GOVERNMENT OF MALAWI

National Aquaculture Strategic Plan

(2021 – 2031)

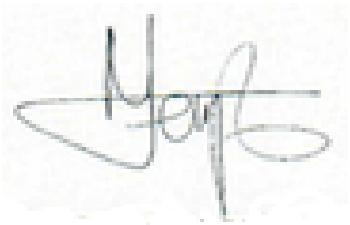
11th November 2021

FOREWORD

The Government of Malawi through Ministry of Forestry and Natural Resources has developed this second edition of the National Aquaculture Strategic Plan in order to guide the transformation of the fish farming sector. Over the past four decades, Malawi has experienced a steady decline in the quantity of fish being harvested from our lakes, rivers and floodplains. While we have closed the demand gap with imports, aquaculture is the only answer to our long-term sustainable fish supply. Additionally, farmed fish will provide farmers with the opportunity to supplement their farming incomes; and contribute to the government's million jobs target.

The strategy provides a policy shifts towards transformation of fish farming into financially viable businesses, regardless of whether they are small or large scale enterprises. This shift is in line with the Malawi 2063. In this regard, the strategy will enable farmers to exploit the wealth-generation potential of aquaculture, while fish will provide rural-urban linkages by taking advantage of the rising demand for fish in our cities and towns. This strategy is coherent with the SADC Regional Aquaculture Strategy and Action Plan (2016-2026), the Pan-African Policy Framework and African Fisheries Reform Strategy as well as the FAO's Code of Conduct for Responsible Fisheries. Particularly, the strategy is informed by the recently SADC Aligned National Aquaculture Strategy, and some of its actions will enable our fish farmers to deepen their regional integration benefits.

Coherence and coordination are key to success in delivering on the goals of this strategy. Therefore, I am calling up on all aquaculture stakeholders, including development partners, commercial and development finance institutions, to join hands in the implementation of this strategy, for the benefit of our fish-dependent communities. Since aquaculture is one of the most efficient ways to produce protein, I am confident that this Strategy will be a Call to Action towards diversified and nutritious diets in Malawian. It is my ministry's utmost commitment to provide leadership in the realisation of the outcomes that have been laid out in this strategy.



Honourable Nancy Tembo, MP.
Minister of Forestry and Natural Resources

PREFACE

Malawians are some of the greatest fish eaters in the SADC region, as our pet capita consumption is closer to the recommended by the World Health Organisation. Therefore, a drive to increase production of farmed fish will not only sustain our ever-rising demand for fish, but aquaculture will make significant contribution to Malawi's food systems. The strategy further reinforces the direction towards delivery on the National Fisheries and Aquaculture Policy of 2016, while at the same time contributes towards the Malawi 2063's agricultural productivity and commercialisation pillars. The strategy has demonstrated that prices of farmed fish are higher than other farm products, especially crops. Therefore, the rising demand for fish is an opportunity for better incomes for fish farmers.

I recognise the importance of better coordination, therefore, the strategy has put in place a robust mechanism to ensure that all efforts by investors and players within the fish supply chain, as well as development partners, are coherent with the objectives of the strategy. The strategy comes at an opportune time when the Ministry of Finance has waivered value-added-tax on imported fish feeds and equipment for manufacturing feeds. Concrete actions have been developed to ensure that the sector can take advantage of the VAT removal, in order creating a vibrant aquaculture industry, able to create many jobs and taxable surplus.

The development process of the strategy was participatory and this inspires the spirit of partnership and collaboration. Therefore, I appeal to all fish farming stakeholders to partner with the Ministry of Forestry and Natural Resources in order to support the implementation of this Strategy.

Yanira Ntupanyama, PhD.
Secretary for Forestry and Natural Resources

ACKNOWLEDGEMENT

The National Aquaculture Strategic Plan (second edition) has been developed through a consultative and analytical process, collective efforts, support of a number of organisations and within government and partner institutions in Malawi and in the SADC region. The Department of Fisheries, led the process, on behalf of the Ministry of Forestry and Natural Resource. Sincere gratitude goes to the team of experts from the various organisations for the technical reviews to the Strategy, these are Prof. Emmanuel Kaunda, Dr. Alfred Maluwa, Dr. Elias Chirwa. The Department of Fisheries wishes to thank all stakeholders, especially fish farmers and key value chain players, who participated in the consultations and validation meetings for their valuable inputs.

The Department of Fisheries is indebted to "Aquaculture Value Chain Project for Higher Income and Food Security" (AVCP) funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit GmBH (GIZ) for the technical and financial support that assisted with the development of this second National Aquaculture Strategic Plan (NASP II). Lastly but not least, Dr. Sloans Chimatiro deserves special mention for developing this second edition of NASP. The consultant worked with the Department of Fisheries NASP II Task Force, which provided the technical guidance to the development of NASP.

Friday Njaya, PhD.
DIRECTOR OF FISHERIES

TABLE OF CONTENTS

ABBREVIATIONS

AU	African Union
AVCP	Aquaculture Value Chain Project
CAADP	Comprehensive Africa Agriculture Development Program
ECOWAS	Economic Community of West African States
EAC	East African Community
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
FAO	Food Agricultural Organization of the United Nations
FCR	Feed Conversion Ratio
GDP	Gross Domestic Product
GoM	Government of Malawi
GoU	Government of Uganda
IFFNT	Innovative Fish Farmers Network Trust
MAIIC	Malawi Agricultural and Industrial Investment Corporation
NAP	National Agriculture Policy
NAIP	National Agriculture Investment Plan
NBS	New Building Society
NPC	National Planning Commission
NASP	National Aquaculture Strategic Plan
PO	Producer Organizations
PFRS	Reform Strategy for Fisheries and Aquaculture in Africa
PPP	Public Private Partnership
SNRL	Strengthening the National-Regional Linkages in SADC
SOFIA	State of World Fisheries and Aquaculture
UNSDG	United Nations Sustainable Development Goal

GLOSSARY

Aquaculture: the planned and controlled farming of aquatic organisms including fish, mollusks, crustaceans and aquatic plants.

Cage culture is the raring of fish and other aquatic organs in closed systems immersed in water for purposes of rearing the organisms in captivity in open water bodies. Cage culture uses existing water resources (ponds, rivers, estuaries, open ocean, etc.) but confines the fish inside some type of mesh enclosure. The mesh retains the fish, making it easier to feed, observe and harvest them. The mesh also allows the water to pass freely between the fish and surrounding water resource, thus maintaining good water quality and removing wastes.

Aquaculture parks: A shared facility, purpose-built for aquaculture research, education and commercial development.

Production systems: referring to fish farming systems at various scales including in tanks cages with no less than 360 square foot. In the case of the aquarium, it can be no less than 20 gallons.

Integrated fish farming: System of producing fish in combination with other agricultural/livestock farming operations centred around the fishpond. The farming sub-systems e.g. fish, crop and livestock are linked to each other in such a way that the by-products/wastes from one sub-system become the valuable inputs to another sub-system and thus ensures total utilization of land and water resources of the farm resulting in maximum and diversified farm output with minimum financial and labour costs

Extensive farming: Raising fish under conditions of little or incomplete control over the growing process and production conditions where their growth is dependent upon endogenously supplied nutrient inputs.

Intensive farming: Means raising fish under controlled growing process and production conditions where their growth is completely dependent on externally supplied fish feed.

Social and community sustainability: Aquaculture must be socially responsible and contribute to community well-being.

Executive summary

The rising population is increasing demand for food, at the same time as the declining land sizes and fish catches are putting pressure on the livelihoods of those dependent on agriculture and fisheries. However, aquaculture offers a glimmer of hope for Malawi to exploit an extra domain for sustainable food productions. Building on the successes of the first National Aquaculture Strategic Plan (2005 – 2015), the NASP II (2021 – 2031) has been developed to ensure increased and sustainable fish production and utilisation by properly managing and promoting aquaculture and reducing post-harvest losses. The goal of this Strategy is to enhance production and productivity from aquaculture for increased household incomes, national economic growth and regional trade. The Strategy was developed through a number of stages, that included (i) desk reviews, (ii) review of the first edition of the National Aquaculture Strategic Plan (2005 – 2015), (iv) building on the SADC Aligned National Aquaculture Strategy, (v) consultative meetings with the key stakeholders including fish farmers, value chain players, (v) technical review and (vi) national and regional validation workshops.

The NASP II has been designed in order to be coherent with other national policies, including the Malawi 2063, Malawi Growth and Development Strategy (MGDS III), National Agricultural Investment Plan (NAIP 2018), and National Agriculture Policy -NAP- (2016). The NASP II is also aligned with the global, continental and regional frameworks major ones are the UN 2030 Agenda on Sustainable Development Goals (SDGs); the FAO Code of Conduct for Responsible Fisheries; the African Union (AU) Agenda 2063; AU Policy Framework & Reform Strategy for Fisheries & Aquaculture; Istanbul Programme of Action (IPoA), the Vienna Programme of Action (VPoA), the SADC Protocol on Fisheries; Southern African Development Community Regional Indicative Strategic Development Plan (SADC RISDP); SADC Aquaculture Strategy and Action Plan (2016-2026); the COMESA Regional Fisheries & Aquaculture Strategy as well as the EAC Regional Aquaculture Strategy and Investment Plan.

The Strategy recognises that farming of fish and the auxiliary activities in the aquaculture value chain, are first and foremost economic activities. In this regard, NASP II further reinforces the fundamental focus on solid and logical sound commercial perspective, in order to transform subsistence fish farming into market-led SMME. Therefore, conceptual framework this Strategy is underpinned by six strategic themes. The themes are as follow:

(i) Theme 1: Transformation of small-scale aquaculture into market-led SMMEs, (ii) technological innovations,
(ii) Theme 2: Knowledge and capacity strengthening of fish farmers,
(iii) Theme 3: Market efficiency,
(iv) Theme 4: Climate-resilience and environmental sustainability,
(v) Theme 5: Technology development and innovations, and
(vi) Theme 6: Public institutional infrastructure enhancement.

The NASP II is guided by the following principles: (i) Alignment to Malawi 2063; (ii) Prioritization with national priorities, (iii) broad participation and consultation; (iv) realism, flexibility and pragmatism; (v) equity and equality; (vi) scalability; (vii) sustainability; (viii) accountability; (ix) self-development; (x) deepening regional and global Integration.

The Strategy defines clear delivery mechanism and implementation arrangement in order to optimise food and nutrition security and well-being of fish farming communities, and enable Malawi to realise the wealth-generating potential of aquaculture. The primary responsibility of implementing NASP II lies with the Department of Fisheries in the Ministry of Forestry and Natural Resources in Malawi. The Department of Fisheries will establish the (i) National Aquaculture Advisory Council, within the framework of the Fisheries Board; (ii) NASP II Coordination Unit, within the Department to ensure smooth planning and implementation of research and extension activities necessary for the delivery of NASP II; and (iii) Aquaculture Coordination Mechanism with the Ministry of Local Government; and (iv) District Aquaculture Coordination Platform, in order to achieve coherence with the District Development Plans. Fig. 4 shows the NASP II Coordination Mechanism.

The NASP II has a Monitoring, Evaluation and Learning System (MEAL) to ensure that the Strategy is implemented in line with the MW2063's 10-Year Implementation Plan (MIP 1). The Strategy aims to produce at least 24,000 tonnes by 2030, increasing the share of aquaculture sector in the agricultural GDP to 0.05% by 2030. Furthermore, in line with the Malawi 2063, the aquaculture sector should produce 140,000 tonnes by 2063. The MEAL will be used to track progress on various indicators as outlined in the Results Framework. The delivery of the Strategy is guided by the Theory of Change which targets multi-stakeholder partnerships of those with shared common vision in order to build a National Innovation System, that leads to a vibrant, diversified, professional and profitable aquaculture industry that delivers pro-poor outcomes.

1.0 Introduction

Aquaculture offers a glimmer of hope for Malawi to exploit an extra domain for sustainable and nutritious food production. Farmed fish can supplement the rising demand for fish which is caused by rising population, at the same time as the fish catches from lakes, rivers and floodplains are declining. Fish farming can be an alternative source of livelihood for those dependent fisheries; and integrating fish in existing crop/livestock farming systems has shown to enhance per unit productivity of water, and enrich the predominantly maize-based diets. Although Malawi has made tremendous strides in aquaculture production over the past two decades, supply of fish from aquaculture is still below the targets that were stipulated in the National Fisheries and Aquaculture Policy of 2016.

Problems of aquaculture sector are technical and institutional in nature. Technical challenges include, inadequate technologies (high yielding strains, quality feeds, best Management Practices), poor linkages between research, farmers and extension, and poorly developed value chain and financial ecosystem. Major institutional challenges are lack of a national strategy to guide research programmes; poor reflection of aquaculture in District Development Plans (DDPs) that leads to inadequate allocation of extension officers; inadequate aquaculture regulatory framework; insufficient coordination and implementation capacity in the Department of Fisheries and inadequate linkage of the sector to the regional aquaculture value chain. Notwithstanding the challenges, there are opportunities for Malawi to gain from aquaculture growth. Some of these opportunities include strong policy focus on aquaculture across government ministries, departments and agencies; Malawi is a member of SADC and benefits from such regional collaboration as Genetics Platform; there is a strong partner/donor support; declining capture fisheries is an opportunity for fish farmers to supply both the domestic, regional and regional market. Fish farmers and private sector are willing to expand production; and there is a very strong interest by investors and funding agencies to focus on aquaculture development.

Aquaculture can make significant contribution to the food systems of the country. Therefore, the second National Aquaculture Strategic Plan can lead to the transform subsistence fish farming to market-led SMME. This strategy provides aquaculture stakeholders with a framework to underpin sector growth, coordination and harmonisation of interventions; and ensure that aquaculture is responsive to diverse farmer and market needs and consumer demand.

It is for this reason that in 2005, the Government of Malawi developed the first National Aquaculture Strategic Plan (2005 – 2015), or NASP I. The NASP I aimed to achieve the outcome on “Improved livelihoods among rural small-holder fish farmers” and had three strategic objectives, namely, (i) best practices for an integrated aquaculture livelihoods approach defined; (ii) integrated aquaculture livelihoods projects actively adopted in the 9, out of 27, environmentally most suitable Districts; and (iii) smallholder fish farmers in at least 3 Districts experience increased income and improved food security measured by verifiable quantitative indicators. NASP I was further support by National Fisheries and Aquaculture Policy (NFAP) (2016), which aimed to guide the planning and development of the aquaculture sector in Malawi.

While Malawi has made major strides in delivering on the NASP I, national priorities have further called on the need to expedite the grow the aquaculture in order to cover the shortfalls from wild capture fisheries. Therefore, this second National Aquaculture Strategic Plan has bene prepared by first reviewing the NASP I and refocusing the targets in line with the prevailing national development priorities. The NASP II has been preceded by the assessment of the alignment of the NFAP with the SADC Protocol on Fisheries as well as the continental framework, the African Union Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa (PFRS) (Chimatiro 2021). Therefore, NASP II aims to build on and maintain the momentum of NASP I, in order to (i) create vibrant, diversified, professional and profitable private sector and market-led national and regional aquaculture value chain; (ii) drive sector growth through science and partners under a National Innovation System; and (iii) create an enabling policy environment in line with the Malawi 2063 and SADC Protocol on Fisheries, that promotes investment and a market system that delivers pro-poor outcomes.

2.0 Background

2.1 Aquaculture production

Resource-dependent Malawians are faced with double challenges. On the one hand, the availability of the wild caught fish from Malawi's lakes, rivers and floodplains has dwindled over the years; and on the other, there has been a steady decline in mean farm sizes. At 238 people/km^2 of agricultural land, Malawi ranked the 10th most densely populated in SSA in 2014 (World Bank, 2018). The overall plot size for cultivated plot was 0.53 ha in 2019 (Malawi Government 2020), a reduction from 0.8 ha in 2013 (Malawi Government 2014) (Table 1). This has happened as numbers of fishers and rural farmers have grown, outstripping the growth in fish stocks and arable land, respectively. Consequently, Gumulira et. al (2019) recommended managing usipa fishery (comprising 70% of total catch in Lake Malawi), using Maximum Economic Yield (MEY), entailing a reduction of fishing effort by 54%. While Malawi's available arable land is limited by both agriculture and human settlement, the country's water surfaces and marginal land is not habited and hence, potentially available for fish farming.

An estimated 24,405 km^2, or 20% of Malawi's surface area is covered by water, under Lakes Malawi, Malombe, Chilwa, Chiuta and river and floodplain system that includes Upper and Lower Shire River. Further to the natural water systems, FAO (2005) reported that there are over 800 small water bodies (reservoirs) covering over 1,000 ha of water surface that can be used for aquaculture. Therefore, utilising these water systems for aquaculture will allow fish farmers to produce more fish, diversify nutrition from the grain-dominated diets, and improve their livelihoods. Fish is an important source of food for many Malawians. With an average per capita consumption of 12.63kg/year (Government of Malawi 2019), making Malawi one of the few countries in the SADC region, with consumption that is closer to the 13-15kg, recommended by the World Health Organisation (WHO). However, due to declining fish production, demand is outstripping supply and imports of fish are rising. In 2018 fish accounted for almost 4% of the proportion of imported food commodities (Munthali et al 2020), estimated at MK 6.4 billion (US $9 million (NSO data).

Although the GoM has prioritised aquaculture (fish farming), through the 2016 National Fisheries and Aquaculture Policy, in order to supplement the dwindling wild capture fisheries, fish production has remained low. At 12,217 MT in 2017 (Table 2), Malawi was the third largest producer of farmed fish in the SADC (AdvanceAfrica 2020)[1]. Between 2001 and 2019, production increased on an average of 54% per annum, with almost 90% of the production comprising of tilapia. The bulk of the farmed fish comes from small-scale fish farmers, except for an estimated 1,500 tonnes which is produced by MALDECO's cage aquaculture farm at Lake Malawi.

Table 1. Descriptive characteristics of Malawi's food security and fisheries

Description	Situation	Source
Population density	238 people/km^2, 10th most densely populated in SSA	World Bank, 2018
Land holdings	0.8 ha in 2013 to 0.53 ha in 2019, cultivated plot size	Malawi Government (2014) & Malawi Government (2020)
Fisheries	Reduction of fishing effort by 54%.	Gumulira et. al (2019)
Food security	from 350,000 (in 2007) to and to 1.7 million (2014); & 6.7 million (in 2016-17)	Government of Malawi, 2018.
Potential for fish farming	24,405 km^2, or 20% of Malawi's surface area; & 800 small water bodies (reservoirs) covering over 1,000 ha	FAO (2005)
Fish imports	US $8.9 million in 2018	Compiled from NSO-MRA

Source: Prepared by the author using various sources

Table 2. Aquaculture production on Malawi (2001 – 2019

Species	Year/Production (tonnes)								
	2001	**2003**	**2005**	**2007**	**2009**	**2011**	**2013**	**2017**	**2019**
Common carp	10	4	7	10	25	76	71	44	11
Mozambique/shiranus tilapia	600	680	83	100	75	1420	2578	8624	6553
Red-breasted tilapia	12	85	61	85	75	862	641	2593	1871
Tilapia nei			623	1260	1350				
African catfish	18	17	21	25	80	175	333	900	782
Rainbow trout	8	15	17	20	15	98	82	56	12
Total	648	901	812	1500	1620	2631	3705	12217	9229

Source: FAO FishStat (2021)

2.2 Importance of aquaculture

Summary of the economic importance of aquaculture in Malawi can be seen in Table 3 below. There is total of approximately 15,465 fish farmers, of these 61.51 percent are males and 38.49 percent are females (GoM 2021). The total recorded number of ponds is currently at 10,007 countrywide with a total pond area of 251.59 hectares. Farmed fish was a source of nutrition

[1] AdvanceAfrica. 2020. Profiling the SADC Aquaculture Value Chains. Southern African Development Community (SADC) Secretariat. Gaborone, Botswana. 10 July 2020.

and food security for many rural dwellers. Farmgate sale of fish generates an estimated total of US$45 million per year, which translates to gross revenue generated from aquaculture of $24.5 million and US$22million in value-added per year (Table 3).

If aquaculture is to grow at a faster rate than it is currently the case, while avoiding negative social and environmental impacts and optimising social, economic and welfare benefits, appropriate strategies must be put in place. The Food and Agriculture Organization (FAO) Code of Conduct for Responsible Fisheries (CCRF) emphasises the need for countries to develop responsible aquaculture while ensuring environment and transboundary waters.

Table 3. Significance of Aquaculture in Malawi

Parameter	Quantity
Aquaculture production (tons)	12,217
Number of people employed in aquaculture	15,465
Number of fishponds	10,007
Total area under fish farming	251.59 hectares
Total income (USD) per year	45 million
Gross Value Added (USD) per year	22 million
Capture Fisheries production in 2017 (tonnes)	199,455
Fish Imports in 2017 (tonnes)	2,356
Fish Exports in 2017 (tonnes)	320

Source: Adapted and calculated by the author from various sources

2.3 Policy context of the National Aquaculture Strategic Plan

This strategy has been aligned with prevailing relevant policies and strategies in Malawi, as well as global, continental and regional ones. The alignment enables the strategy to be coherent with other policies that directly influences fish farming development; and help the Department of Fisheries to achieve better coordination across sectoral policy ecosystems in the country. According to OECD (2006), incoherence of policies result in weak policy performance and thus a wastage or inefficient use of national resources. It is important to establish synergies, because experience in other countries has shown that the national fisheries and aquaculture policy alone will rarely be sufficient to meet all intended objectives. In this regard the Department of Fisheries will need to implementation the NASP II in coordination with a mix of national policy instruments below, in order to deliver on the aquaculture sector growth. These include Malawi 2063, Malawi Growth and Development Strategy (MGDS III), National Agricultural Investment Plan (NAIP 2018), National Agriculture Policy -NAP (2016), Water Act, TEVETA Strategic Plan (2018-2023); National Agriculture and Natural Resources Research Agenda (2017 – 2022) of the National Commission for Science and Technology, Agriculture Food and Nutrition Strategy, Cooperative Development Policy and Decentralisation Policy.

At the global level context, the strategy is aligned with Convention on Biological Diversity (CBD), especially the Cartagena Protocol and Nagoya Protocol; the 1995 FAO Code

of Conduct for Responsible Fisheries, particularly, Article 2, Declaration of the Rio de Janeiro United Nations Conference on Sustainable Development, known as Rio+20 – the future we want (United Nations 2012), the 2030 Agenda for Sustainable Development (United Nations 2015), and OIE's new strategy (OIE 2021).

At the continental level, the strategy will enable Malawi to deliver on its commitments to the African Union's Agenda 2063 (African Union 2015)**;** Policy Framework and Reform Strategy for Fisheries & Aquaculture (PFRS) (African Union & NEPAD 2014) and the Comprehensive Africa Agriculture Development Program (CAADP) (NEPAD 2003). At the regional level, the strategy is coherent with the SADC Regional Indicative Strategic Development Plan (RISDP) (both the 2015 – 2020 and the RISDP 2020 – 2030), the Regional Infrastructure Development Master Plan (RIDMP), the SADC Regional Agricultural Policy (RAP), and the SADC Industrialization Strategy and the Roadmap (2015), the SADC Protocol on Fisheries (2001). In addition, the Dar es Salaam Declaration on Agriculture and Food Security (SADC 2004), and the SADC Food and Nutrition Security Strategy (2015-2025).

NASP II is also aligned with the key subsidiary frameworks of the SADC Protocol on Fisheries. These include (i) SADC Regional Aquaculture Strategy and Action Plan (2016-2026); (ii) Aquaculture Evaluation Tool for the SADC Region (2016); (iii) Development of a Regional Aquatic Biosecurity Strategy for the Southern African Development Community (SADC) (FAO. 2018); (iv) Regional Framework on Environmental Management for Sustainable Aquaculture Development in Africa - Southern African Region (AU-IBAR and SADC, 2016); (v) SADC Harmonised Fish Standards (SADC 2017); and (vi) Guidelines for Aquaculture Management in SADC (SADC 2019). Malawi is also a member of COMESA and, therefore, the NASP II is aligned with the COMESA Strategy for the Sustainable Development of Fisheries Strategy (2011). The COMESA Strategy outlines the priority areas within the sub-sectors of marine fisheries, inland fisheries and aquaculture where targeted investment can overcome constraints and foster sustainable development; as well as the Programme on Climate Change Adaptation and Mitigation in the ESA (COMESA-EAC-SADC) (2011). Although Malawi is not a member of EAC, the NASP II has drawn on some of the EAC aquaculture development instruments such as EAC Regional Aquaculture Strategy and Investment Plan (LVFO 2009) and the 2013 EAC Implementation Plan for Sustainable Aquaculture. Aligning the National Aquaculture Strategic Plan with the EAC instruments will make it easier for Malawi to trade farmed products with the countries in the EAC region.

2.4 Approach and process of developing the NASP II

Section 21 of the Fisheries Conservation and Management Act (Malawi Government 1997), states that the Director of Fisheries not to amend management plans, regulations and any other subsidiary legislation related to the conservation and management of fisheries resources without wide consultations with key stakeholders. Therefore, the second National Aquaculture Strategic Plan was developed in this context. The Department of Fisheries (DoF) through the NASP Task Force, with the guide from the Consultant, led the process of developing the strategy. The strategy has been developed in five stages that included (i) desk review, (ii) assessment of the extent to which the first NASP (2005-2015) was accomplished by the Department of Fisheries; (iii) consultative meetings with a range of stakeholders; (iv) analytical

work; and (v) comparative reviews of aquaculture best practices. The reviews involved detailed analysis of existing, continental; and regional fisheries and aquaculture policies in order to assess the level of alignment between these frameworks with the Department of Fisheries Policies and Strategies; and benchmark the NASP II to globally recognised standards of aquaculture strategies. The alignment built of recent process of domestication of the SADC Protocol on Fisheries.

Comparative reviews of aquaculture development were done in Asian and African countries. In Asia, the studies were done in Viet Nam, Indonesia, The Philippines and Myanmar, following the recent report by Rabobank, the bank, which noted that these countries are key to driving the future growth in aquafeeds in Asia, while in China, the demand was declining (Rabobank 2020). In African, the studies were conducted in the main aquaculture producing countries, namely Egypt, Kenya, Uganda, Ghana, Mozambique, Zimbabwe, and Tanzania. In Latin America a review was done on Brazil. The key lessons drawn from the comparative studies were as follows:

- The countries have developed comprehensive fisheries laws that designate aquaculture as stand-alone sector/department, with detailed Master Plans that target aquaculture to contribute more to fish supply than fisheries.
- The countries have highly skilled researchers and extensionists, a capacity that has been developed over time, through heavy investments in training and skills development.
- All countries surveyed have developed strong links in the aquaculture supply chains (particularly quality and affordable feeds), with robust domestic markets as well as industries that are vertically integrated and linked to export markets.
- Development and introduction of genetically improved breeds and strains of tilapia, coupled with well-developed centralised hatcheries that supply certified, high quality fingerlings have ensured high aquaculture production.
- Development of strong fish producer institutions in form of either Associations or Chambers of Aquaculture has provided the fish farmers with organisational capacity for a unified voice in lobbying for input and output markets as well as investment finance.
- Provisions of investment incentives to the aquaculture sector, particularly feed manufacturing, buttressed with trade policy characterised by **import substitution model**, including tariffs, and non-tariff barriers created opportunity for the local aquaculture industry to grow and reduce fish imports, with positive effects on the crop value chains (e.g. soya and maize, that are used as feed ingredients).

Analytical assessment focused on identifying practical private-public partnerships along strategic areas of investment in aquaculture. This analysis culminated in defining the is “market-led aquaculture” or simply put, “Aquaculture Commercialisation Strategic Framework”. Financial assessment was conducted in order to prepare summaries of financial returns on a typical small-scale commercial fish farming business. Financial ecosystem analysis was also done in order to assess the investment capital environment for the sector. The methodologies for the strategy were validated through an inception workshop and the final draft was validated by stakeholders through a consultative process. Before the final validate, a team of experts reviewed the National Aquaculture Strategic Plan.

3.0 Strategic Analysis: Current Situation of Aquaculture

3.1 Regulatory Framework Organisational structure of the Department of Fisheries

According to DHRMD (2020), the Department of Fisheries' overall goal is to promote fisheries resource utilization and aquaculture development in order to contribute to food and nutrition security and economic growth of the country. The Department draws its mandate from The Fisheries Act of 1949 which has been revised in 1965, 1973 and 1997. Currently, all fisheries and aquaculture activities are governed by the Fisheries Conservation & Management Act of 1997. While the Fisheries Acts of 1966 and 1973 neglected aquaculture, the Fisheries Conservation and Management Act of 1997 (or Fisheries Act) puts much emphasize on Aquaculture (DHRMD 2020). Part VIII of the Fisheries Act is dedicated to aquaculture, and specifies a number of requirements for involvement in fish farming, namely no person shall establish or operate an aquaculture establishment (i) without a permit granted by the Director of Fisheries; (ii) unless granted rights to use water under the Water Act; and (iii) without following correct siting, design, sanitary condition of fish and fish products, measures to prevent diseases, measures to minimise escape of waste products and polluting land and water.

However, the Act does not provide comprehensive regulatory instruments to adequately guide the growth of the sector. For example, except for the large-scale commercial fish farmers, all small-scale fish farmers operate without prior permit from the Department of Fisheries. Moreover, most of the control provisions of the Act (i.e. enforcement; Fisheries Protection) refer to the management and protection of fisheries, but not aquaculture. Therefore, the strategy has put in place adequate regulatory and coherent frameworks that serve a viable aquaculture industry.

3.2 Organisational structure of the Department of Fisheries

The Department is headed by the Director of Fisheries who reports to the Principle Secretary and the Minister responsible for Forestry and Natural Resources. The Director of Fisheries is assisted by three Senior Deputy Directors for (i) Training and Extension, (ii) Research, and (iii) Planning and Development Divisions. The Senior Deputy Directors of each Divisions are assisted by Deputy Directors. There is General Administrative Support Division which is headed by Chief Human Resource Management Officer. With its Headquarters offices are located in the Capital Hill, in Lilongwe, the Department has research centres in Mzuzu, Domasi in Zomba and Kasinthula in Chikwawa, for aquaculture, and Monkey Bay in Mangochi and Senga Bay in Salima, for fisheries. All extension and community outreach activities are carried out District Fisheries Officers (DFOs) who are stationed in all District Councils.

3.2.1 Structures related to aquaculture development

Aquaculture Division: In a recent review by the Department of Human Resources Management and Development (DHRMD), it was decided to disband Research Division and create an Aquaculture Division, in line with best practices globally, because aquaculture is a distinct specialized field, and in consideration that the National Fisheries and Aquaculture Policy (2016) has considered aquaculture as a focus area (DHRMD 2020). The Aquaculture

Division is divided into two Units, one responsible for aquaculture research and the other for aquaculture management (regulation of aquaculture services; and registration and coordination of aquaculture services). The new Division will be headed by the Senior Deputy Director of Fisheries.

3.2.2 Malawi College of Fisheries: in addition to conduct in-service training for new recruits who end up as research or extension assistants, the College also undertakes Community Outreach. There are plans for the future Community Outreach Unit to coordinate training and community outreach services, following the devolution of aquaculture extension to District Council. The new Community Outreach Unit will be at the Department of Fisheries headquarters (DHRMD 2020).

3.2.3 District Fisheries Offices: These are currently providing aquaculture extension services and they have been devolved to the District Councils. The National Decentralisation Policy (1998) prescribes for the devolution of 17 government functions to the District level. One of these Functions and Services that has been assigned to District Assemblies include "fisheries and aquaculture. Therefore, the District Fisheries Officers belong to the "Agriculture and Natural Resources" Department, and reports to the Director of Agric & Natural Resources. The challenges being faced by DFOs have been highlighted in Section 6.3 as well as the SWOT Analysis.

3.3 Reviewing the First National Aquaculture Strategic Plan (2005 – 2015)

From January 2003 to August 2005, the Government of Malawi and Japan International Cooperation Agency (JICA) developed the first National Aquaculture Strategic Plan (NASP I -2005 - 2015). The overall objective of NASP I was to facilitate the necessary institutional, legal, and administrative changes in the sector, in order to (i) improve livelihoods among rural small-holder fish farmers, (ii) achieve a successful commercial aquaculture sector, and (iii) provide quality aquaculture services at a national and local level.

Section 21 of the Fisheries Conservation and Management Act (Malawi Government 1997), states that the Director of Fisheries not to amend management plans, regulations and any other subsidiary legislation related to the conservation and management of fisheries resources without wide consultations with key stakeholders. Therefore, the second National Aquaculture Strategic Plan was developed in this context. From October 2020 to December 2020, a review of the NASP I was carried out by the Consultant, with the help of the NASP Task Force in the Department of Fisheries. Extensive consultation process was conducted in order to solicit input from central and local government as well as fish farmers and interested stakeholders regarding the future development of sustainable aquaculture in Malawi. Detailed review of the NASP I is provided in the Working Paper, but Table 5 below shows the summary.

3.3.1 What was done well in NASP I, and needs to continue

Concomitant with the summary of assessment in Table 4, it can be deduced that NASP I was largely implemented. The key success factors include:

(i) the Department of Fisheries has been able to include aquaculture in its regular programmes and budget;

(ii) the Department's outstanding efforts to solicit the support of development partners and projects under NGOs and donors;

(iii) the Department has been able to take advantage of Decentralisation Policy by deploying Fisheries Officers to all District Councils, in line with the NASP I's concept of "District Aquaculture Livelihoods Project/Strategy". As a result, aquaculture extension services have been provided by Area Extension Development Officers (AEDO) together with crop and animal husbandry technologies;

(iv) the move of the Department of Fisheries from the Ministry of Natural Resources to the Ministry of Agriculture made it possible for aquaculture development programmes to access funding from agriculture development projects, such as ASWAp. With the move back to the Ministry of Forestry & Natural Resources, it is important for the Department to maintain and strengthen linkages with the agriculture sector, through the food systems approach;

(v) the Department has done exceptionally well in forging science partnerships with local (e.g. LUANAR, MZUNI, MUST) and international universities, as well as international research institutions (e.g. WorldFish). Through these partnerships the Department has been able to undertake research as well as training of its scientists and extensionists.

As a result of the above success factors, there has been a remarkable increase in fish production since the NASP I was endorsed. NASP I had proposed 3 **"Development Phases"** of aquaculture sector in Malawi. According to the proposed phases, namely: (i) Development Phase (2005 – 2015), (ii) Maturity Phase (2015 – 2025); and (iii) Sustainable Phase (2025 – 2040). NASP I projected a number of targets that were to be achieved by 2025. For example, by 2025 it was projected that Malawi would be producing a total of 5,000 MT. However, from Table 3 above, it is clear that at around 9,229 MT, Malawi has done well in surpassing the projected level of production. Furthermore, pond productivity has risen from the projected 15 - 45kg.m^2 to 15 - 270kg.m^2.

3.3.2 What was not done well in NASP I and needs to improve

Despite the success, NASP I was not able to achieve its full potential due to a number of technical and institutional challenges, including:

(i) inadequate staffing and funding levels to the District Councils meant that coverage and quality of services was poor. There are plans (which have not been approved) to undertake a detailed Functional Review in order to ensure that District Councils fully incorporate fisheries and aquaculture officers in their staff establishments, and at appropriate senior grades and funding levels (DHRMD (2020);

(i) inadequate coordination between the Department of Fisheries and the Ministry of Local Government resulted in District Councils not prioritising aquaculture and fisheries staff for senior grade posts and promotions;

(ii) the NASP Coordination Committee was never operationalised, which resulted in NASP I not being systematically implemented, since annual planning, budgeting and reporting processes were not done consistently;

(iii) A joint review with the members of IFFNT, revealed that **Strategic theme on "Farmer Organisations"** was partially achieved because operationalisation of IFFNT as a Producer Organisation was delayed. However, recent support of the GIZ-AVCP, has revived IFFNT;

(iv) lack of regular Training Needs Assessments meant that although a lot of trainings have been conducted to upgrade the research and extension officers, the capacity to allocate staff according to technical specialisation and needs of aquaculture has been affected. This has also resulted in staff taking up training opportunities for the sake the qualification, but delivering little towards the targeted sector growth priorities;

(v) lack of systematic data collection, analysis and dissemination of aquaculture production has resulted in the Department of Fisheries not being able to (i) demonstrate the overall socio-economic status of aquaculture in the economy, and (ii) to raise the profile of aquaculture in District Development Plans.

Table 4. Assessment of what worked and did not work under NASP I (2005 – 2025)

Strategies/Outputs	Status of implementation
Strategy 1: *Providing the opportunity for all stakeholders to develop their capacity to enhance the integrated livelihoods approach, which includes aquaculture*	• Cross-sectoral aquaculture policy implemented very well • District Model implemented very well • Department has used Agriculture Extension Development Officers (EADOs) in most of EPAs that has potential for aquaculture
Strategy 2: *Enhancing institutional capacity of NAC to develop medium to large-scale commercial fish farming technologies*	• Institutional set-up of NAC strengthened, but moderately successful in executing research due to inadequate staff • Research Plans were developed, but implementation is lagging due to inadequate funding • A lot of scientists and extensionists have and are undergone training, at MSc, PhD and BSc • A lot of technologies have been developed but Department lacks skills to assist commercial farmers
Strategy 3: Providing an appropriate credit, business training and technology package for small to medium-scale commercial fish farmers	• Operationalisation of IFFNT as a Producer Organisation was delayed • IFFNT is not yet a functional institution • The Special Credit Scheme has not been formulated due to lack of capacity. • Farmer obtain loans through other District institutions • These studies have been conducted mainly by LUANAR, through students' MSc and PhD theses research • Some NGOs have trained fish farmers in business management, but not much has been achieved due to lack of capacity among aquaculture extensionists
Strategy 4: Creating a regionally competitive and investor friendly environment through sound policy, clear procedure and legal framework	• One-stop-shop has not yet been created and operationalized, • Environmental guidelines have been developed jointly with EAD • Business management has not been done due to inadequate capacity of IFFNT • IFFNT has not done participatory research systematically
Strategy 5: Ensuring aquaculture activities are environmentally responsible and sustainable	• Activity done in collaboration with EAD • The Fisheries Act is yet to be revised • Advocacy on potential impact of aquaculture was only done for Lake Malawi. • There is a need for similar work to be done for land-based aquaculture
Strategy 6: Establishing links and information flows between producers and fish traders to enhance access to markets	• Workshop for fish trader and fish farmers has not been done because the framework for collection of market information has not been developed and implemented • The department of Fisheries has participated in major National Agricultural Shows. However, demonstration events in major cities have not been conducted
Strategy 7: Sensitising and building capacity of local government on their primary responsibilities in aquaculture development	• District Assemblies have incorporated District Fisheries Officers • Most District Councils are unable to integrate aquaculture in District Development Plans (DDPs) because fish is not included in the District Development Planning Manual. Consequently, District Socio-economic Profiles lack aquaculture. • Most DFOs lack (except Kasungu) capacity to raise profile of aquaculture in the VDPs and ADPs • Department of Fisheries was unable to instigate the establishment of the Coordination Committees at the district; but took advantage of the decentralisation to deploy the DFOs within the Directorate of Agriculture and Natural Resources at the District Councils

Strategies/Outputs	Status of implementation
	• Guidelines for aquaculture extension are being developed • Training materials for extension were developed and training courses are on-going • DFOs have been deployed to Districts, but staffing and funding levels are inadequate to ensure these trainings are conducted efficiently.
Strategy 8: Developing alliances between DoF and NGOs to promote unified approaches in aquaculture extension	• NGOs are promoting aquaculture, but there are no guidelines • NGOs lamented lack of technical support from the Department
Strategy 9: Fostering fish producer's organizations that assist farmers to increase production, access to finance, markets and other services	For a long a time there was no support for farmer organisation, until recent GIZ-AVCP technical support to IFFNT
Strategy 10: Building healthy DoF financial resources	• Department of Fisheries has done very well to sensitise donors (e.g. EU-Kulima, GIZ-AVCP, AfDB-SFAD, CASA-DFID etc) for support. • Some materials for sensitization developed and Media campaigns underway, but web-based materials were not developed. • NASP Audit systems was never developed • Research on revenue retention was never developed
Strategy 11: Realising efficient DoF operation	• This was never established. However, recently GIZ-AVCP helped the DoF to establish the Aquaculture Roundtable. • Programme lining farmers with Department of Fisheries research has not been developed • LUANAR has developed exchange programme with other universities including Egypt via WorldFish
Strategy 12: Promoting quality DoF staff and information	• Some aquaculture manuals have been produced • Curriculum review for Bunda College was done, and Malawi College of Fisheries has also undertaken reviews, including support from GIZ-AVCP to develop TEVETA curriculum • Experiential learning through internship is on-going • Proper evaluation system has not been done • Some efforts have been made to improve data collections, especially under APES, but more needs to be done, especially on economic analysis • 3-year aquaculture census has not been done consistently done, just on ad hoc basis via APES • Aquaculture base is being collected but the database is not in place. Most District Commissioners reported lack of reliable data at district levels

3.3.3 Aquaculture Institutions and Stakeholders

Despite Malawi having given special attention to aquaculture development, Chimatiro (2020), reported that the results, however, have fallen short of expectations, and Malawi still depends largely on fish imports. The overall contribution of fisheries and aquaculture to the economic development of Malawi is sub-optimal. In order to identify the challenges to aquaculture sector growth, key stakeholders and institutions were identified and consulted. The major aquaculture stakeholders can be divided into thirteen (13) broad categories (Table 5). The Department of Fisheries believes that the role the aquaculture stakeholders play in the sub-sector is critical for the Department of Fisheries to achieve its mandate. Therefore, efforts will be taken to ensure that all the stakeholders are involved in implementation of this strategy in order to deliver on the wealth-creation potential of fish farming.

Table 5. Key Aquaculture Stakeholders

	Category	Key Institutions/Divisions	Key roles
1	Department of Fisheries	• Director of Fisheries • Senior Deputy Director - Extension & Training • Senior Deputy Director - Research • Senior Deputy Director - Planning & Development • Chief Human Resource Management Officer • District Fisheries Officers Aquaculture Research Officers	• Overall policy guidance • Fisheries & aquaculture training, extension services & community outreach • Oversee research in fisheries & aquaculture • Planning, monitoring and evaluation • General administrative support, including finance, HR & administration • Aquaculture extension services and community outreach
2	Fisheries Field Officers	District Fisheries Officers in Eastern, Southern, Central and Northern Regions Managers of Aquaculture Research & Development Stations	Frontline staff for aquaculture extension and development
3	District Councils	• District Commissioners • Director of Planning • Director of Agriculture & Natural Resources	• Head of devolved functions at District Councils • Responsible for the process of planning & implementing District Development Plan • Oversee implementation of fisheries & aquaculture activities, and supervise DFOs
4	Aquaculture development partners	• Non-governmental organisations (NGOs) • Civil Society Organisation • Community Based Organisations • Development projects	• To initiate & implement fish farming projects • Advocate for agriculture, natural resources and aquaculture • Participate in fish farming activities • Provide funding for fish farming projects and extension service
5	Academic & training institutions	Universities (LUANAR, MZUNI, Chancellor College, Polytechnic, MUST) Colleges (Malawi College of Fisheries & Stephanos)	• Training of aquaculture extensionists & researchers • Developing aquaculture technologies • Training of aquaculture extensionists • Conducting community outreach
6	Research institutions	WorldFish, Universities, National Aquaculture Centre, and Aquaculture Stations	• Aquaculture science, technology, & Innovations

	Category	Key Institutions/Divisions	Key roles
			• Technology & knowledge development
7	Commercial farms and private sector	Commercial fish farms, Private sector service providers (feed manufacturers)	• Growth fish on commercial level (2000 tons per hectare • Provide services such as equipment, feeds, advice
8	Small-scale fish farmers	Small-scale and medium-scale	1,000 tons of fish per hectare (small-scale) and 1,500 tons of fish per hectare (medium-scale). These produce the bulk of the fish
9	Fish Producer Organisation	Innovative Fish Farmers Network Trust (IFFNT)	(i) to enhance economic opportunities for commercial fish farming, (ii) to ensure that fish producers are financially independent through aquaculture; (iii) to enhance access to aquaculture credit scheme for small & medium-scale commercial fish farmers; and (iv) to improve business planning & management capacity of small and medium-scale fish.
10	Parastatal organisations	• National Council for Science & Technology (NCST) • TEVETA • Malawi Bureau of Standards • Malawi Revenue Authority	• Policy-holder for aquaculture science • Vocational and entrepreneurial training curriculum development • Quality control, standards development & protect citizens from unsafe food and materials • Revenue collection
11	Retail outlets	BOSS Fisheries, Shoprite, Sana, Lake Harvest and Food Lovers	The major selling points in the urban centres
12	Financial Institutions	NBS, FCB, FDH, MAIIC	Provide funding for aquaculture investments
13	Donors, cooperating partners and NGOs	AVCP-GIZ, CASA, WESM, CEPA	Implement aquaculture and natural resources projects and provide policy advocacy

4.0 Aquaculture value chain in Malawi

The main processes that define the aquaculture value chain in Malawi, including the production of fish, value addition, trading, marketing of fish products and inputs, as well as provision of services, and institutions that enable the various processes in the value chain to happen (De Silva, 2011). These processes were assessed where possible, using field observations and secondary data, with the aim of identifying areas requiring upgrading in order to improve productivity and commercial viability. The aquaculture sector is characterized by a value chain with two distinct and separate subsectors (Fig. 1), the small-scale sub-sector, mainly driven by the support of development partners, including NGOs as well as government; and the emerging, commercial sub-sector that is largely driven by private capital investments into medium and large companies.

4.1 The small-scale sub-sector: comprises a total of 15,465 small-scale farmers operating extensive, earthen pond systems at the household. Of these 61.51 percent were males and 38.49 percent were females. They operated a total number of 10,007 fishponds in 27 districts

countrywide; and covering a total pond area of 251.59 hectares. Majority of the farmers were located in Phalombe and Mulanje districts, in the Southern region and Nkhata kota district in the Central region. The bulk of the production is believed to come from this sub-sector.

4.2 Commercial sub-sector: is mostly made up of MALDECO aquaculture, which has a cage aquaculture establishment on Lake Malawi. Recently, other medium-scale farmers have invested in large numbers of fishponds, mainly in Mzuzu and Mchinji. While the actual production levels of these commercial sub-sector player cannot be reported with certain it can be estimated that they account for almost 20% of the total aquaculture output in Malawi.

4.3 Seed, fertiliser, manure and feed: is an emerging sub-sector as a result of the Department of Fisheries' tremendous efforts to encourage private fingerling production as a specialised business. Recently, GIZ-AVCP has also trained dedicated fingerling producers in all three regions. However, most farmers reported using their own fingerlings to stock their ponds. Nonetheless, field observations revealed a number of fingerling producers (e.g. Chambo Fisheries), with a few obtaining fingerlings from government stations (Domasi, Kasinthula, Chisitu and Mzuzu). As most farmers reported using manures and brans (maize and rice), estimates of manures and brans, revealed that average numbers of livestock per household too low for the farmers to generate substantial quantities of manure. All high quality floating fish feeds were imported from Zambia, Zimbabwe and Mozambique.

4.4 Distribution, processing and retail: small-scale fish farmers mostly sold their fish at the pond site where consumers come at the announced date of fish harvest and sell**,** while the large and medium-scale farmers transported the fish in fresh form mainly to consumers in the urban areas in Blantyre and Lilongwe, as well as municipalities and small towns in Southern and Central regions (e.g. Kasungu). For MALDECO, transport of fish to the final market is mainly done through its fleet of cooler trucks. One of the medium-scale farmer in Mzuzu owns motorbike-drawn van which distributes fish to the urban markets in Mzuzu. A number of traders import frozen tilapia from abroad, notably BOSS Fisheries, Food Lovers and Shoprite; and Lake Harvest mainly sells tilapia that is imported from its sister farm in Zimbabwe.

4.5 Upgrading of the current value chain

The strategy aims to promote upgrading of the value chain by (i) reducing fragmentation of the value chain; (ii) formalising off-taking markets by linking farmers to established food retailers (i.e. off-take agreement) such as supermarkets in urban centres, and mainly the engagements with informal traders who typically purchase the harvested fish at the farm gate at a reduced price; (iii) strengthen business management capacity of farmers and off-takers (i.e. to keep bank traceability records); (iv) improve logistic capacity both infrastructure (cold chain) and services (transport, supply-chain finance, wholesale distribution centres); and strengthen institutional capacity of fish farmers in order for them to form cooperative societies that can provide extension and logistical services to their members. Details can be seen in the Working Paper.

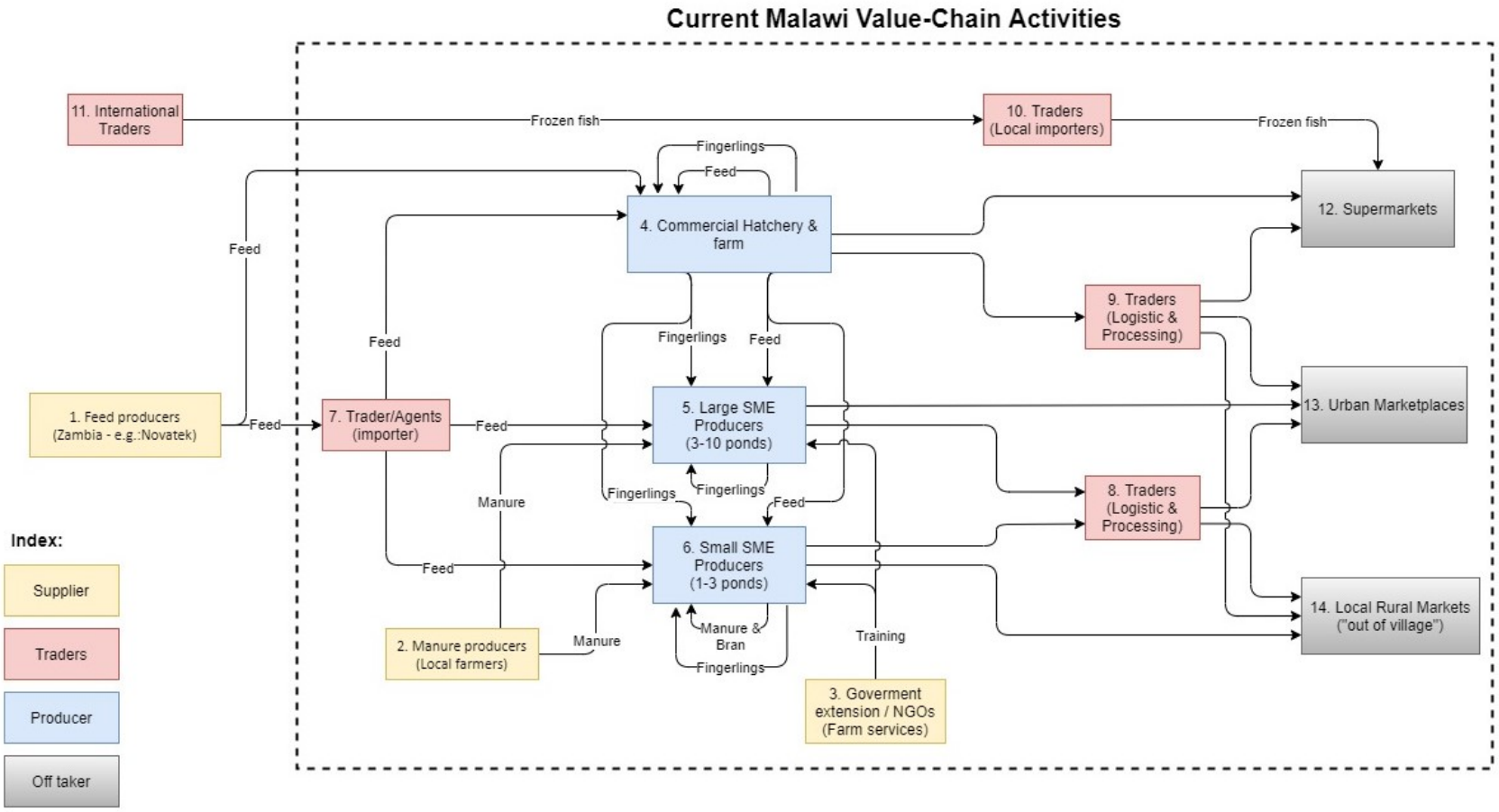


Fig. 1. A summary of the aquaculture value chain in Malawi

5.0 Assessment of Best Practices in aquaculture

5.1 Key lessons from largest producing countries

According to a recent report by Rabobank, the bank, Viet Nam, Indonesia, The Philippines and Myanmar had some of the fastest growing aquaculture sectors in Asia, in part seen in the growth in the demand for aquafeeds. Similarly, here in Africa, Zambia, Nigeria and Ghana have large aquafeed sectors. Assessment of success factors of these major aquaculture producers in Asia (Viet Nam, Indonesia, The Philippines and Myanmar), Latin America (Brazil) and Africa (Egypt, Kenya, Uganda, Ghana, Mozambique, Zimbabwe, and Tanzania), revealed a number of success factors (see Table 6).

Table 6. Aquaculture support mechanisms in major African aquaculture producing countries

Country	Success factor	Aquaculture production (tonnes)‡
Viet Nam	• Fisheries Law designates aquaculture land • VAT-free feeds in 2014 • Master Plan 2030 targets aquaculture to contribute more than fisheries • Highly skilled researchers & extensionists	4.3 million tonnes
Indonesia	• VAT exemption on feed • Lower FCR via better fingerlings, feeds & husbandry • Genetic improvement	5.4 million
Philippines	• Duty-free importation (expired 2015) • Highly skilled researchers & extensionists • Strong links in the supply chains • Introduction of genetically improved breed of tilapia	826 060
Myanmar	• Industry is vertically integrated and linked to export markets • Centralised hatcheries with high production • Tax exempted • Myanmar Fishery Association supports access to finance	1.1 million tonnes
Zambia	• VAT exemption on feeds • Statuary Instrument (SI) to exempt duty on aquaculture equipment for a period of 3 years • Aquaculture Investment Fund • Tilapia Genetic Improvement Programme	30,300
Nigeria	• Zero percent duty • Agricultural Credit Guarantee Scheme Fund (ACGSF) • Pioneer Status with 100% tax-free period for 5 years • or projects into processing of agricultural produce • Ban on tilapia imports	291,323

Source: compiled by author from various sources

These success factors can be summarised follows:

a) All the countries surveyed have some progressive tax regimes that has supported the sector to grow rapidly. For example, Egypt, the sixth largest aquaculture producer in the world, encourages investments in aquaculture through tax holiday and VAT

exemption on corn and soya, the main ingredients of feed manufacturing. Nigeria, the twentieth largest aquaculture producer in the world, offers tax exemptions on industries that invest in agriculture, including animal, poultry and fish farming. While the 2016 National Fisheries and Aquaculture Policy (NFAP) identifies aquaculture as the second policy priority area (due to dwindling fish catches), tax policy does not support this aspiration. Current tax regime reduces local fish producers' competitiveness due to the high cost of feed, but fish imports are duty-free (CASA 2020). Therefore, the real road to growth can only come from structural reforms, that include provisional tax exemptions on imported equipment, fish feeds and ingredients.

b) Lessons from the major aquaculture producing countries in Asia and Africa have shown that governments in those countries have been providing incentives for the industry. These incentives have either been in form of tax holidays, creation of Special Economic Zones (SEZ), where fish farms and feed manufacturing industry can be located. Government of Nigeria also provides preferential finance for fish farmers, tariff and non-tariff measures on imported fish products that dumped on the market. Key policy interventions have focused on promoting domestic feed production industry.

c) Transformation of the aquaculture sub-sector has been achieved by increased productivity, driven by science. Most of the countries in Asia and Latin America provide sustained financing for aquaculture research. Most countries have developed high yielding strains of tilapia through genetic improvement.

d) Most of these countries upgraded their feed value chains and increased fish production by (i) increasing fish farmers' access to and capacity to utilise high quality feeds; (ii) assuring the quality of fish feeds through development and enforcement of national feed quality standards; (iii) intensifying extension services to train fish farmers on best ways to utilise fish feeds; and (iv) providing 'missing middle' finance to farmers to purchase feeds.

e) Establishing Fish Producer Organisations has helped create strong fish farmer institutions necessary for (i) providing political influence; (ii) supporting to craft policies which are beneficial to the industry; (iii) participating in creating industry standards to gain customer and consumer confidence; (iv) networking opportunities for farmers and input suppliers; and (vi) participating in technology and innovation development research projects.

Therefore, the strategy has drawn on these lessons to develop a framework necessary for the creation of a fast growing sector, in part by deliberate government actions to address "supply-side" policies, including tax reforms; and developing a highly skilled research and extension service in order to achieve a science-led sector growth.

5.2 Best Management Practice

Best management practices (BMPs) in aquaculture can generally be defined as the application of sound management practices that promote the sustainable growth of the industry whilst achieving the minimum of harm to the environmental, through the application of cost-effective and continually assessed management measures. Drawing on lessons from other countries, the strategy has defined the BMP appropriate for Malawi to include interventions that should be made to optimise performance across a range of areas including water management, fish health, species, production system, feed management and business management. A summary of BMPs can be seen in Fig 2 below.

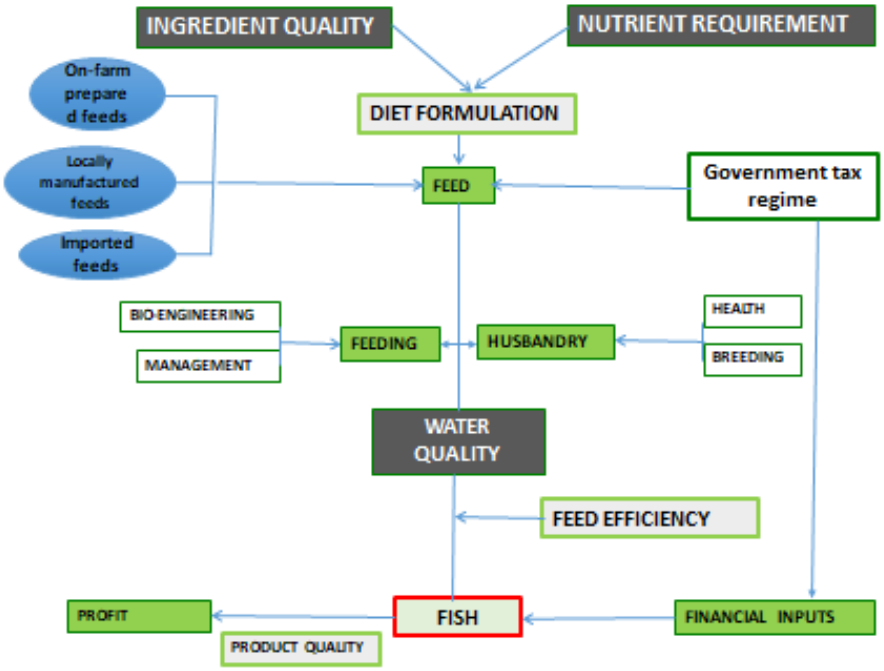


Fig. 2. Conceptual Framework of Best Management Practices (BMPs)

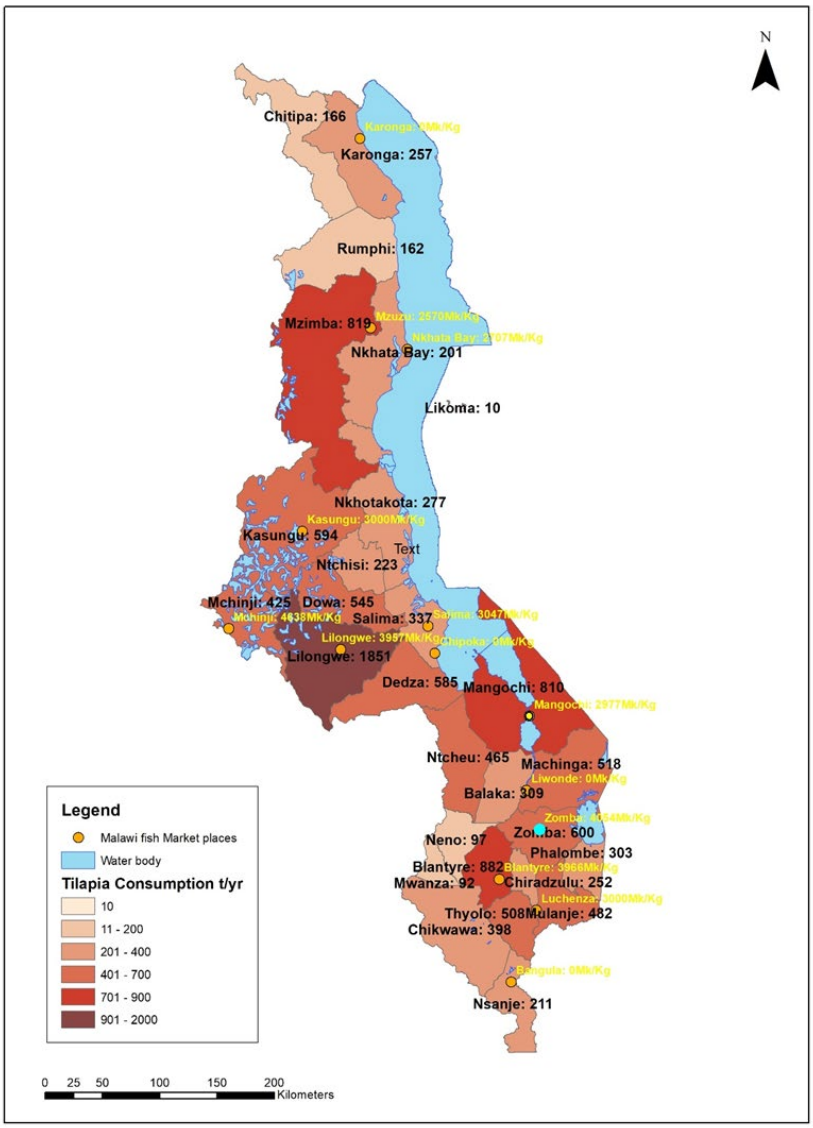
A successful fish farming business requires (i) nutritionally balanced diets, (ii) good husbandry skills, and (iii) good business management. However, good quality feeds are paramount, the production of nutritionally balanced diets for fish requires research, quality control, and biological evaluation. Key factors to successful fish farming include (i) quality ingredients, (ii) nutrient requirements of the fish, that is affected by digestibility and the balance of those nutrients; (iii) good husbandry skills coupled with management influences the performance of the fish under a particular diet; (iv) fish growth (and productivity) together with feed conversion are greatly influenced by feed intake and water quality; (v) these factors in turn affect the nutritional requirements and dietary levels of nutrients; (vi) water temperature influences metabolic rate and energy expenditure; and (vii) financial inputs, including government taxes, have a major bearing on the profits of the farm business. The strategy recommends that the Department of Fisheries develops training materials on BMPs and deliver training to extension workers, hatchery operators, on-farm fish feed manufacturers, and fish farmers, in order to enhance their knowledge of commercially and environmentally viable fish production practices. In addition, technical guidelines should be produced in order to guide the extension workers on the use of the BMPs.

6.0 Commercialisation perspectives of aquaculture in Malawi

The NASP I aimed to create financially independent fish producers who would be able to derive most of their incomes from aquaculture. While many farmers have moved to become commercial over the period of implementation of NASP I, the review has revealed that a lot of farmers still operate at sub-optimal commercial level. Therefore, the strategy has developed a logically sound commercial perspective to guide SMME investments, by (i) determining the supply-demand dynamic up to 2030, at district levels, and (ii) determining financial viability of the Small Medium Enterprise (SME).

6.1 Estimated current tilapia consumption dynamics

According to Department of Fisheries statistics, current potential consumption of tilapia in Malawi is estimated be 12,380 tonnes. This consumption comprises (i) aquaculture production (8,262tonnes), (ii) capture fishery landings (3,638 tonnes), and (iii) imported (frozen Tilapia) (480 tonnes). Therefore, the 12,380 tonnes translates into an estimated market value of about **MK30.947 billion** per a year (**USD39 million**). At the current consumption, the tilapia market (MK31 billion) represents 14.3% of the current capture fisheries production (in 2018, fish landings had a beach or landed value of MK196.69 billion (USD273.18 million). Calculated as per capita consumption per district, the results indicate that Lilongwe, Blantyre, Mangochi, Zomba, respective, have the greatest per capita consumption of tilapia in Malawi (see Map 1 below).



Map 1. GIP Demand profile of tilapia in all districts in Malawi, based on per capita consumption rates

6.2 Estimated tilapia market size to 2030, at current consumption

The 12,380 tonnes translate into a per capita consumption of 0.7048 kg per person. In order to maintain the current per capita consumption until 2030, fish farmers will need to produce an additional 4,025 tonnes by 2030 (Table 7). This level of consumption will increase the market size of tilapia to MK40.861 billion.

Table 7. Estimated total tilapia consumption and market size in 2020 and 2030

Description	Total market demand ($MT.yr^{-1}$)	Total market value size (MK billions)
Current (2020)	12,379	30.947
Future (2030)	16,404	40.861
Increase	4,025	9.814

Source: Prepared by the author

6.3 Forecast of production and input requirements of tilapia aquaculture to 2030

During the stakeholder consultations, a consensus was reached that NASP II should aim to increase aquaculture production to 20,000 tonnes by 2030 (the target in the National Fisheries & Aquaculture Policy 2016 is 20,000 tonnes by 2021). The simulations were done on production possibilities and reached production levels of 24,200 tonnes. This rise of production will target domestic and regional (SADC) markets; and will increase the market size of tilapia to **MK60.5 billion**. Combined with the values of required fish feeds (MK40.74 billion) and fingerlings (**MK1.56 billion**) sub-sectors, the whole aquaculture industry could be worth an estimated total of **MK102.7 billion** to 2030. In order to achieve this level of production, the strategy aims to (i) at least 1,500 small-scale fish farmers (25% of the total number), should produce at least 3 tonnes each per year; (ii) support emerging medium-scale fish farmers that use cage culture either on Lake Malawi or some of the small-water bodies (reservoiurs), that will produce at least 10-20 tonnes each a year; and (iii) support two more large-scale fish farms, that are similar to MALDECO, and with the potential to produce a minimum of 1,500 tonnes each per year (Table 8). Assumptions for the production potential in the simulations can be seen in the Working Paper.

6.4 Small-scale farm financial analysis

In order to take advantage of the expanding aquaculture sector, small-scale fish farmers need to operate as businesses. To support this, the strategy has put in place a simplified Financial Model, with results clearly show that small-scale fish farming is an attractive baseline business case with operational margin of 35% from first year, an ROI break even at year 3, and an IRR of 39% over 10 years (detailed financial analysis can be seen Working Paper). However, for small-scale fish farmers to realise this potential, the strategy calls for the need to build their capacity to (i) improve farm management and fish husbandry; (ii) access and use high quality of fingerlings; and (iii) access and use high quality feeds (preferably formulated ones) (i.e. BMPs). The strategy encourages enhancement of small-scale fish farmer productivity from the current estimated 1900 Kg/ha/year to at least 2500 Kg/ha/year and 3000 Kg/ha/kg. Furthermore, better retains can be achieved with expanded pond sizes from an average of 600m^2 to 2000m^2. These improvements will enable fish farmers to achieve some level of economies of scale.

Table 8. Simulated feed requirements and resultant fish production over NASP II period (2021-2030)

Production category	Years									
Quantities (MT)	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Large-scale-Fish productions (MT)	1,000	2,500	2,700	4,600	4,800	7,500	8,750	12,000	13,500	16,500
Large-scale – Feeds (MT)	1,682	3,788	4,540	7,735	12,612	13,839	18,979	21,351	23,723	26,096
Large-scale fingerlings (million)	5,530	8,300	9,960	12,730	12,730	16,600	19,370	22,130	24,900	30,430
Medium-scale – Fish production (MT)	5	16	25	38	60	100	120	120	160	200
Medium-scale – Feeds (MT)	8	27	42	63	101	168	201	201	268	335
Medium-scale fingerlings	27,667	44,267	55,333	83,000	110,667	138,333	166,000	166,000	221,333	276,667
Small-scale – Fish production (MT)	2,250	3,000	3,000	3,750	4,500	4,500	6,000	6,000	7,500	7,500
Small-scale fingerlings (million)	8,300	11,067	11,067	13,833	16,600	16,600	22,133	22,133	27,667	27,667
Small-scale – feeds (MT)	4,292	5,723	5,723	7154	8,585	8,585	11,447	11,447	14,308	14,308
Total fish (MT)	**3,255**	**5,516**	**5,725**	**8,388**	**12,060**	**13,350**	**18,120**	**19,620**	**22,660**	**24,200**
Total feeds (MT)	**5,982**	**9,538**	**10,305**	**14,952**	**21,298**	**22,592**	**30,627**	**32,999**	**38,299**	**40,739**
Fingerlings (million)	**13,858**	**19,412**	**21,083**	**26,646**	**33,311**	**36,109**	**44,429**	**47,199**	**55,558**	**58,374**

Source: Prepared by the author

6.5 The aquaculture finance ecosystem

6.5.1 Current financial ecosystem

Despite the Financial Models above indicating that solid market with prospects for future expansion, the overall investment environment for aquaculture in Malawi is mixed. There are number of challenges, mainly due to the fact that the financial sector in Malawi is not developed to cater for small and medium aquaculture enterprises. The key challenges include:

(i) monopolized environment, where a few local banks control the bulk of the financial-sector assets;
(ii) limited access to financial services by majority of Malawians; the situation is even worse for fish farmers;
(iii) high cost of borrowing, with interest rates above 35%, it is challenging, especially for fish farmers, to generate positive returns;
(iv) loans with strict conditions, such as collateral requirements, which fish farmers are unable to meet; and
(v) limited number of DFI capital impact in Malawi. Unlike in Kenya, Zambia and Mozambique, where a lot of DFIs are supporting fish farming enterprises, not much is happening in Malawi. However, there is hope that the GIZ-AgFin might help since aquaculture has been identified as one of the potential business to benefit from the project.

6.5.2 Proposed new financial ecosystem platform for aquaculture

The strategy is proposing an Aquaculture-Centric Financial Ecosystem Platform which is based on available resources and business solutions that have proven successful elsewhere (Fig. 3). This will entail:

- active role of government in providing funding and incentives by attuning current government funded initiatives, such as AGCOM and NEEF, to benefit fish farming business, with supporting services from MITC. Government should also support equity funding through such entities as MAIIC.
- DFIs should be involved in aquaculture development by supporting private aquaculture investments.
- Commercial banks (e.g. FDH, NBS, FCB) should dedicate funds to aquaculture and modify the microfinancing loan conditions to suit fish farmers (i.e. adaptive collaterals or securities, repayment aligned with farming seasons). Lessons from Zambia where Rabobank, jointly with ZANACO, a local commercial bank, are providing funding to aquaculture, can be used by NBS Bank.
- **NGO and DPs** – should diversify their portfolios, which are dominated by crops, in order to offer support services and subsidized business activities to fish farmers. Typically, such activities could include training and capitalisation for fix duration.
- **Local Private sector** should be integrated in the financial ecosystem platform, so that they can provide incubator and accelerator support to farmers.
- **University and Technical colleges** should intensify their interactions on commercialisation of the sector by developing applied research which is linked to actual farm business development. For example, students' research on breeding and nutrition should be linked to a commercial hatchery and feed manufacturing mills that required local adaptation into the Malawian environment.

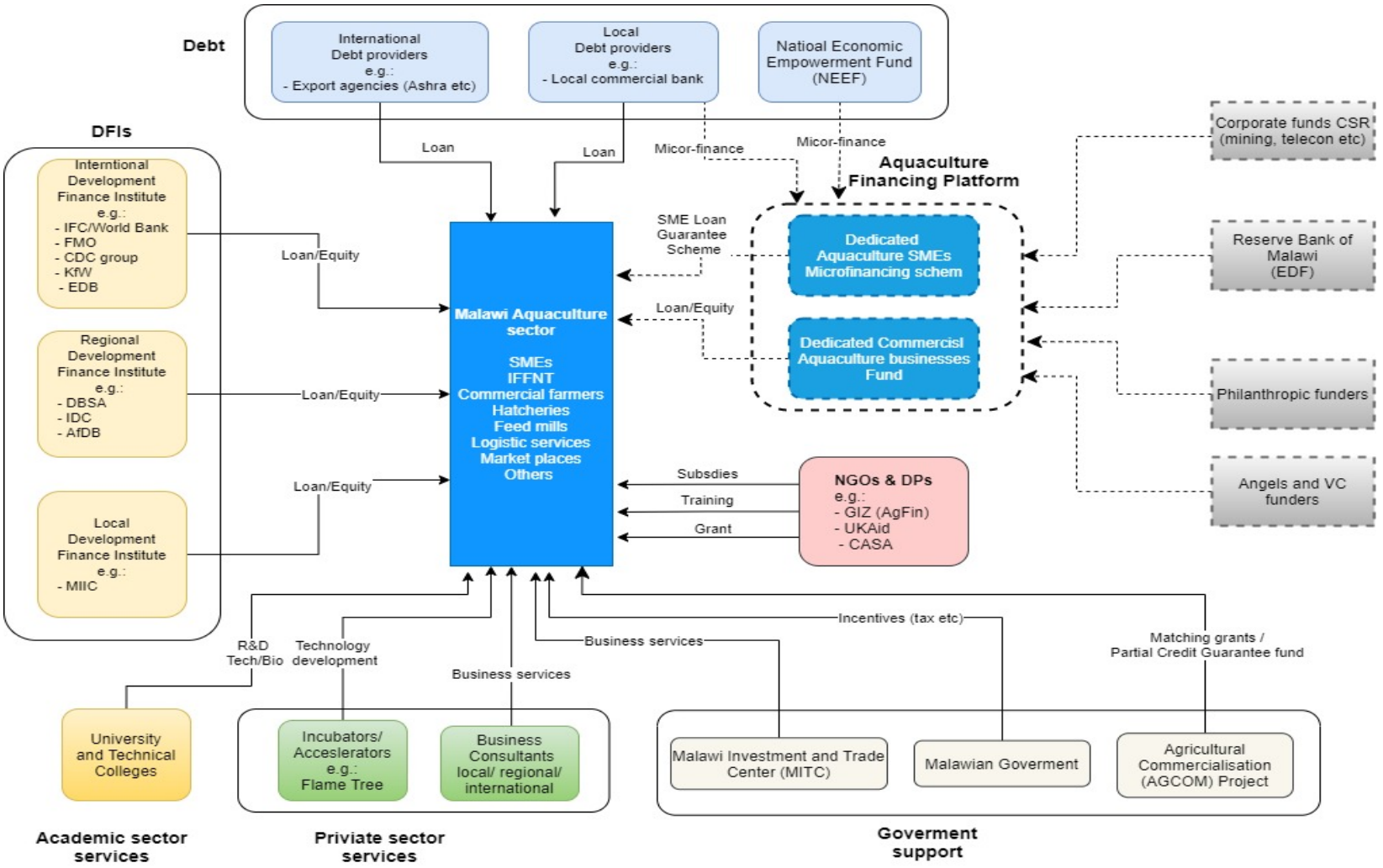


Fig. 3: The Malawian aquaculture finance ecosystem (current and future)

7.0 Problem Statement

The analysis of the problem builds on the recent SNRL's that assessed the alignment of the National Fisheries and Aquaculture Policy (2016) with the SADC Protocol on Fisheries (Chimatiro 2021). Problem analysis was done in two parts. First, focused on the general challenge of aquaculture sector growth in Malawi; and this this revealed the technical constraints that have led to Malawi lagging behind many counties, despite being an early adopter to aquaculture. Second, determined the institutional challenges that have resulted from lack of alignment of Malawi's Aquaculture Policy with the SADC regional Protocol on Fisheries and other instruments. The analysis identified eight problems, namely (i) weak linkages between national and regional policies and strategies; (ii) Inadequate development of fish supply chain; (iii) Limited participation of the private sector and market-led investment; (iv) weak institutional capacity to implement regional integration commitments; (v) weak governance to achieve coherence of aquaculture with development and regional integration; (vi) climate change, disaster and risk management; (vii) limited capacity on technology development; (viii) weak sectoral collaboration and coordination.

7.1 Success, Weakness, Opportunities and Threats (SWOT)

Assessment of the results of the stakeholder consultation, field visits and the recent study of the SADC National-Regional Linkages (SNRL) summarised into the SWOT analysis (Table 9), in order to identify the key priorities that are necessary for Malawi to achieve aquaculture sector growth, through the NASP II. While recognising that aquaculture in Malawi is saddled with enormous weaknesses and threats, these are not insurmountable; and hence the sector's strengths and opportunities, outweigh the weaknesses and the threats (Chimatiro 2021)[2]. However, in order to achieve growth in the aquaculture sector, the Department of Fisheries needs to work in a coordinated manner to deal with internal (strengths and weaknesses) and external (opportunities and threats) factors to help decision-making process that will place the sector on a path to growth. In addition to the SWOT, PESTELD was also conducted in order to further assess the opportunities and threats, PESTELD diagnosis was used to identify critical external factors (Political, Economic, Social, Technological, Environmental, Legal and Demographics) that may affect the Department of Fisheries as an institution in the course of implementing NASP II. Detailed PESTELD results can be seen in Working Paper.

Table 9. Strengths, Weaknesses, Opportunities and Threats (SWOT) to Aquaculture in Malawi

INTERNAL	
STRENGTHS	**WEAKNESSES**
1. Strong demand for fish	1. Lack of zoning of potential areas on land, lakes, rivers & small waterbodies to guide investments
2. Good response to decentralisation of aquaculture activities at district level	2. Lack of clarity on rules on import permits, tax exemptions, quality control & food safety by MRA & MBS
3. Conducive climatic and bio-physical conditions for farming a variety of species (tilapia, African catfish, and trout)	3. Inadequate support for the transformative approach to enable smallholder farmers graduate to market-led operations*
4. A rich endemic fish biodiversity for potential candidate species	4. Inadequate linkage to the regional aquaculture value chain*

[2] Chimatiro, S. 2020. National Aquaculture Strategy: Aligned with the SADC Protocol on Fisheries. September 2020.

5. Water is generally available, including abundant lakes and rivers for land-based aquaculture and cage culture	5. Poor hatchery infrastructure and fingerling production
6. Malawi is signatory to SADC Protocol on Fisheries*	6. Absence of affordable feed manufacturing capacity
7. Strong policy focus on aquaculture across government ministries, departments and agencies	7. Farmers unable to access investment finance
8. Well conceptualised NASP I	8. Inadequate expertise and strategy for aquatic animal health
	9. Poor staffing and funding levels to District Fisheries Offices
	10. Poor reflection of aquaculture & fisheries in District Development Plans (DDPs)
	11. Poor linkage between research/ technology development and extension.
	12. Lack of a national strategy to guide research programmes (e.g. fish breeding, feeding etc)
	13. Lack of strategy to integrate fish farming in irrigation schemes
	14. Inadequate alignment with SADC Protocol on Fisheries*
	15. Poor linkages between Department of Fisheries and SADC National Committee*
	16. Inadequate participation in SADC regional processes*
	17. Lack of coordination with regional (SADC) research agenda and research centres in other countries
	18. Inadequate regulatory framework
	19. Department of Fisheries neither implemented NASP I systematically nor monitored its implementation
	20. NGOs & development projects lack technical support from the Department of Fisheries
	21. NGOs are not aware of NASP to guide their priorities
EXTERNAL	
OPPORTUNITIES	**THREATS**
1. Fish farmers & private sector willing to expand production	**1.** Rising cheap fish imports competing against locally produced fish
2. Retail outlets willing to support farmers enhance productivity & product variety	2. Smuggled fish products are undercutting prices of legitimate products
3. Decline in capture fisheries regionally & globally*	3. Poor incentives for private sector investments*
4. Regional feed and fish markets	4. Financial sector is underdeveloped for aquaculture
5. Strong interest by investors and funding agencies	5. Profile of aquaculture at District level is too weak to attract attention of policy-makers
6. Institutionally, aquaculture is part of the District Agriculture & Natural Resources Directorate	6. Lack of national strategy to guide technical specialisation in accordance with NASP
7. All public universities and colleges offering training in aquaculture	7. Farmers & Private sector exerting pressure for exotics
8. Some coordination of research efforts among universities, Department of Fisheries and private sector research institutions	8. Declining wild fish biodiversity
9. Strong research in universities and National Aquaculture Centre	9. Lack of application of FAO "Framework for Aquatic Genetic Resources" *
10. Well-established regional training institution at LUANAR*	10. Inadequate alignment with Nagoya Protocol*
11. Fisheries & Aquaculture Research Plan developed by FISH Project	11. Lack of zoning for cage culture is risk for pollution management
12. Growing demand for fish in SADC region	12. Malawi's aquaculture is uncompetitive at the SADC regional level due to high cost of production
13. Malawi is a member of SADC Regional Genetics Platform	13. Rising numbers of competing training & research institutions in SADC region
14. Aquaculture is integrated in policies & strategies of many parastatal organisations	14. Poor coordination between Department of Fisheries & NCST on implementation of the National Research Agenda
15. Strong partner/donor support*	15. Smallholder fish farmers not organised in Producer Organisations
16. Farmers can improve productivity and incomes if assisted	16. NGOs in the sector are too few and with no capacity to lobby policy-makers & donors for funding

Source: Analysis by current study and *Chimatiro (2021)

7.2 Rationale for the National Aquaculture Strategic Plan

Aquaculture in Malawi is faced with a number of challenges that lead to Sub-optimal and non-profitable sector growth, and the impact the effect is reduced profitability and competitive of the sector, and increased livelihoods and food security losses of fish farmers (see Problem Tree Table 10). Therefore, justification for strategy is based on three reasons, strategic, operational and opportunistic. Strategically, natural sources of fish are increasingly strained from intensified demand, leading supply shortfall that is driving fish imports, further reducing local farmers' competitiveness. For operational reasons, there is a need for better management measures for fish farming; it is important to have priorities that are based on stakeholders' views and needs; and to guide government to allocate public investments. Opportunistically, Malawi farmers need to take advantage of the business opportunity presented by the huge domestic and regional (SADC, COMESA) fish supply shortfall.

Table 10. Problem Tree for Aquaculture Sector in Malawi

Problem Tree	Objective Tree	Results
Effect: Reduced profitability and competitive of the sector, and increased livelihoods and food security losses of fish farmers	**Overall Objective**: To enhance production and productivity of aquaculture for increased household incomes, national economic growth and regional trade	**Impact**: Competitive and inclusive aquaculture sector that significantly contributes to wealth creation, descent jobs, food and nutrition security, social and environmental sustainability
Core Problem: Sub-optimal and non-profitable aquaculture sector growth	**Specific Objective**: To ensure increased and sustainable fish production and utilisation by properly managing and promoting aquaculture and reducing post-harvest losses	**Project Outcome**: Aquaculture sector is profitable and sustainably grows to deliver food security, nutrition and wealth creation
Causes: 1. Weak transformation of fish farming into small-scale market-led SMMEs 2. Research-4-Development unable to generate technologies and innovation to increase profitability, environmentally & socially sound sector growth 3. Aquaculture input-output markets, supply chains & products non-responsive to gender and unable to create wealth 4. Knowledge and skills unable to attain higher productivity & competiveness 5. Climate and environment constraining sound aquaculture investments 6. Weak central and local government institutions	**Strategies**: 1. Build capacity of fish farmers to increase productivity, enhance market-led transformation and manage farm business 2. Enhance scientific capacity, technology development and adoption 3. Develop and implement engendered value chains, modern market and trade regulatory instruments 4. Develop and implement frameworks and tools for effective knowledge and skills generation, dissemination and uptake 5. Develop mechanisms for improved climate resilient and ecologically sustainable aquaculture production and productivity 6. Strengthen institutions for improved governance and coordination of aquaculture policy and sector growth strategies	**Outputs**: 1. Capacity of fish farmers to increase productivity, enhance market-led transformation and manage farm business built 2. Capacity for scientific, technology development and adoption enhanced 3. Engendered value chains, modern market and trade regulatory instruments developed and implemented 4. Frameworks and tools for effective knowledge and skills generation, dissemination and uptake developed 5. Mechanisms for improved climate resilience and ecologically sustainable production and productivity of aquaculture developed 6. Institutions for improved governance and coordination of aquaculture policy and sector growth strategies strengthened

8.0 Strategic Direction for National Aquaculture Strategic Plan

8.1 Conceptual Framework for NASP II

The conceptual framework for NASP II is shown in the Fig. 2 below. In order for aquaculture to contribute to sustainable food systems (FAO 2018) in Malawi, it must (i) contribute to sustainable fish production, (ii) enable farmers to derive decent incomes, and (iii) while minimising potential environmental damage resulting from expansion in fish production. Therefore, the NASP II's conceptual framework is underpinned by six strategic themes. These include (i) transformation of small-scale aquaculture into market-led SMMEs, (ii) technological innovations, (iii) capacity strengthening, (iv) market efficiency, (v) climate-proofing and environment, and (vi) institutional infrastructure. This conceptual model aligns the NASP II with the Malawi 2063, SADC Protocol on Fisheries, SADC Industrialization Strategy and the Roadmap (2015), AU-PFRS, FAO Code of Conduct as well as the food systems approach.

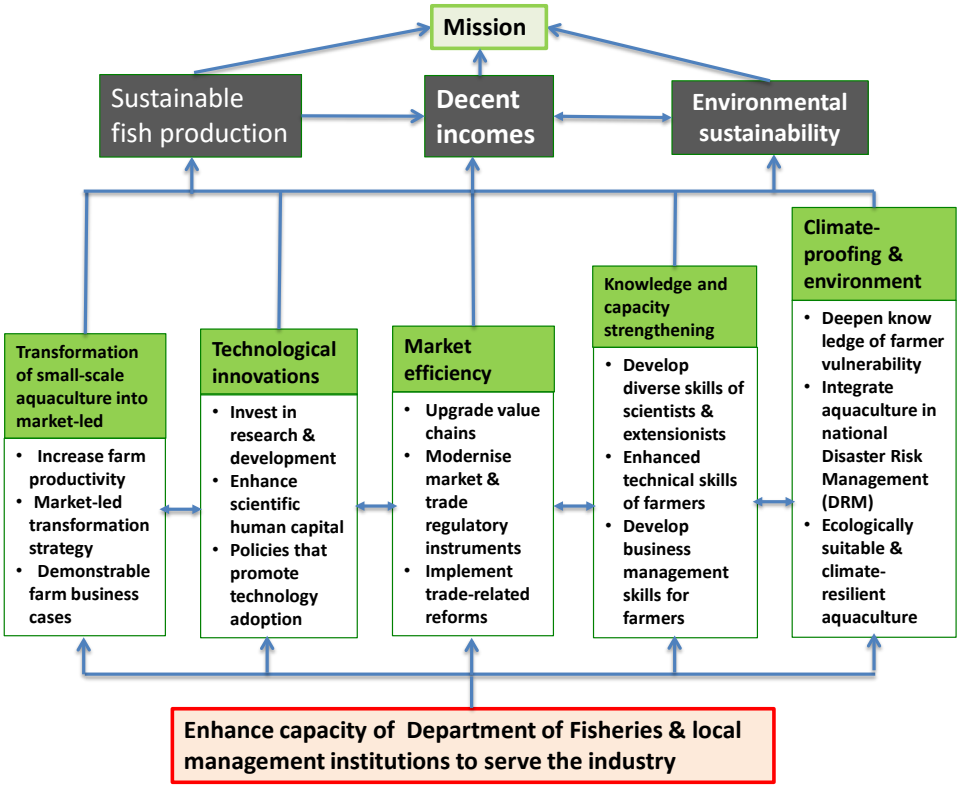


Fig. 2. Conceptual Framework for the NASP II

8.2 Vision, Mission, Goal, Objectives, and Guiding Principles

Building on the recent findings from the GIZ-SADC National-Regional Linkages (SNRL) on the alignment of Malawi's aquaculture policy with the SADC Protocol on Fisheries (Chimatiro 2020), as well as the analysis of the findings from stakeholder consultations, the NASP II comprises (i) vision, (ii) mission, (iii) goal, and (iv) six strategic themes/objectives (see NASP II Strategic Map in Fig. 3 below).

8.2.1 Vision

To become a leader of competitive, inclusive and sustainably produced farmed products in the SADC that contributes significantly towards wealth creation, employment, food and nutrition security, agricultural transformation and self-reliance in Malawi.

8.2.2 Mission

Ensure a competitive and inclusive aquaculture sector that significantly contributes to wealth creation, descent jobs, food and nutrition security, social and environmental sustainability.

8.2.3 Goal

Enhanced production and productivity from aquaculture for increased household incomes, national economic growth and regional trade.

8.2.4 Overall objective

To ensure increased and sustainable fish production and utilisation by properly managing and promoting aquaculture and reducing post-harvest losses.

8.2.5 Guiding principles

Effective implementation of this strategy will require strong cooperation, collaboration, coordination and investment across a range of entities based on a well-structured and participatory approach. The implementation of the Strategy is aligned to the general principles of the MW2063, PFRS, RISDP and the SADC Protocol on Fisheries. Below are the principles that will be applied in the planning, decision-making, investment, management and regulation of the aquaculture sub-sector in Malawi.

(1) **Alignment to national medium and long term plans** – NASP II will be aligned to MW2063 with periodic and measurable targets based on realistic assumptions (National Planning Commission 2020).
(2) **Prioritization** - The focus must be on the realistic attainment of specific objectives in line with national priorities.
(3) **Broad Participation and Consultation** – the implementation of the Strategy must be based on broad participation and consultation to ensure ownership and commitment.
(4) Realism, flexibility and pragmatism are the key fundamentals for implementing the strategy.
(5) **Equity and equality** - Decision-making processes must be inclusive, fair and transparent, non-discriminatory to women, youth, vulnerable and disadvantaged groups and subject to clear and consistent rules and procedures.
(6) **Scalability -** Activities, wherever possible, must be designed to be suitable for use at different scales, for example at local and national scales and regionally. Scaling must be attained by replication (in different places), and by modification and adaptation of initiatives for different contexts.

(7) **Sustainability** – Application of EAA and international BMP will guard against undesirable bio-ecological and socio-economic outcomes.

(8) **Accountability** – stakeholders including and non-State actors must own the process of implementing the strategy and be held responsible for their decisions and actions.

(9) **Self-development -** Strategies are of little value in the absence of supporting political will and financial resources. Government will provide an enabling environment for stakeholders to successfully implement the strategy.

(10) **Deepening Regional and Global Integration -** Malawi shall take full advantage of its being a member of the UN, AU, SADC, COMESA, WTO and other such regional and global bodies to tap in the fish trade and economic investment opportunities that they offer for the realization of the aspiration of inclusive wealth creation and self-reliance (National Planning Commission 2020).

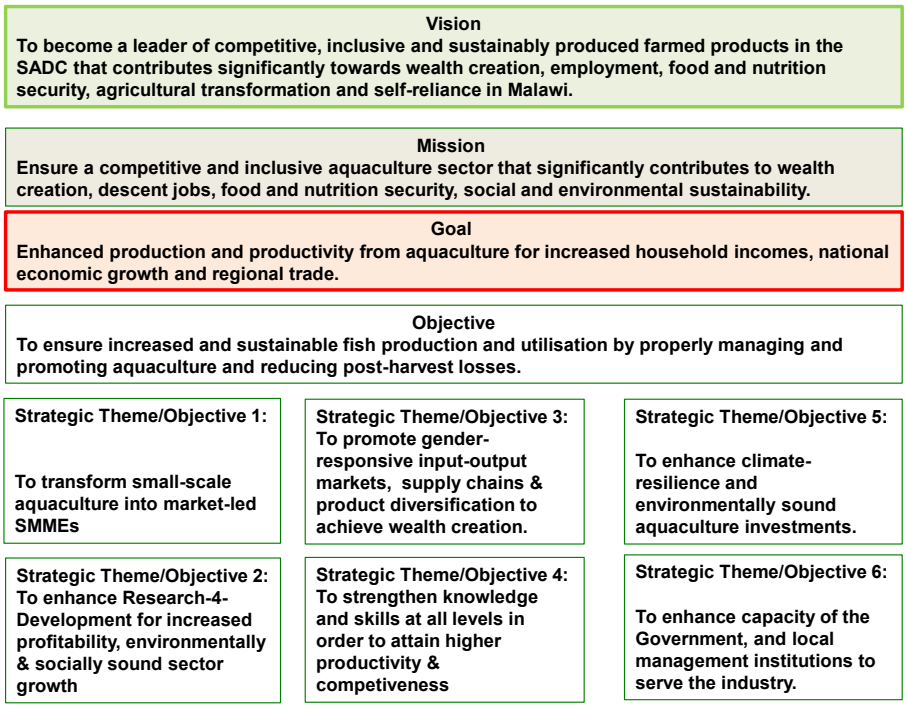


Fig. 3. Strategic map of the NASP II

8.3 Strategic objectives

The strategic themes or objectives (Table 11) aim to close the gaps that were identified in the review of the first National Aquaculture Strategic Plan (2005 – 2015), and the recent report by Chimatiro (2021), through which the National Fisheries and Aquaculture Policy (2016) was aligned with the SADC Aquaculture Strategy and Action Plan (2016-2026), as well as the AU-PFRS.

Table 11. Strategic Themes/Objectives and expected outputs

#	Strategic Objective	Outcomes
1	To transform small-scale aquaculture into market-led SMMEs	Increased demonstrable farm business and productivity (from 1.9 to 3 MT/ha) for enhanced market-led transformation
2	To enhance Research-4-Development for increased profitability, environmentally & socially sound sector growth	Enhanced capacity for scientific, technology development and adoption enhanced
3	To promote gender-responsive input-output markets, supply chains & product diversification to achieve wealth creation	Enhanced capacity for development and implementation of engendered value chains, modern market and trade regulatory instruments
4	To strengthen aquaculture knowledge and skills in order to attain higher productivity & competiveness	Strengthened frameworks and tools for effective knowledge and skills generation, dissemination and uptake
5	To enhance climate-resilience and environmentally sound aquaculture investments	Improved capacity for climate resilience and ecologically sustainable production and productivity of aquaculture
6	To enhance capacity of the Central and local government institutions to serve the industry.	• Improved institutional and organisational capacity for efficient aquaculture development services • Strengthened coherence and regulatory framework for a viable aquaculture industry • Functional decentralised system in the delivery of aquaculture services • Effectively aligned sector for enhanced regional integration

8.6 Strategic priority areas and interventions

Strategic objective 1: To transform small-scale aquaculture into market-led SMMEs

Strategy and reform context

Transformation of small-scale fish farming is paramount because, the share of aquaculture (estimated at US$20 million) in the country's agriculture GDP (US$2.51 billion) is very low. Therefore, increasing the productive potential of the sector is critical in order to improve wealth generation and reduce poverty. Therefore, for increased productivity of small-scale farmers to occur, NASP II emphasises on farmer-led aquaculture transformation and commercialisation that entails farmers treating aquaculture as a business. According to Hecht et al (2012) in principle, basic tilapia farming systems are well tested throughout Africa and the criteria for success are not technical but successful adaptation to market requirements, consumer preferences, market prices and local technical capacity; in a nutshell this illustrates that commercial aquaculture could be a viable and vibrant sector in most countries.

For transformation to occur, alternative institutional arrangements will be required. These institutions should offer a suitable mode of organisation for productivity and value added growth (Collier & Dercon 2014). Field observations revealed that farmers are already transitioning towards market-led operations. The Transformation Strategy will entail creating

appropriate institutions that will (i) mediate skills and technology transfer, (ii) open access to finance and capital, and (iii) build organisational capacity for logistics of trading, marketing and storage, using the model that has been proposed by Collier & Dercon (2014). In order to realise this Transformation Strategy, through NASP II Malawi will (i) enhance husbandry technics and skills among small-scale fish farmers (ii) create policy environment for easy access to investment finance; (iii) support emerging medium-scale farmers; (iv) develop certified fingerling producers; (v) develop domestic fish feed industry; and (vi) enhance input and out markets, including regional markets.

Outcome: Increased demonstrable farm business and productivity (from 1.9 to 3 MT/ha) for enhanced market-led transformation	
Strategic objective 1: To transform small-scale aquaculture into market-led SMMEs Strategy and reform context	
Priority actions	PA1: Design and implement strategies that enhance market-led transformation PA2: Support farmers to transform to producer organizations and cooperatives PA3: Develop and operate demonstrable farms business cases PA4: Increase farm productivity

Strategic objective 2: To enhance Research-4-Development for increased profitability, environmentally & socially sound sector growth

Strategy and reform context

Aquaculture productivity in Malawi must be underpinned by science and technologies. Driven by technical knowhow. Insights from China on tilapia industry development, indicate that two levels are important, namely (i) farmers need to have a clear scope of the Business choice, and Develop models that are based on resources and upgrade technology; (ii) Government must provide support and guidance on (a) hatchery, (b) feed industry, and (c) quality control and sustainable development (Yuan 2015). Therefore, NASP II will lead to better organised and high quality scientific research, that will develop and promote aquaculture innovations, in order for the Department of Fisheries to deliver inclusive, evidence-based and sustainable solutions to fish farmers. In addition, research on economic and policy analysis will enable the Department of Fisheries to demonstrate the contribution of the sub-sector to national economic development.

Outcome: Enhanced capacity for science, technology, innovation development and adoption	
Strategic objective 2: To enhance Research-4-Development for increased profitability, environmentally & socially sound sector growth	
Priority actions	PA1: Strengthen institutional capacity for research and development PA2: Design and conduct priority research for appropriate technologies PA3: Enhance scientific human capital

Strategic objective 3: To promote gender-responsive input-output markets, supply chains & product diversification to achieve wealth creation

Strategy and reform context

Field observations during the review of the NASP I, revealed that regardless of the scale of production, all farmers aimed to sell for cash income; hence, there is no pure subsistence. This supports the recent research findings which reported that for most Malawian households, including in rural communities, their food security and dietary nutritional needs now are equally tied to the market as to their own farming, if not more so (Gilbert et al 2020). However, there are numerous gendered barriers limiting the capacity of women and youth to generate incomes and build assets from aquaculture. This is more critical for women that are poor, as they experience a lot of barriers than their male counterparts. Some of these barriers include limited access to appropriate technologies, extension services, markets and loan services. For example, women face gender-based discrimination, restrictions by husbands and social exclusions that prevent them from engaging in the lucrative small-scale fisheries value chains in Malawi (Manyungwa et al. 2019). Furthermore, a lot of youth have struggled to participate in fish farming enterprises because aquaculture is not youth-responsive. Consequently, young men and women have largely been excluded from fish farming activities. Therefore, evidence-based, gender-focused interventions and innovation that address inequalities in aquaculture, are urgently needed.

Adapting aquaculture supply chains and input-output markets to suit women and youth is critical. However, this can only happen if fish value chains are upgraded, and women and youth are assisted to connect with domestic and regional input and output markets. This will be beneficial for both livelihoods and nutritional outcomes. A case for enhancement of fish markets to deliver national outcomes is provided by Gilbert et al (2020, who reported that there is a noticeable shift away from meat as a source of nutrients, with a significant shift towards fish in urban areas, with more calories and protein came from fish than from meat in 2016/17. NASP II will build rigorous gender-integrated and sex-disaggregated evidence to address gaps in data, knowledge and methodologies; (ii) capacity strengthening for gender research for evidence-based policy and development interventions; (iii) gender-inclusive aquaculture, with women- and youth-targeted financing and enterprise models; (vi) promote and increase opportunities for youth employment, entrepreneurship, technical and organisational capacity for production, input supply, processing and trading in various elements of the agrifood value chains.

Outcome: Enhanced capacity for development and implementation of engendered value chains, modern market and trade regulatory instruments	
Strategic objective 3: To promote gender-responsive input-output markets, supply chains & product diversification to achieve wealth creation	
Priority actions	PA1: Promote a gender transformative approach to aquaculture development PA2: Increased growth, sustainability, and participation of women and youth in aquaculture enterprises PA3: Promote strategies that overcome processing, marketing & consumption barriers for women and youth

Strategic objective 4: To strengthen knowledge and skills at all levels in order to attain higher productivity & competiveness

Strategy and reform context

Field observation revealed that, compared to crop farmers, most fish farmers are not well covered by extensionists. And because they are not organised in producer organisations, they cannot easily exchange knowledge. Therefore, most fish farmers reported to lack technical and managerial skills, leading to the sector being unproductive. Recently, GIZ-AVCP has demonstrated that encouraging formalisation through IFFNT and coaching the farmers on better husbandry, can help increase productivity and reduce the obstacles for members of IFFNT to be registered as a Producer Organisation. However, for fish farmers to acquire knowledge and skills, it is important for the extensions and researchers to received appropriate academic and technical training at the colleges and universities. Therefore, NASP II will aim to (i) develop diverse skills of scientists & extensionists, (ii) enhance technical skills of farmers, and (iii) develop business management skills for farmers.

Outcome: Strengthened frameworks and tools for effective knowledge and skills generation, dissemination and uptake	
Strategic objective 4: To strengthen knowledge and skills at all levels in order to attain higher productivity & competiveness	
Priority actions	PA1: Promote demand driven education and training in aquaculture to cater for research and extension needs PA2: Enhance institutional capacity of Aquaculture Division to support commercial fish farming technologies PA3: Develop business management skills for farmers PA4: One-stop-shop for all aquaculture business application procedures established. PA5: Establish to Increase local capacity for development of aquaculture equipment and manufacturing

Strategic Objective 5: To enhance climate-resilience and environmentally sound aquaculture investments.

Strategy and reform context

Increasing seasonal and annual variability in rainfall and resulting flood and drought extremes are likely the most significant drivers of change in capture fisheries and aquaculture (WorldFish 2007). As Malawi intensifies aquaculture investments on both land and cage aquaculture on Lake Malawi, environmental impact of such expansion is likely to present major challenges to sustainable aquaculture production. Many farmers reported that climate change was already affecting water availability on their farms. The Food and Agriculture Organization (FAO) Code of Conduct for Responsible Fisheries (CCRF) emphasises the need for countries to develop responsible aquaculture while ensuring environment and transboundary waters. At the continental level, the Joint Ministerial Conference on Agriculture, Fisheries and Aquaculture, which was held in Addis Ababa in 2014, recommended that: "**Urge Member States to include fisheries/aquaculture in existing Climate Change (CC) adaptation and mitigation, and Disaster Risk Management (DRM) Policy and Strategy"** (African Union 2014).

While the National Fisheries and Aquaculture Policy (2016) clearly provides guidance on climate change, it omitted DRM; however, recently Malawi has been affected by tropical cyclones Idai, and every year farmers lose their fishponds due to flooding or drought (Chimatiro 2021). Therefore, NASP II aims to ensure that the aquaculture industry is made resilient to future shock that could come from climate change and weather uncertainty. There could be increased virulence of pathogens and diseases, reduced ecosystem productivity in warmer waters, and adverse impacts on livelihoods and extreme weather conditions could cause destruction of cages, with escapees, possibly leading to loss of biodiversity and cause water stress. There is need to implement climatic smart aquaculture mitigation measures.

Outcome: Improved capacity for climate and disaster resilience and ecological sustainability of aquaculture	
Strategic Objective 5: To enhance climate-resilience and environmentally sound aquaculture investments	
Priority actions	PA1: Establish vulnerability of the fish farmers and shared ecosystems PA2: Implement disaster risk management and mitigation measures for aquaculture

Strategic Objective 6: To enhance capacity of the Government, and local management institutions to serve the industry.

Strategy and reform context

Responsive market-led aquaculture can only be facilitated and not hindered by coherent regulatory frameworks that serve the industry. Consultations with stakeholders has revealed that the Department of Fisheries has achieved a lot in mainstreaming aquaculture in the district development process. However, human resource capacity at the district level remains limited. Furthermore, many NGOs have adopted fish farming as one of their major programmes; but implementation of their fish farming programme lacks coherence with the National Fisheries & Aquaculture Policy (2016). In order to remain relevant to the Malawi's development philosophy, NASP II must contribute to the Malawi 2063. Therefore, NASP II provides the effective institutional framework for aquaculture governance and sector growth by ensuring that the Department of Fisheries (i) puts in place and implements a coherent regulatory framework that serve a viable industry, (ii) realises efficient organisational operations, (iii) guides mainstreaming of aquaculture to achieve efficient district development, (iv) enhances aquaculture governance at all levels, and (v) domesticates the aquaculture aspects of the SADC Protocol on Fisheries (Chimatiro 2021).

Outcome: Improved institutional and organisational capacity for efficient aquaculture development services	
Strategic Objective 6: To enhance capacity of the Government, and local management institutions to serve the industry	
Priority actions	PA1: Operationalise NASP II Coordination Unit in the Department of Fisheries PA2: Strengthened coherence and regulatory framework for a viable aquaculture industry

	PA3: Achieve functional decentralised system in the delivery of aquaculture services PA4: Effective nationally aligned sector for enhanced regional integration

9.0 Strategy delivery mechanism and implementation arrangement

Delivery of NASP II will optimise food and nutrition security and well-being of fish farming communities, and enable Malawi to realise the wealth-generating potential of aquaculture, in line with the Malawi 2063. According to Chimatiro (2019), the delivery mechanism of policy and strategies entails (i) appropriate analytical tools to determine the level community, or district at which the investment will have the most impact, (ii) considers efficiency/equity trade-offs of delivery, (iii) coherence with the overall regional strategy; (iv) connecting local and national resources (human and financial) to successfully leverage cross-country cooperation. In order to achieve the 4 conditions above, the delivery mechanism calls for (i) an adaptable governance framework that embraces the shifting roles of stakeholders at all levels; (ii) improves the capacity of Local Government/Councils and fish farming community authorities, (iii) facilitates participation at all levels, and (iv) introduces mechanisms to ensure proper horizontal and vertical coordination, as well as (v) knowledge and resource pooling at all levels.

9.1 Stakeholders engagement

The primary responsibility of implementing NASP II lies with the Department of Fisheries in the Ministry of Forestry and Natural Resources in Malawi. The Fisheries Conservation and Management Act, 1997 (Cap. 66:05) provides for the Fisheries Board as an advisory body for the Director of Fisheries. Therefore, it is important that the Department of Fisheries establishes the National Aquaculture Advisory Council, within the framework of the Fisheries Board. The Council will provide oversight on the implementation of the Strategy. Furthermore, the Department of Fisheries will establish the NASP II Coordination Unit (Fig. 4).

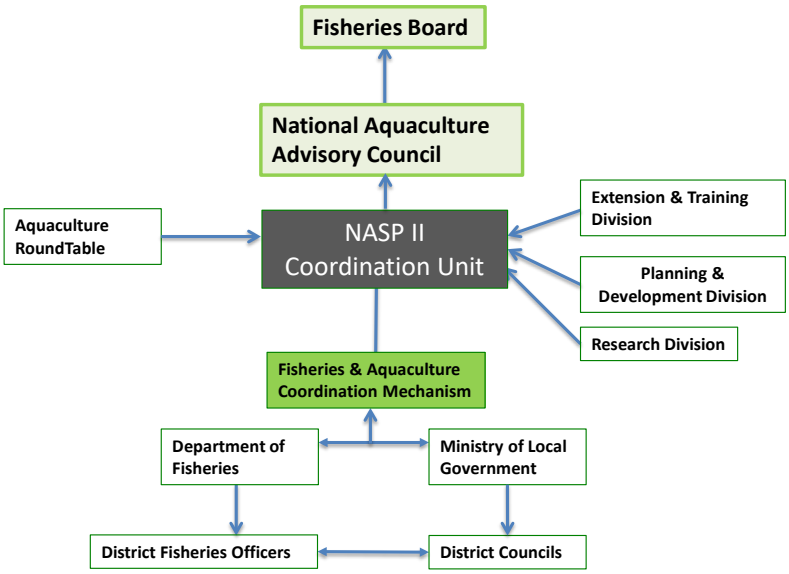


Fig. 4. NASP II Coordination Mechanism in the Department of Fisheries

The Senior Deputy Directors of Extension & Training; Planning & Development and Research, will jointly ensure smooth planning and implementation of research and extension activities necessary for the delivery of NASP II. Since aquaculture productivity programmes will only be visible at the district level, the Department of Fisheries will establish Aquaculture Coordination Mechanism with the Ministry of Local Government, and the District level, a similar platform will ensure improved coordination of aquaculture development activities in order to achieve coherence with the District Development Plans. Fig. 4 shows the NASP II Coordination Mechanism. Since the strategy is positioning aquaculture as a business, the Department of Fisheries will coordinate implementation with fish farmers and the private sector.

9.2 Implementation of the Strategy

The Implementation Plan for NASP II must be time bound, with clear strategies, outcomes, interventions, outputs and output indicators, activities and assumptions for implementing each strategic objective. Annex 1 shows the detailed Implementation Plan.

9.3 Financing the NASP II

The NASP II has been aligned with the Malawi 2063, therefore, the Department of Fisheries must ensure that aspects of the Strategy that lead increased productivity and wealth creation should be costed and submitted for incorporation in the Malawi 2063 10-Year Implementation Plan. The implementation of this ten-year strategy will require an estimated total of US$

23,285,000 (around K19 billion). Therefore, the Ministry of Forestry & Natural Resources and Department of Fisheries will undertake rigorous resource mobilisation in order to raise funds from government, development partners, NGOs, philanthropies, fish farmers and the private sector. As the strategy is contributing towards the food systems, it is important for the Department of Fisheries to maintain links with the Ministry of Agriculture, through the NAIP. Special efforts must be directed at aligning the implementation of this strategy with the regional (especially SADC), continental (PFRS) and global (FAO's Code of Conduct for Responsible Fisheries) frameworks, in order to benefit from funding opportunities that comes with these instruments.

9.4 Human Resource Development Plan

The development of human resources (both in quality and quantity), is pivotal to sustaining aquaculture industry, especially in the climate of changing paradigms affecting the sector (De Silva 2001). It was apparent from the stakeholder consultation that in view of the diversity of aquaculture practices (small-scale, rural, peri-urban, medium and large scale), there is a need for diversity of approach to aquaculture extension. In addition, current aquaculture education (AE) in the various universities and colleges also has adopted a diversity of course content, standards and delivery mechanisms. Lastly, there are varying degree of collaboration among academia, the Department of Fisheries and the aquaculture industry, including farms and other service providers. Human resources development is at the centre of Sustainable Development Goals (SDGs 4). Therefore, the strategy has put in place a coherent a five-year Human Resource Development Plan (see Working Paper).

9.5 Monitoring and Evaluation: Aligning NASP II to the Malawi 2063 First 10-year Implementation Plan (MIP 1)

The NASP II Coordination Unit, under the Aquaculture Division and leadership of the Senior Deputy Director of Fisheries (Aquaculture), will coordinate implementation of the NASP II, in collaboration with the Divisions of Extension & Training, Research and Planning & Development, within the Department of Fisheries. The MIP 1 targets to grow the share of agriculture, forestry and fishing to GDP from 23.3 percent in 2020 to 28 percent by 2030 (National Planning Commission 2021). Currently, the entire fisheries sector is estimated to contribute around 4% to the economy. Therefore, NASP II will target to contribute an estimated 0.05% to agricultural GDP by 2030.

MIP 1 aims to expand the area under commercial agriculture from 16 percent in 2020 to at least 40 percent in 2030 (NPC 2021). Therefore, NASP II aims to expand fish farming production by 39% by 2030; with the small-scale, medium-scale and large-scale sub-sectors growing at an average of 15%, 59% and 42%, respectively. In line with the Malawi 2063, the NASP II forecasts that the aquaculture sector will produce an estimated total of 140,200 tons by 2063; with the small-scale, medium-scale and large-scale sub-sectors growing at an average of 5,250, 35,000 and 100,000 tonnes, respectively.

The Aquaculture Division will prepare and submit monthly, quarterly and annual plans, budgets and reports, with the help of the Planning and Development Division. The quarterly reports will be consolidated into annual reports that will be reviewed to determine consistency with the overall NASP II. The Aquaculture Division will prepare and submit monthly, quarterly and annual plans, budgets and reports, with the help of the Planning and Development Division. The quarterly reports will be consolidated into annual reports that will be reviewed to determine consistency with the overall NASP II.

The Department of Fisheries will also incorporate the NASP II annual work plans into its Performance Appraisal System in order to ensure that implementation of the NASP II can be monitored through the targets of individual officer's Performance Contracts. M&E of the Strategy will be guided by the Theory of Change (Fig. 5). NASP II will only be able to deliver the most effective impact by implementing the Strategy through multi-stakeholder partnerships of those with shared common vision a vibrant, diversified, professional and profitable aquaculture industry can be delivered based on a National Innovation System that promotes sustainable investment on the one hand and a market system that delivers pro-poor outcomes on the other (Fig 5).

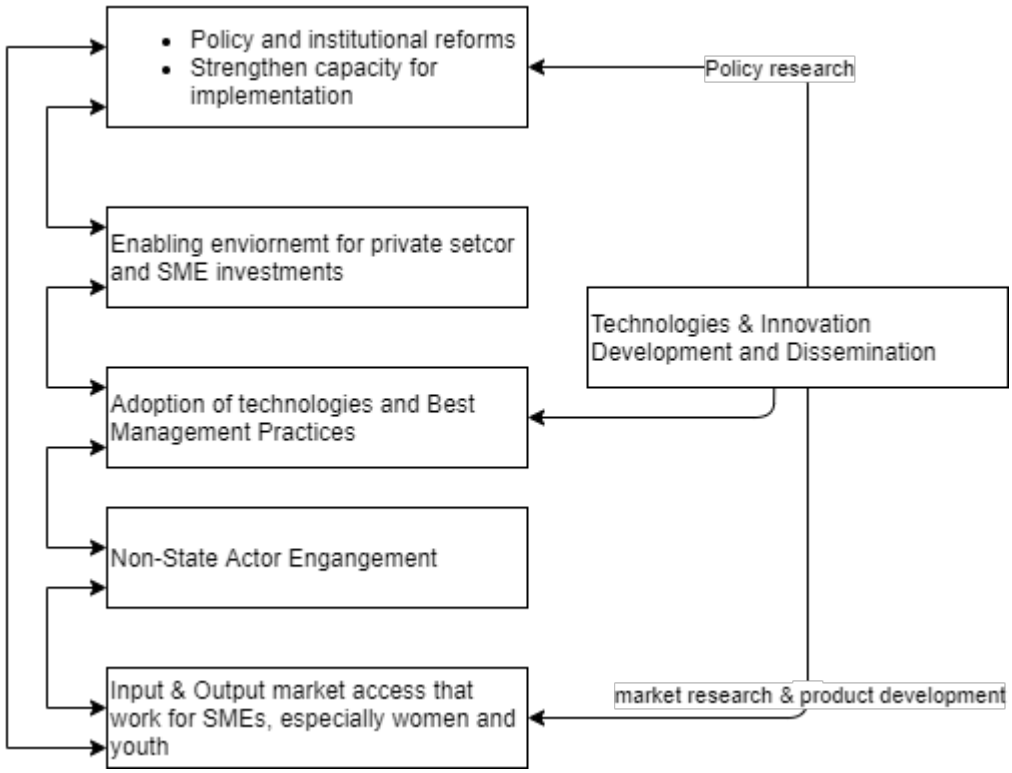


Fig. 5. Impact Pathway for National Aquaculture Strategy

Annex 1. National Aquaculture Strategic Plan (2021 – 2030) Results Framework

ACTIVITIES	TARGETS SHORT-TERM (2021-2023)	TARGETS MEDIUM TERM (2024-2027)	TARGETS LONG TERM (2028-2031)	Budget (USD)	VERIFICATION SOURCES
Strategic Objective 1: To transform small-scale aquaculture into market-led SMMEs.					
Outcome: Increased demonstrable farm business and productivity (from 1.9 to 3 MT/ha) for enhanced market-led transformation					
1.1 **Interventions & priority actions:** Design and implement strategies that enhance market-led transformation					
1.1.1 Establish Aquaculture Clusters to achieve scale 1.1.2 Establish live marketing infrastructure 1.1.3 Provide marketing and storage infrastructure through PPP 1.1.4 Facilitate access to financing by commercial banks	2 pilot clusters 2 pilots 1 in each cluster 3 pilot facilities 1,200 farmers	4 clusters 4, 1 in each cluster 4 facilities 7,200 farmers	8 clusters 8, 2 in each cluster 8 facilities 9,600 farmers	500,000	Department of Fisheries annual reports
1.2 Interventions & priority actions: Support farmers to transform to producer organizations and cooperatives					
1.2.1 Establish Producer Organisation (e.g. IFFNT) Liaison Unit in the Department of Fisheries **1.2.2** Register farmers into cooperatives **1.2.3** Support Fish Farmer Cooperatives to develop Business Plans and secure finances	• Liaison Unit operational • 10% of farmers operating as business • As in 1.1.4	• 60% of farmers operating as business • As in 1.1.4	• 80% of farmers operating as business • As in 1.1.4	250,000	Department of Fisheries & Funding Agency' annual reports
1.3 Interventions & priority actions: Develop and operate demonstrable farms business cases					
1.3.1 Carry out a survey to identify suitable sites for aquaculture **1.3.2** Gazette the identified land and water sites **1.3.3** Develop Fish-Hub or Clusters/Schemes **1.3.4** Link farmers to Anchor Farms to aggregate production or vertically integrate Clusters	• 2 cage, 4 dams, 8 pond sites • Gazette published • As in 1.1.1 • 2 anchor farms	• 3 cage, 8 dams, 12 pond sites • Gazette published • As in 1.1.1 • 4 anchor farms	• 5 cage, 20 dams, 30 pond sites • Gazette published • As in 1.1.1 • 6 anchor farms	350,000	Department of Fisheries
1.4 Interventions & priority actions: Increase farm productivity	12,000MT fish production	18,000MT fish production	**24,200** MT fish production		Department of Fisheries Annual reports
1.4.1 Improve production of good quality fingerlings **1.4.2** Provide targeted support to ensure quality of fish feeds among processors and farmers **1.4.3** Improve use of feeds, through Best Management Practices **1.4.4** Provide finance for the "missing middle"	• 80 million fingerlings, 4 certified hatcheries • 1 feedmill • 19,000MT feed (on-farm, local & imports) • As in 1.1.4	• 114 million fingerlings, 8 certified hatcheries • 2 feedmills • 29,000 MT feed (on-farm, local & imports) • As in 1.1.4	• 222 million fingerlings, 12 certified hatcheries • 39,000MT feeds (on-farm, local & imports) • As in 1.1.4	1,000,000 450,000 2,800,000	Department of Fisheries annual reports
Strategic objective 2: To enhance Research-4-Development for increased profitability, environmentally & socially sound sector growth					

ACTIVITIES	TARGETS SHORT-TERM (2021-2023)	TARGETS MEDIUM TERM (2024-2027)	TARGETS LONG TERM (2028-2031)	Budget (USD)	VERIFICATION SOURCES
Outcome 2: Enhanced capacity for scientific, technology development and adoption enhanced					
2.1 **Interventions & priority actions:** Strengthen institutional capacity for research and development					
2.1.1 Establish a Research Clearing Mechanism	• Mechanism in place, 20 technologies cleared	• 100 technologies cleared	300 technologies cleared	150,000	Department of Fisheries & University/college annual reports
2.1.2 Build on Aquaculture RoundTable to establish a "Research Coordination Mechanism"	• Coordination in place	• All research coordinated		20,000	
2.1.3 Develop National Science Skills Strategy	• Skills Strategy endorsed & used to guide specialisations			35,000	
2.1.4 Strengthen the link between research and research users	• Bi-annual Research Open Days	• Bi-annual Research Open Days	• Bi-annual Research Open Days	150,000	
2.2 **Interventions & priority actions:** Design and conduct priority research for appropriate technologies					
2.2.1 Enhance institutional capacity for aquaculture research planning and execution	• Aquaculture Research Unit in place			15,000	Department of Fisheries annual reports
2.2.2 Advance research on fish nutrition to guide development of sustainable feeds	• Research operational & local feeds identified	• Affordable locally produced feeds	• Feed self-sufficiency	350,000	
2.2.3 Implement National Genetic Improvement Programme (GIP) for *O. shiranus*	• Strain released, 2 multiplier hatcheries certified	• 4 multiplier hatcheries certified	• 6 multiplier hatchers certified	950,000	
2.2.4 Intensify research on candidate fish species in order to diversify aquaculture systems	• 1 candidate in place	• 2 candidates in place	• 3 candidates in place	550,000	
2.2.5 Conduct multidisciplinary research on selective breeding, fish health, aquafeeds and environmental management	• Joint breeding, health, feeds, environment research in place	• New BMP & training manuals used	• Updated BMPs & training manuals	250,000	
2.2.6 Improve research funding through joint proposals (universities, DoF, IRIs)	• Research Fund set, funding 20% of research	• 50% of research funded	• 70% of research funded	100,000	
2.3 **Interventions & priority actions:** Enhance scientific human capital					
2.3.1 Develop and implement National Science Skills Strategy to guide technical specialisation in accordance with NASP II	Skills Strategy endorsed & used widely			25,000	• Department of Fisheries annual reports
2.3.2 Undertake regular skills needs assessment and train scientists accordingly	Needs assessment & 10 scientists trained	20 scientists trained	100 scientists trained	3,000,000 50,000	• Research Institutions' and private

ACTIVITIES	TARGETS SHORT-TERM (2021-2023)	TARGETS MEDIUM TERM (2024-2027)	TARGETS LONG TERM (2028-2031)	Budget (USD)	VERIFICATION SOURCES
2.3.3 Enhance collaborative links among national, regional & international research partners 2.3.4 Expand involvement of private sector in research and training 2.3.5 Build capacity for aquatic animal health, including inspectorate and diagnosis	• Regional Platform for science endorsed • 5 private sector-led research underway • At least 3 AAH specialists in place • AAH Strategy endorsed	• 5 collaborative research underway • 10 research partly funded privately • 6 AAH specialists in place & Strategy fully implemented	10 collaborative research underway • 17 research privately funded • 10 AAH specialists in place	 350,000 650,000	sector annual reports
Strategic objective 3: To promote gender-responsive, equitable and sustainable aquaculture development in order to improve wealth creation, incomes, food, and nutrition security					
Outcome: Enhanced capacity for development and implementation of engendered value chains, modern market and trade regulatory instruments					
3.1 **Interventions & priority actions:** Promote a gender transformative approach to aquaculture development					
3.1.1 Collect & analyse gender disaggregation data 3.1.2 Carry out gender sensitive adaptive research along the value chain 3.1.3 Promote utilisation of new technologies for increased production and access to input & output markets by women and youth 3.1.4 Identify and reduce gendered barriers to improve capacity of women to generate incomes and build assets from aquaculture 3.1.5 Promote gender-sensitive extension and communication to promote uptake of aquaculture	• Sex-disaggregate aquaculture census • Field data is age disaggregated • Identify women & youth technology preferences • Identify and address power inequalities in the sector • Address women & youth's agency (capacities, skills, confidence) in the sector	• Women are 10% of adopters of improved strains • 30% & 15% of members of Aqua. Association are women & youth, respectively • Address women & youth's agency in the sector • 15% of extensionists are women	• 60% and 30% of adopters of technology are women & youth, respectively • Research is fully gender mainstreamed • Address women & youth's agency in the sector	65,000 150,000 250,000 100,000 95,000	Department of Fisheries annual reports
3.2 **Interventions & priority actions:** Increased growth, sustainability, and participation of women and youth in aquaculture					
3.2.1 Facilitating women-led businesses with technical, leadership entrepreneurial skills 3.2.2 Increase use of improved technologies by youth 3.2.3 Increase youth's access to markets, finance, extension, fingerlings, and feeds	• 2 pilot women-targeted financing & enterprise models • 10% of new adopters are youth • 5% of SMEs are youth-led • Set up 2 Youth Incubators	• 20% of SMEs are women-led • 15% of SMEs are youth-led • Women & youth increase yields by 50% & 60%, respectively	• 60% and 20% farmers are women and youth respectively • Women and youth increase productivity by 80% & 90% respectively	250,000 150,000 250,000	Department of Fisheries annual reports

ACTIVITIES	TARGETS SHORT-TERM (2021-2023)	TARGETS MEDIUM TERM (2024-2027)	TARGETS LONG TERM (2028-2031)	Budget (USD)	VERIFICATION SOURCES
3.2.4 Promote opportunities for youth employment, entrepreneurship, technical and organisational capacity for production 3.2.5 Promote use of interactive ICT to link rural fish farmers & consumers & input and output markets	• 10% of farmers, including women use mobile phones & SMS in extension & marketing	• 10 youth & 20 women involved in input supply • 50% of farmers, including women use mobile phones & SMS in extension & marketing	• 70% of farmers, including women use mobile phones & SMS in extension & marketing	150,000 75,000	
3.3 **Interventions & priority actions:** Promote strategies that overcome processing, marketing & consumption barriers for women and youth					
3.3.1 Identify barriers to access to nutritious fish products by women and infants 3.3.2 Implement strategies to improve accessibility and affordability of nutritious and safe farmed fish products to women & infant consumers	• Barriers identified • Fish-based products preferred by women and infants • Promote use of Chitofu-3in1 for processing • Promote packaging of processed fish	• Promote commercial fish-based products • Promote access to nutritious fish products by women & infants • Packaged products widely available in supermarkets • Aquaculture included in home-grown school feeding programme	Commercial linkages between fish farmers & retail outlets fully established	80,000 150,000 80,000	Department of Fisheries annual reports
Strategic Objective 4: To strengthen knowledge and skills at all levels in order to attain higher productivity & competiveness					
Outcome: Strengthened frameworks and tools for effective knowledge and skills generation, dissemination and uptake					
4.1 Interventions & priority actions: Promote demand driven education and training in aquaculture to cater for research and extension needs					
4.1.1 Develop & implement a comprehensive Human Resource Development Plan 4.1.2 Develop demand–driven, competence-based, modular courses for farmers, extension & research 4.1.3 Promote aquaculture sector demand driven programmes 4.1.4 Establish partnerships with District Councils, TEVET & Malawi College of Fisheries	• HRD Plan endorsed & implemented • Demand-drive courses in place & implemented • Train 200 farmers, 50 extensionists, 30 researchers • 3 Partnerships signed	• HRD Plan reviewed • Train 4,500 farmers, 100 extensionists, 50 researchers • 6 partnership signed	• HRD Plan reviewed • Train 10,000 farmers, 150 extensionists, 80 researchers • 12 partnerships signed	150,000 25,000 1,250,000 15,000 35,000	Universities & college reports Department of Fisheries reports

ACTIVITIES	TARGETS SHORT-TERM (2021-2023)	TARGETS MEDIUM TERM (2024-2027)	TARGETS LONG TERM (2028-2031)	Budget (USD)	VERIFICATION SOURCES
4.1.5 Promote linkages amongst informal aquaculture training providers (e.g. NGOs, IFFNT)	• 3 informal training providers certified	• 10 informal training providers certified	• 20 informal training providers certified		
4.2 **Interventions & priority actions:** Enhance institutional capacity of Aquaculture Division to support commercial fish farming technologies					
4.2.1 Rehabilitate facilities to demonstrate commercial farming (e.g. Kasinthula, Mzuzu, Domasi)	• Rehabilitations complete			600,000	Department of Fisheries annual reports
4.2.2 Develop & implement commercially orientated research action plans and protocols	• Commercial oriented research Plan endorsed & 5 research completed	• 5 commercial oriented research conducted	• 20 commercial oriented research conducted	150,000	
4.2.3 Identify and evaluate economic potential of technologies	• 5 economic technologies evaluated	• 5 on-farm participatory research conducted	• 2 on-farm participatory research conducted	100,000	
4.2.4 Enhance participatory research	• 2 participatory research conducted & 2 Open Days annually	• 2 Open Days annually to disseminate commercial technologies	• 2 Open Days annually to disseminate commercial technologies	300,000	
4.2.5 Support universities & colleges to establish research cooperation agreements with national & private sector	• 3 partnerships	• 8 partnerships signed	• 10 partnerships signed	20,000	
4.3 **Interventions & priority actions:** Develop business management skills for farmers					
4.3.1 Identify business skills gaps	• Skills needs report			10,000	Department of Fisheries annual reports
4.3.2 Design and implement business skills improvement courses	• 10 business training sessions for 200 farmers	• 50 business training sessions for 1000 farmers	• 100 business training sessions for 2000 farmers	250,000	
4.3.3 Provide appropriate technology package	• 4 technology package developed based on needs assessment	• 6 technology package developed based on needs assessment	• 8 technology package developed based on needs assessment	75,000	
4.3.4 Conduct participatory research enabling business models in collaboration with IFFNT	• As in 4.2.4	• As in 4.2.4	As in 4.2.4		
4.4 **Interventions & priority actions:** One-stop-shop for all aquaculture business application procedures established.					
4.4.1 Develop comprehensive and simple guidelines for licensing of commercial aquaculture	• Guidelines in place			5,000	Department of Fisheries, MITC & National Planning Commission annual reports
4.4.2 Conduct research on aquaculture investment environment and make recommendations	• One-Stop-Shop in place • Research report endorsed & disseminate results	• Revised research recommendations	• Revise research recommendations	15,000	
4.4.3 Support communication among entrepreneurs to share information and procedures by organizing regional conferences	• Dissemination of information to attract investors through Annual Forums	• Number of investors utilising the system	• Number of investors utilising the system	75,000	

ACTIVITIES	TARGETS SHORT-TERM (2021-2023)	TARGETS MEDIUM TERM (2024-2027)	TARGETS LONG TERM (2028-2031)	Budget (USD)	VERIFICATION SOURCES
4.4.4 Conduct a feasibility study on establishing AquaParks as part of Blue Economy Strategy under Malawi 2063	• Feasibility study endorsed • Basic infrastructure for commercial investment established at Chipoka	• 3 more commercial investments established	• 5 more commercial investments established	250,000	
4.5 **Interventions & priority actions:** Enhance local capacity for development of aquaculture equipment and manufacturing					
4.5.1 Support indigenous supply chain, by supporting innovation in Malawi equipment manufacturing and technology, including processing technology	• Equipment substitution Plan developed jointly with MUST, MUBAS, MBS	• 20% of key equipment locally produced	• 50% of key equipment locally produced	250,000	• Annual reports of NPC, Department of Fisheries,
4.5.2 Establish "Aquaculture Innovation Challenge' to fund development of equipment and other accessories for the aquaculture industry	• Aquaculture Innovation Challenge in place & 10% funded • 3 locally developed equipment	• Aquaculture Innovation Challenge, 50% funded • 5 locally developed equipment	• Aquaculture Innovation Challenge, 70% funded	300,000	LUANAR, MUBAS & MUST • NSCT annual reports
4.5.3 Draw lessons from other industry's experience, especially the food processing, for technologies that can be transferred	• 3 fish processing technologies	• Value-added products traded regional markets rise by 20%	• Value of value-added products traded locally & in regional markets	75,000	• Lenzemill reports
4.5.4 Develop a substantial level of knowledge based industry and jobs in the aquaculture sector	• 100 jobs in manufacturing	• 800 jobs in manufacturing	• 1500 jobs in manufacturing		• Ministry of Trade annual reports
Strategic Objective 5: To enhance climate-resilience and environmentally sound aquaculture investments.					
Outcome: Improved capacity for climate resilience and ecologically sustainable production and productivity of aquaculture					
5.1 **Interventions & priority actions:** Establish vulnerability of the fish farmers and shared ecosystems					
5.1.1 Conduct research to deepen the understanding of the vulnerability of the fish farmers and shared ecosystems	• Research completed			50,000	Department of Fisheries annual reports
5.1.2 Determine the potential impact of climate change	• Impact Zone Maps • Climate-resilient Aquaculture Investment Plan	• Climate-resilient Aquaculture Investment Plan funded	• Climate-resilient Aquaculture Investment Plan funded	35,000	
5.1.3 Determined capacity needs of fish farmers to adapt	• Mitigation measures developed	• Mitigation measures implemented	• Mitigation measures implemented	25,000	
5.2 **Interventions & priority actions:** Implement disaster risk management and mitigation measures for aquaculture					

ACTIVITIES	TARGETS SHORT-TERM (2021-2023)	TARGETS MEDIUM TERM (2024-2027)	TARGETS LONG TERM (2028-2031)	Budget (USD)	VERIFICATION SOURCES
5.2.1 Improve early warning systems for Disaster Risk Management (DRM), against extreme weather (heavy rains, floods, droughts) for fish farmers to use 5.2.2 Integrate aquaculture in national Disaster Risk Management (DRM) 5.2.3 Develop & implement aquaculture insurance scheme 5.2.4 Strengthen inclusive aquaculture value chain development that supports ecologically suitable, climate-resilient aquaculture 5.2.5 Incorporate ecosystems approach to aquaculture in order to adapt to climate change	• Study to develop risk information on new and man-made risks completed • Aquaculture integrated in Early-Warning Systems & National Determined Contributions (NDC) • Aquaculture Insurance operational • Develop & roll out a model for ecologically sound farms (10) • EAA strategy in place	• Revise NDC & Adaptation Plan & Early Warning • Fish farmers benefit from climate funding • Fish farmers benefit from insurance • 100 ecologically sound farms • Strategy for EAA rolled out into investments	• Revise NDC & Adaptation Plan & Early Warning • Fish farmers benefit from climate funding • Fish farmers benefit from insurance • 100 ecologically sound farms • Strategy for EAA rolled out into investments	25,000 85,000 500,000 25,000 15,000	DRM agencies, EAD and local authorities (assisted by relevant sector experts) Department of Fisheries annual reports
Strategic objective 6: To enhance capacity of the Government and local management institutions to serve the industry					
Outcome: Improved institutional and organisational capacity for efficient aquaculture development services					
6.1 **Interventions & priority actions:** Operationalise NASP II Coordination Unit in the Department of Fisheries					
6.1.1 Develop, coordinate and implement aquaculture programme in line with the NASP II 6.1.2 Facilitate institutional linkages and networks in research aimed at efficient development of technologies for NASP II 6.1.3 Implement Human Resource Development (HRD) Plan 6.1.4 Enhance coordination in implementation of NASP II, by institutionalising the "Aquaculture Roundtable"	• NASP II Unit in place • Research-Extension-Farmer System in place & Annual Research-Extension-Farmer Forums held • HRD Plan & Aqua. Educational Consortium endorsed • Aquaculture Roundtable institutionalised in DoF	• Annual Research-Extension-Farmer Forums held • Execute trainings in the HRD Plan • Regular Aquaculture Roundtable meetings hosted by DoF	• Annual Research-Extension-Farmer Forums held • Execute trainings in the HRD Plan • Regular Aquaculture Roundtable meetings hosted by DoF	50,000 200,000 1,500,000 50,000	• Department of Fisheries annual reports • National Planning Commission annual reports
Outcome: Strengthened coherence and regulatory framework for a viable aquaculture industry					

ACTIVITIES	TARGETS SHORT-TERM (2021-2023)	TARGETS MEDIUM TERM (2024-2027)	TARGETS LONG TERM (2028-2031)	Budget (USD)	VERIFICATION SOURCES
6.2 **Interventions & priority actions:** Review and update policies, legislation, regulations and institutional entrustments in order to address needs of the industry					
6.2.1 Prepare & implement aquaculture regulations	▪ Aquaculture regulations in place (e.g. SPS standards; Manual of Standard Operating Procedures (MSOP) endorsed ▪ Border Inspection and quarantine facilities in place & regional trade rise 10%	▪ Border Inspection and quarantine facilitate intra-regional trade in farmed products • Malawi increases regional trade by 30%	▪ Border Inspection and quarantine facilitate intra-regional trade in farmed products ▪ Malawi increases regional trade by 50%	75,000 450,000	Department of Fisheries annual reports
6.2.2 Establish and strengthen capacity of Fish Product Competent Authority (CA)	▪ CA in place & staffed			95,000	
6.2.3 Prepare guidelines on sustainable aquaculture development, including Best Management Practices (BMPs)	▪ Best Management Practices (BMPs) developed & promoted			30,000	
6.2.4 Monitoring, Control & Surveillance of aquaculture activities to ensure that guidelines and regulations on sustainability are enforced	▪ Inspections deter diseases spread ▪ National Residue Control Plan (NRCP) and Residue Monitoring Plan (RMP) in place	▪ Inspections deter diseases spread	▪ Inspections deter diseases spread	100,000 20,000	
6.2.5 Sensitize stakeholders on best practices to sustain aquaculture development	▪ 3 annual sensitisation meetings for regulations	▪ 3 annual sensitisation meetings for regulations	▪ 3 annual sensitisation meetings for regulations	270,000	
Outcome: Functional decentralised system in the delivery of aquaculture services					
6.3 **Interventions & priority actions:** Conducting a Functional Review of aquaculture at all levels, especially district councils					
6.3.1 Enhance awareness on development potential of aquaculture among policy-makers and planners at District/village level	• Integrate aquaculture & fisheries in District Development Planning Manual • Implement Functional review of District	• 60% of District Development Plans contain aquaculture	• 90% of District Development Plans contain aquaculture	100,000	Department of Fisheries annual reports

ACTIVITIES	TARGETS SHORT-TERM (2021-2023)	TARGETS MEDIUM TERM (2024-2027)	TARGETS LONG TERM (2028-2031)	Budget (USD)	VERIFICATION SOURCES
6.3.2 Strengthen institutional and technical capacity to deliver aquaculture extension at district levels 6.3.3 Improve information management & dissemination 6.3.4 Improve District funding	Fisheries Offices at District Councils • District data collection framework in place • Funding rise by 20%	• 70% staffing levels in District Councils • District aquaculture data in place • Funding rise by 70%	• 80% staffing levels in District Councils • District aquaculture data in place • Funding rise by 80%	150,000 95,000 1,000,000	
Outcome: Effective nationally aligned sector for enhanced regional integration					
6.4 **Interventions & priority actions:** Create awareness of the development potential of aquaculture and improve the capacity of public, non-state and private sector					
6.4.1 Conduct economic valuation to determine GDP contribution of aquaculture sector	• Update Value of African Fisheries data on Malawi & share	• Revised GDP	Revised GDP	200,000	Department of Fisheries annual reports
6.4.2 Implement SADC Aligned National Aquaculture Strategy	• Aquaculture sector benefits from regional integration • Participate actively in regional (2), continental (1) & global (1) aquaculture development processes	Participate actively in regional (2), continental (1) & global (1) aquaculture	Malawi participates actively in regional (2), continental (1) & global (1) aquaculture	100,000	
6.4.3 Develop aquaculture projects coherent with the Malawi 2063 10-Year Implementation Plan	• Aquaculture embedded in **Malawi 2063** 10-Year Implementation Plan • 2 projects endorsed	• 2 projects in **Malawi 2063** 10-Year Implementation Plan	• 2 projects in **Malawi 2063** 10-Year Implementation Plan	150,000	
6.4.4 Strengthen and build capacity for aquaculture data collection, analysis and dissemination linked to regional database	• Review aquaculture position in APES & SADC/AU data	• Report aquaculture in APES & SADC/AU	• Report aquaculture in APES & SADC/AU	100,000	

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