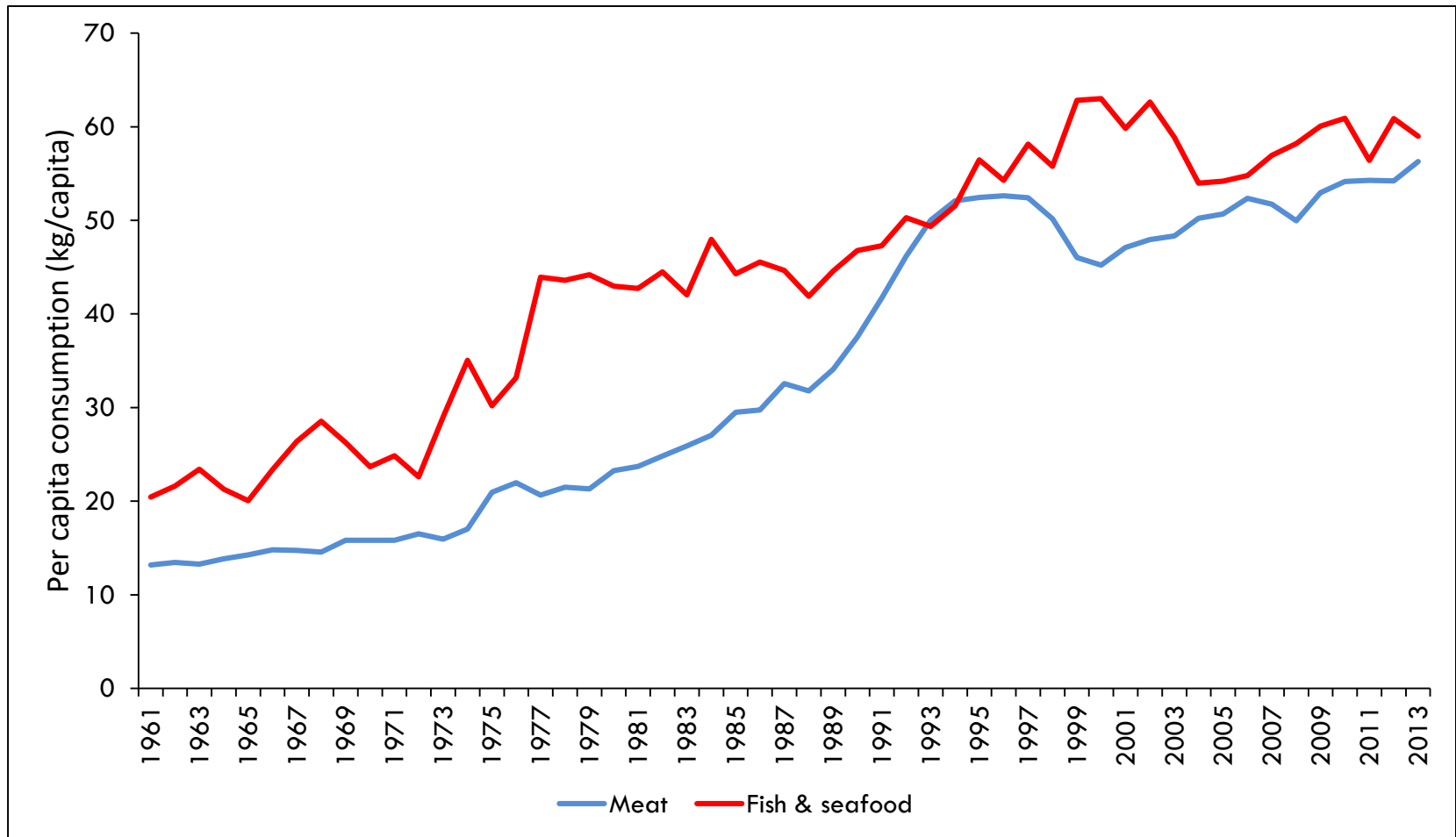
LKIM's landings incentive, 2012 – 2016

Year	Total Amount (RM)
2012	84,189,964
2013	75,470,043
2014	90,225,183
2015	33,100,509
2016	20,771,411

ANALYSIS & DISCUSSION

CONSUMPTION

Per capita consumption of meat and fish & seafood in Malaysia, 1963 - 2013



ANALYSIS & DISCUSSION

CONSUMPTION

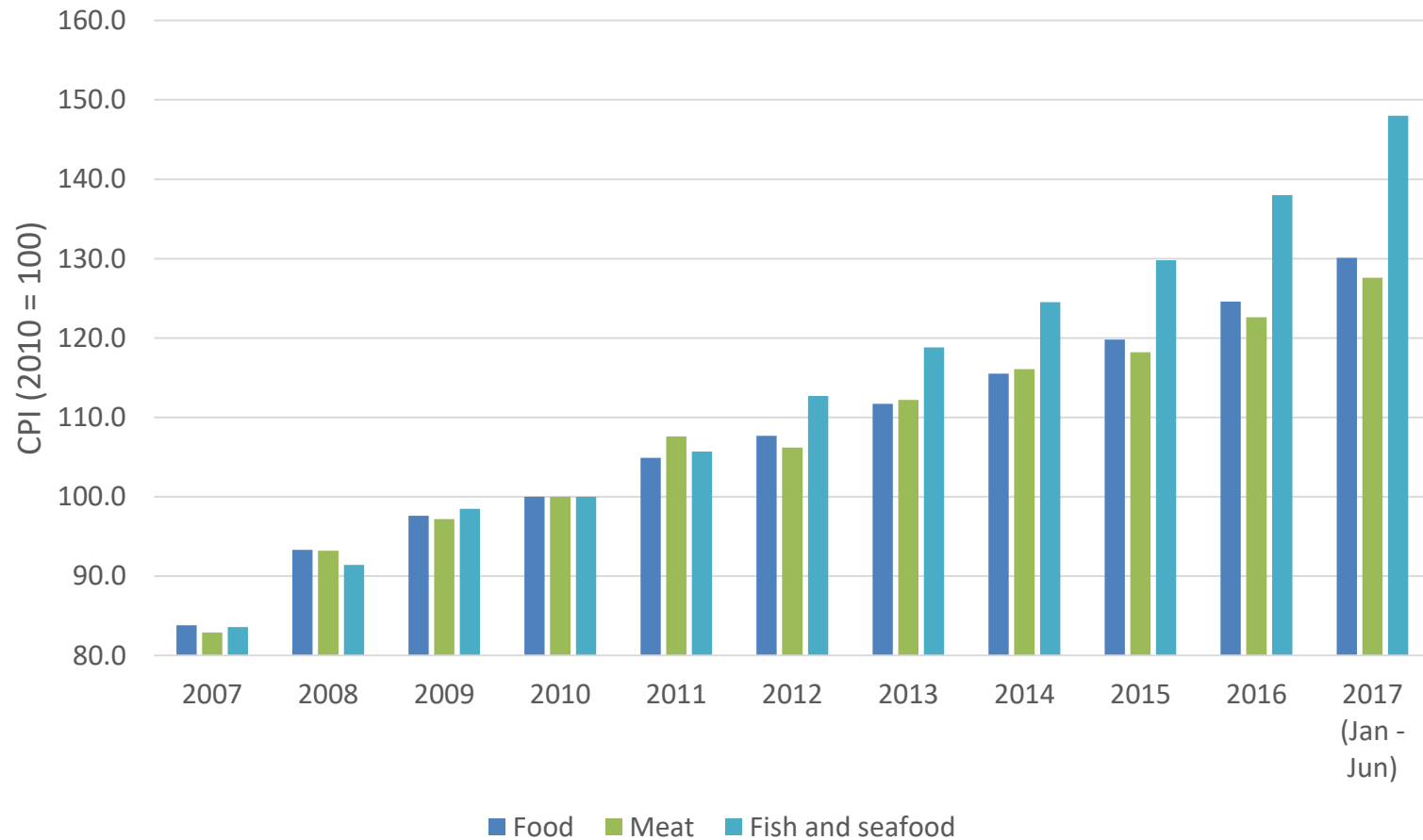
Quantity of per capita protein supply in Malaysia
(g/capita/day)

Year		1963	1973	1983	1993	2003	2013
Animal	Fish & seafood	6.76	7.86	12.31	13.91	16.97	17.61
	Bovine meat	0.63	0.45	0.78	1.61	2.30	2.6
	Poultry	1.29	2.33	4.00	10.37	11.00	13.29
	Mutton meat	0.15	0.09	0.13	0.16	0.18	0.32
	Pig meat	1.93	1.94	2.94	4.13	2.48	2.32
	Other animal product	4.28	5.63	8.3	10.16	8.8	9.26
	Sub-total	15.04	18.3	28.46	40.34	41.73	45.4
Non-animal		34.69	35.29	31.74	31.3	34	36.18
TOTAL		49.73	53.59	60.2	71.64	75.73	81.58

ANALYSIS & DISCUSSION

CONSUMPTION

Consumer price index for food, meat, and fish & seafood in Malaysia (2010=100), 2007 – 2017 (January-June)



ANALYSIS & DISCUSSION

TRADE

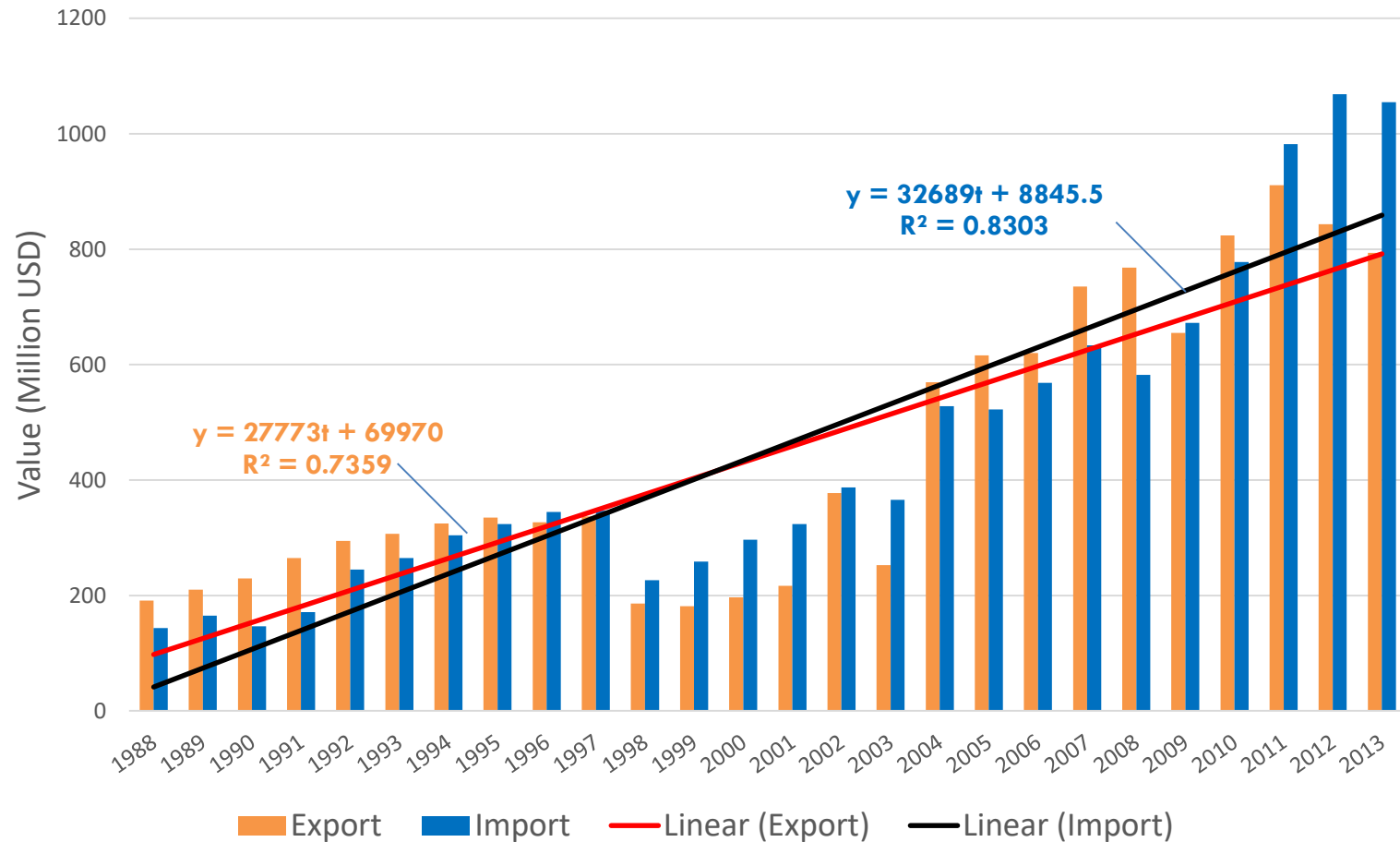
Malaysia's self-sufficiency level for fish & seafood, 2007-2013

Year	Fish & seafood	Shrimp	Tuna	Mackerel	Crab	Cuttlefish
2007	92.0	137.8	99.0	83.4	91.9	157.7
2008	94.2	154.0	106.3	87.7	87.8	159.1
2009	91.8	124.4	99.9	85.1	80.1	127.3
2010	93.1	125.9	101.0	84.9	77.4	122.7
2011	95.9	123.4	97.8	83.1	86.7	120.3
2012	92.1	110.9	98.3	83.1	68.8	113.4
2013	88.9	103.4	97.9	86.5	80.2	109.6

ANALYSIS & DISCUSSION

TRADE

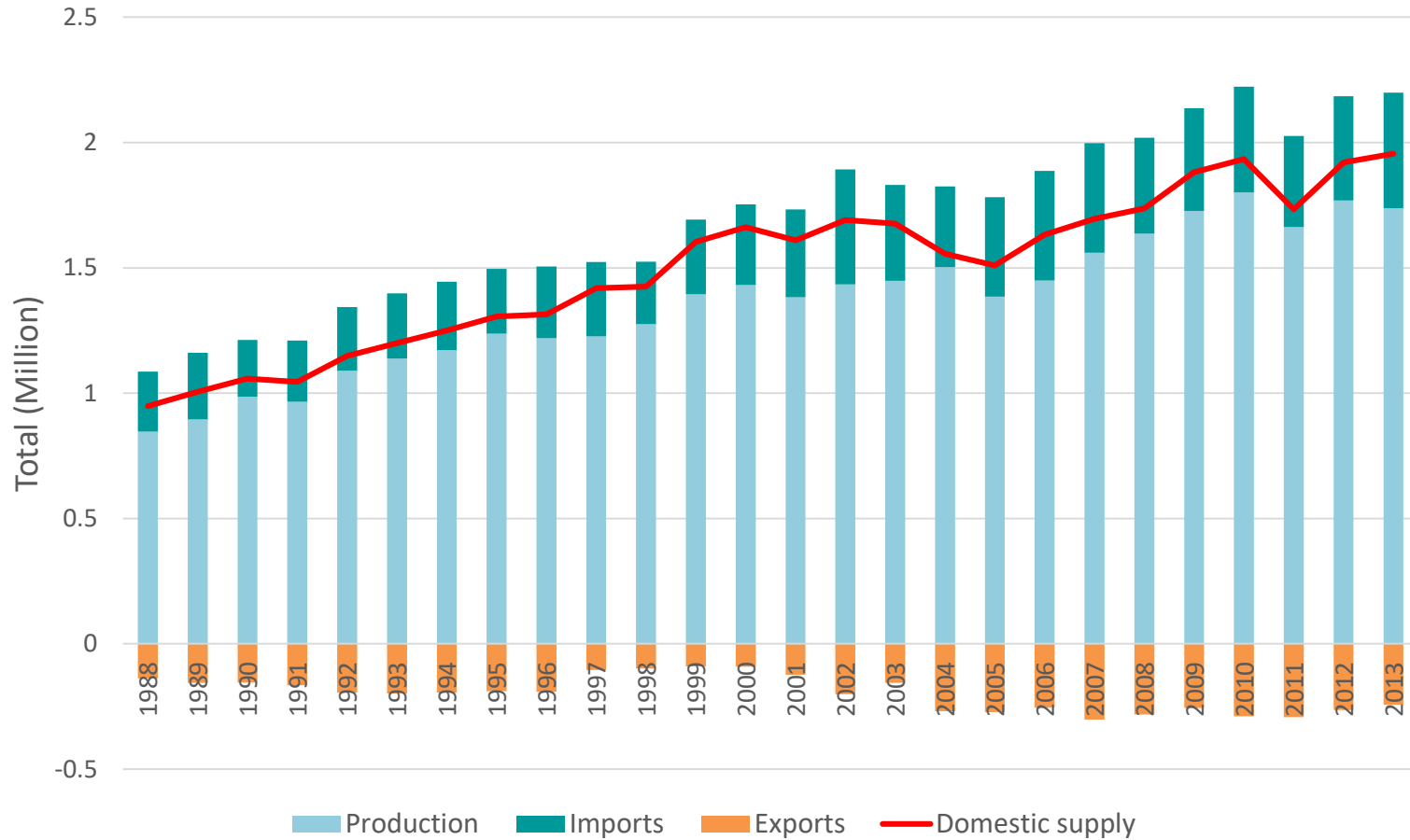
Malaysian export and import of fish & seafood, 1988 – 2013



ANALYSIS & DISCUSSION

TRADE

Malaysian production, export, import, and domestic supply of fish, 1988 – 2013



Source: Fisheries and Aquaculture Department, FAO (2017)

Notes:

- i. Domestic supply is the sum of production and import less export. Variations in stock are negligible.
- ii. Export quantities are represented in negative numbers in the graph to indicate the otherwise contribution to domestic supply.

SUSTAINABILITY OF MALAYSIAN FISHERIES

ECONOMIC

POSITIVE

Various programs were established to increase the production and profit of the fisheries sector including credit facilities

Continuous improvements in infrastructure



NEGATIVE

Most fishermen are still dependent on subsidies and financial assistance that continuously put pressure on government's budget

Increasing dependency on foreign labour

The price of fish rises at a higher rate than other food products

SUSTAINABILITY OF MALAYSIAN FISHERIES

SOCIAL

POSITIVE

Under the NAFP, government has started the initiative to encourage community-based fisheries management



NEGATIVE

The standard of living of the fishing community is still sub-standard

Ageing fishers and rural-urban migration may hinder labour productivity and technical progress

SUSTAINABILITY OF MALAYSIAN FISHERIES

ENVIRONMENT

POSITIVE

Conservation efforts through marine parks and fish refugias may help to preserve fish stock



NEGATIVE

Declining catch per unit effort raises red flag on dwindling fish stock

Policy measures marginally address the protection of ecosystem and habitat

The threat of climate change is not well addressed

THE WAY FORWARD

ECOSYSTEM-BASED FISHERY MANAGEMENT

- EBFM is a new direction for fishery management
- Reverses the order of management priorities so that management starts with the ecosystem rather than a target species
- Aims to sustain healthy marine ecosystems and the fisheries they support

THE WAY FORWARD

ECOSYSTEM-BASED FISHERY MANAGEMENT

- Requires committed and concerted efforts from all agencies and stakeholders
- Conflicting organizational goals among agencies hinders EBFM efforts
- Needs scientific and technical collaboration among researchers and policy-makers from different fields including biological science, marine science, economics, management, data science, and law
- Should be open for different policy options for EBFM to work. For example, with Malaysia has only recently started to conduct pilot projects on the implementation of the Individual Quota System (IQS) through Total Allowable Catch (TAC)
- Should also explore the feasibility and potential advantage of adopting effort-rights based management through Total Allowable Effort (TAE) as well as hybrid management
- Squires et al. (2017), argue for hybrid management that combines the features of catch and effort rights to address multiple externalities related to by-catch and the ecosystem.

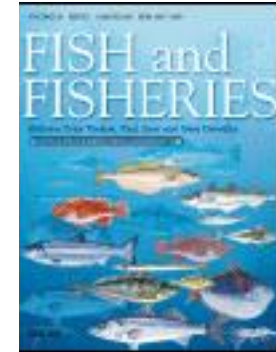
THE WAY FORWARD

ECOSYSTEM-BASED FISHERY MANAGEMENT

FISH and FISHERIES



FISH and FISHERIES



Effort rights-based management

Dale Squires¹, Mark Maunder², Robin Allen^{3,†}, Peder Andersen⁴, Kepa Astorkiza⁵, Douglas Butterworth⁶, Gonzalo Caballero⁷, Raymond Clarke⁸, Hans Ellefsen⁹, Patrice Guillotreau¹⁰, John Hampton¹¹, Rögnvaldur Hannesson¹², Elizabeth Havice¹³, Mark Helvey^{14,a}, Samuel Herrick Jr^{14,a}, Kjartan Hoydal^{15,†}, Vishwanie Maharaj¹⁶, Rebecca Metzner¹⁷, Iago Mosqueira¹⁸, Ana Parma¹⁹, Ivan Prieto-Bowen²⁰, Victor Restrepo²¹, Shaufique Fahmi Sidique²², Stein Ivar Steinsham¹², Eric Thunberg²³, Ikerne del Valle⁵ & Niels Vestergaard²⁴

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THE WAY FORWARD

AQUACULTURE & BIOTECHNOLOGY

- The potentials of aquaculture can further be developed through the advancement in biotechnology as a means to enhance productivity via improved yield and quality of production
- Potential benefits include improving growth rate and cost effectiveness; increasing resistance to environment and pathogens; improving brood-stock quality and control reproduction; and creating new and better products
- The main challenges in the application of biotechnology in Malaysia are quoted as limited financial resources, lack of qualified personnel, less optimal structure for cutting-edge research, and limited international collaboration

THE WAY FORWARD

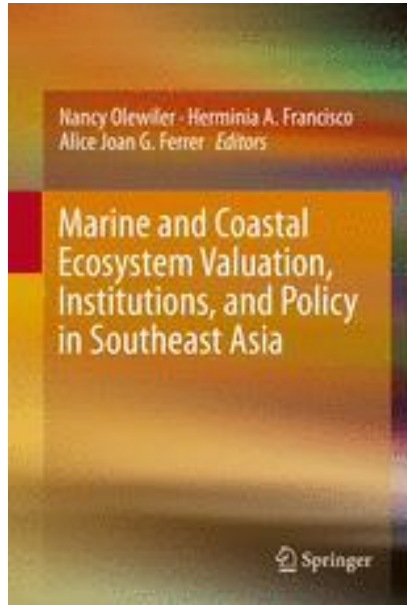
ARTIFICIAL REEFS

- Artificial reefs serve a variety of different purposes
 - to prevent the degradation of natural habitat, ecosystem and biodiversity
 - to improve the biomass, and therefore the availability, of specific commercial fish species by increasing their survival, growth and reproduction
 - to promote tourism and leisure activities
 - for scientific research and educational purposes (United Nations Environmental Programme [UNEP], 2009)



THE WAY FORWARD

ARTIFICIAL REEFS



Chapter 16

The Impacts of Artificial Reefs on the Income of Artisanal Fishers in Terengganu, Malaysia

Shaufique Fahmi Sidique, Kusairi Mohd Noh, Gazi Md Nurul Islam, and Aswani Farhana Mohd Noh

Abstract The marine fishery resources in Malaysia have declined considerably over the past decades primarily due to overfishing and overcapacity. In response, the government has deployed artificial reefs (ARs) to conserve and enhance the natural fish stocks in marine waters. Specifically, AR deployment was expected to rehabilitate the degraded fish stocks and secure the livelihoods of the fishers along the coastal villages. This study examined the impact of ARs on fisher households' income in Terengganu, Malaysia. The data for this study was obtained from a survey involving 312 fisher respondents in 3 contiguous districts, namely, Besut, Setiu, and Kuala Terengganu. The results showed a difference in the value of catch of fishers fishing in an AR and those fishing in non-AR area. Fishers fishing near AR areas were found to benefit from higher monthly catch value. The regression models indicated that fishing in an AR area helps reduce the vessel operating costs. The catch value also significantly differed between fishers using an inboard-powered vessel and those fishers using outboard-powered vessels (on an average obtained MYR 5935 per month and MYR 3126 per month, respectively). Fishers using inboard-powered vessels were also less dependent on ARs as they were able to fish further to the sea.

Keywords Artificial reefs • Terengganu • Fisher's income • AR deployment • Malaysian fisheries



Economic impact of artificial reefs: A case study of small scale fishers in Terengganu, Peninsular Malaysia

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ABSTRACT

This paper examines the economic benefits of artificial reefs (ARs) on artisanal fishers in Terengganu in the east coast of Peninsular Malaysia. The data for this study was obtained from interviews with 290 artisanal fishers from three districts of Terengganu, using a structured questionnaire. The study found that for fishers, income from fishing was significantly lower in AR areas, compared to non-AR areas. The income of the fishers who used drift nets as their main fishing gear was significantly lower in AR areas. This indicates that income from fishing was not attributable to the AR programme in Malaysia. The results suggest that artificial reefs may not be effective at increasing catch and income for artisanal fishers in Terengganu. Furthermore, the larger-engined boats gained substantial fishing income, which seems to reflect unequal distribution of benefits, because only those who could invest in fishing equipment and who spent more on fishing operations were able to gain maximum benefits. The results suggest that the current use of multiple gear in the same fishing locations created conflicts between various groups of fishers, and increased fishing costs. These conflicts could be reduced if the artificial reef locations are clearly marked and they established user rights among various fisher groups. The fisheries agencies involved in artificial reefs programme should ensure that artificial reef development produces positive social and economic benefits for the local fishing communities through sustainable fisheries management in Malaysia.

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*Strengthening local capacity
in the economic analysis
of environmental issues*

The Economy and Environment Program for Southeast Asia (EEPSEA) was established in May 1993 to support training and research in environmental and resource economics across its 10 member countries (i.e., Cambodia, China, Indonesia, Lao PDR, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, and Vietnam.)
It aims to strengthen local

Do Artificial Reefs Help the Environment and Fishers? An Assessment from Malaysia

Marine fishery resources in Malaysia have declined considerably over the past few decades, primarily due to overfishing. Excessive fishing has also damaged key marine habitats, which is a serious concern for the Malaysian government. To try to enhance natural fish stocks, the government has championed the use of artificial reefs (ARs), which are designed to rehabilitate degraded fish stocks and to secure the livelihood of the artisanal fishing communities that live along the country's coasts.

THE WAY FORWARD

ARTIFICIAL REEFS



Economic Impacts of Artificial Reefs: The Case of Fisher Households in Peninsular Malaysia

Shaufique Fahmi Sidique, Kusairi Mohd Noh, Gazi Md Nurul Islam
and Aswani Farhana Mohd Noh



THE WAY FORWARD

IMPROVING SUPPLY CHAIN – FROM FISHERS TO CONSUMER

- Issues related to supply chain include high post-harvest loss, inefficient marketing and distribution system, multiple tiers of middlemen, and ineffective extension services.
- High post-harvest loss is attributed to the lack of sound fisheries practices, inefficient catching equipment and technologies, poor storage facilities and logistics, and inadequate knowledge of post-harvest handling
- The problem of multiple tiers of middlemen in agriculture sector including in fisheries sector is very prevalent in Malaysia. The lack of financial capacity and knowledge for marketing activities among the fishermen has contributed to the presence of powerful middlemen. The existence of multiple tiers of middlemen results in high consumer fish price yet low fishermen's income