Policy Prioritisation through Value Chain Analysis (PPVC)

Deep Dive Analysis on the Aquaculture Value Chain in Kenya

Executive Summary
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BACKGROUND ON PPVC METHODOLOGY

The PPVC is a market-led approach that aims to:

- Assist governments with evidence-based analysis to adequately prioritise their policies and investments (e.g. the Agriculture Sector Transformation and Growth Strategy (ASTGS)[1] and the accompanying National Agricultural Investment Plan (NAIP) for Kenya, Kenya Vision 2030[2], and the Big Four Presidential Agenda[3])
- Determine which policies and public investments are most (cost) effective at driving market-led inclusive agricultural transformation, and
- Involve public- and private sector stakeholders right from the start.

First, the current state or "as-is" baseline is established. For the aquaculture value chain, this provides the current state and historical trends of fish supply and demand, identifying critical stakeholders throughout the value chain, with associated market shares, operational costs, capacity and constraints, and then summarising challenges faced by the various value chain actors. Secondly, "ideal state" of the value chain is defined, in which key bottlenecks and constraints are addressed using specific levers of change (e.g. value chain investments and policy levers). In order to reach the ideal state, a combination of investments and policies are formulated at specific nodes of the value chain aimed at unlocking more value out of the market system. Furthermore, these changes are translated to gross margin impacts at the various nodes of the value chain. The impactof interventions on the aquaculture sector is modelled over a medium-term horizon (10 years, using BFAP'spartial equilibrium model) and the resulting impact on agri-food system GDP, poverty reduction and off- farm agri-food system jobs is modelled using the IFPRI RIAPA CGE modelling system.

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[1] The ASTGS (2019-2029) is a 10 year strategy aiming at developing and transforming the agriculture sector through increasing farmers incomes, value of agricultural produce, and build households' resilience.

[2] The Kenya vision 2030 is implemented through three pillars: Economic, Social and Political. Agriculture is a key sector under the economic pillar. The goal is to attain 10% annual economic growth through transforming the sector to be highly commercially oriented.

[3] Agriculture sector contributes significantly to two agendas of the Big Four Agenda: Attainment of 100% Food Security and Nutrition and Manufacturing. Under Food Security and Nutrition, the government aims at attaining food self-sufficiency and lower the cost of food. Under manufacturing agenda, the government aims to grow the manufacturing industry through agro processing and agro-based SMEs.

BACKGROUND

The oceans and fisheries sector plays an important role in the Kenyan economy. It provides food, employment and income to a large share of the population, and earns the country an estimated KES 5 billion annually in foreign exchange. Kenya's annual fish production is approximately 163 thousand metric tonnes valued at approximately KES 39.2 billion at ex-vessel (farm-gate) price. The revenue from foreign fishing vessels is approximately KES 290 million annually (National Oceans and Fisheries Policy, 2018). The sector supports about two million people directly and indirectly that include fishers, traders, processors, input suppliers, merchants of fishing accessories and providers of related. The value of fish from fresh water sources in 2017, which accounted for 81% of the total value, rose from US$186 million (Sh18.6bn) in 2017 to US$209 million (KES20.9bn) in 2018. The total fish output increased from 135,100 tonnes in 2017 to 146,687 tonnes in 2018 (KNBS, 2020).

However, freshwater fisheries production is declining mainly due to overfishing, pollution and use of illegal fishing gear. Total fresh water fish output in 2019 was 120 873 tonnes of which 18 542 tonnes was realised from aquaculture production. Marine fish output in 2019 was 25 670 tonnes. The country has an annual deficit of 365 thousand tonnes of fish against an estimated annual demand of 500 thousand tonnes, which can only be filled through imports (KNBS, 2019).

PROBLEM STATEMENT

Kenyan fish consumption is still low on a per capita basis, at less than half of the average level on the African continent. Projected growth in both income levels and the size of the population points to ample additional demand over the coming decade, but even at current levels, domestic producers are unable to supply the roughly 185 thousand tonnes of fish consumed in Kenya. In fact, in recent years, domestic supply has been contracting, owing largely to reduced capture from Lake Victoria, which is troubled by overfishing, pollution and the influence of foreign species. Consequently, competitively priced fish imports have increased rapidly in recent years and accounts for an increasing share of the domestic market.

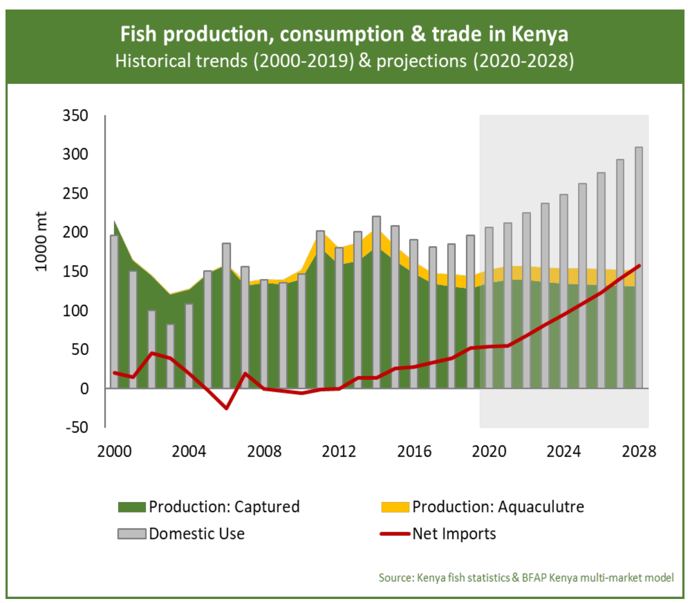

Figure 1: Fish production, consumption and trade

Rapid growth in fish consumption is expected to lead to substantial market opportunities over the coming decade, but in order to meet this demand, domestic production will need to expand by 150 thousand tonnes. In the absence of such expansions, half of the fish consumed in Kenya by 2028 could be imported, at a cost of more than US$ 70 million per annum. Presently, captured fisheries, mostly from inland sources, account for roughly 90% of total fish production in Kenya. Sustainable resource management will undoubtedly have a role to play in safeguarding these volumes, but given the finite nature of the resource, as well as the challenges that have led to declining volumes since 2014, the bulk of additional growth would likely need to come from aquaculture.

AQUACULTURE VALUE CHAIN

Aquaculture is still a small industry in Kenya, but it has grown threefold over the past decade and currently supplies around 15 thousand tonnes per annum. At the height of the economic stimulus programme, it supplied in excess of 24 thousand tonnes. The aquaculture industry comprises four major production systems:

- **Extensive production**: Fish are reared in the natural environment, with the only input being organic or chemical fertiliser to improve algae growth. A large number of producers utilise an extensive system in existing water bodies such as dams or ponds, with estimates ranging from 5 000 to 10 000 producers. Many of them benefitted from fingerling stock, and ponds constructed under the economic stimulus program (estimates range from 3 000 to 40 000 ponds), but many of these ponds remain underutilised. Limited feed use implies that production is not very efficient and this system is estimated to account for only 2 to 5 percent of total aquaculture production – mainly for household consumption.
- **Semi-intensive, pond based production**: In terms of producer numbers, this is the predominant system utilised in Kenya, with estimates ranging from 10 000 to 15 000 producers, many of which also benefitted from ponds constructed under the economic stimulus program. Producers utilise earthen, liner or concrete ponds and fish are reared in a natural environment, with some supplementary feeding to enhance productivity. Intensity of feed use remains low, relying on on-farm formulation, or purchases from cottage industries and larger manufacturers or importers of balanced rations. Frequent use of poor quality feed compromises feed use efficiency and consequently, this system is estimated to account for 25 to 30 percent of total aquaculture production, despite its high volume of producers.
- **Intensive land based production systems**: This recirculating air system is based on improved technology that maintains water quality, enabling a high stocking density and intensive use of high quality, commercial rations. More fish is produced per unit area, but establishment and running costs are substantially higher, resulting in a limited number of producers utilising this system. Estimates point to less than 20 producers, who supply around 5% of fish production. High running costs and dependence on electricity constrain viability for commercial production and the bulk of producers utilising this system do so for breeding purposes.
- **Intensive, cage based production**: The cage based system is concentrated around major lakes and mainly occurs in Lake Victoria. It is estimated to comprise 200 to 500 producers, which account for 65 to 70 percent of total aquaculture production between them. They rely on intensive use of feed, with production solely reliant on feed provided as opposed to naturally occurring feed, but with cages located in large waterbodies, they benefit from natural water circulation.

Aquaculture production in Kenya faces many challenges, but one of the greatest is the combination of high feed costs, which makes it difficult for producers to compete with imports that are priced very competitively. Figure 2 compares fish prices at various points in the value chain in Kenya (grey) to production costs in semi-intensive and intensive production systems (blue), as well as the cost of imported fish from various destinations (red). The bulk of imports, around 70%, are from China and mainly comprise Tilapia which is produced at scale and at a lower cost. Evidently, in all three semi and fully intensive systems, the cost of production is similar to, or higher than the cost of imported Tilapia – depending on size. This is before accounting for any profits to the producer and is a key factor contributing to rising import volumes.

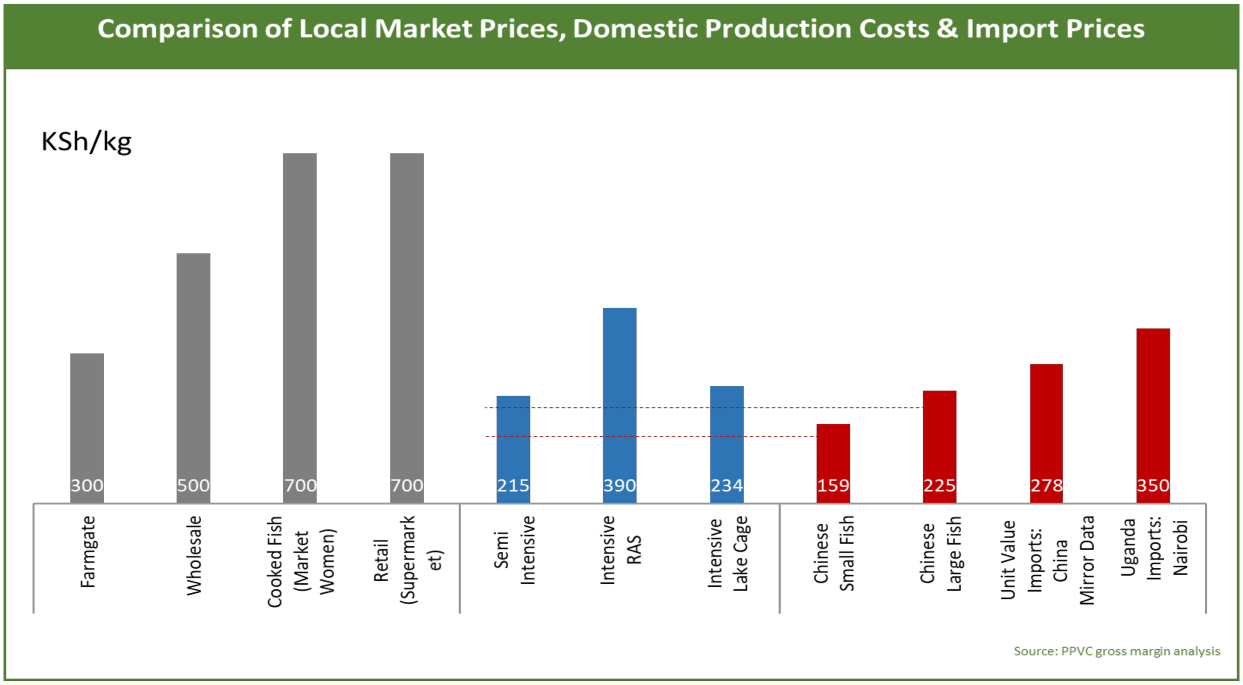

Figure 2: Comparison of local prices, production costs and import prices

As part of the deep dive analysis, an evaluation of producer margins indicated that, across all three systems, feed constituted the single biggest cost component. The share of feed in total costs ranged from 55% in highly intensive, recirculating air systems (RAS), to 71% in semi intensive systems and more than 90% in intensive cage based systems. Within the RAS system, the lower share of feed is attributed to additional costs such as electricity, which also brings additional risks due to inconsistent supply. The increased total costs associated with the RAS system implies that producers need a substantial premium for their fish in order to enable a positive margin, when producing fish for the market instead of fingerlings for farmers.

Kenya's challenge of high feed costs is not unique to the aquaculture industry and emanates from its deficit in raw material production. Kenya is a net importer of important raw materials used in the manufacture of animal feed, including maize, soybean meal and fish meal. This results in increased prices. While the raw maize and soybean meal can be procured at significantly lower cost elsewhere, factors such as transport costs (both sea freight and inland), port and handling costs and tariffs all add to the import parity levels. Both soybean meal and maize sourced from outside of the East African Community carry significant tariffs of 10% and 50% respectively. In the case of maize, this is further exacerbated by the premium payable for non-GM maize. In the case of fishmeal, which is an important protein source in fish feed, domestic production is limited, firstly because the main potential source, Omena (silver cyprinid), is predominantly used for human consumption, secondly because of regulation in order to mitigate juvenile capture and

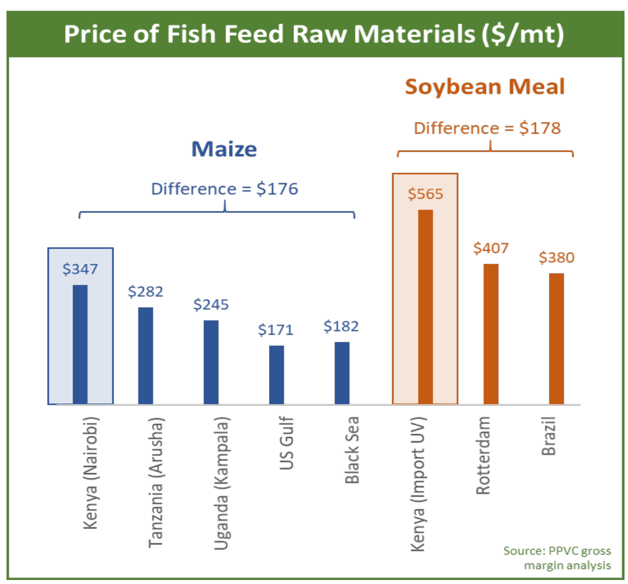

Figure 3: Comparison of raw material costs sourced at different destinations

thirdly due to limited domestic processing of fish. The high cost of some raw materials, as well as imported vitamin and mineral packs also influence formulation and ultimate feed quality. Stakeholders note that while quality of domestically produced rations is improving, it is not yet fully on par with imported products.

The deep dive analysis identified a number of priorities for investment and policy that can contribute towards improved competitiveness against imports and therefore expanded production. These priorities can be grouped into 6 distinct focus areas, of which the impacts of the first three were modelled.

1) **Feed and Equipment Cost Reductions**

    a. In the short term, this could entail the removal of import tariffs and administrative fees on fish farming inputs (such as feed) and equipment. Presently, there is an administration fee of 4.5% on pre-mixed rations. Removal of this fee can reduce costs, improve the competitiveness of fish production and initiate expansion, which in turn broadens the base for feed demand, thereby creating scale and improving the viability of investments into the domestic feed sector.

    b. In the medium term, the establishment of a high quality, competitive domestic feed industry must be incentivised. Increased fish production and a broader base of demand will help, but a reduction in raw material costs will also be required, which could entail multiple aspects:

        i. Removal of the import tariff on a quota of GM yellow maize for specific use in feed sector will yield a US$ 55 per tonne saving on maize, which comprises around 30% of typical rations. Over the last three years, Kenya has used an average of 150 thousand tonnes per annum in the production of animal feed. This will also imply that domestically produced, non-GM white maize can be milled for human consumption instead.

        ii. Removal of the tariff on a quota of soybean meal for specific use in the feed sector can yield a 90 USD per tonne saving on soybean meal, which comprises 30% of the ration.

        iii. In the medium term, the development of feed raw material production, as well as investment in feed mill developments with scale benefits and optimal sourcing potential will be critical to a competitive feed sector.

2) **Import Protection**

    a. In the short term, import protection will entail improved import regulation and protection to allow the local fish industry to become competitive. For illustrative purposes, simulations (Figure 4) show the effect of increasing import tariffs on fish from 25% to 35%.

    b. Tariffs alone are not the ultimate answer to improved import competitiveness and in the medium term, streamlined legislature and governance, as well as improved policy coordination would be required, as the fish sector is influenced by many Departments with regards to regulation.

3) **Improved Genetics, which will enable improved response from better and higher density feed**

    a. In the short term, this would entail facilitation of improved genetic availability to domestic producers through facilitation, in a controlled environment, of safe, disease free stock from leading global producers.

b. In the medium term, genetic improvements would require research and development, along with the provision of services to maintain and improve genetic diversity.

4) Marketing and Processing

a. Promote the development of downstream value chains, which will be necessary when local production volumes increase.

5) Research and Extension

a. Pooling and better coordination of research from public, NGO and private institutions.

b. Investment in extension service, increasing the level of expertise and on-the-ground presence.

6) Zoning plan for Lake Victoria

a. Cap production at a sustainable utilisation target within each zone, to provide assurance to operators that the environment will not degrade to unsustainable levels.

The analysis of possible impacts from the suggested interventions are focussed on the first three, which are better quantifiable and are able to generate a significant impact. The interventions were introduced incrementally in the model, in order to illustrate individual, as well as combined impact. Figure 4 to Figure 6 illustrate these impacts, with the various scenarios defined as follows:

1) *Removal of government fees (4.5%) on animal feed imports*

2) *Increase the tariff on fish imports from 25% to 35%*

3) *Enabling imports of improved genetics, providing a 10% per annum gain in feed conversion and a 20% lifecycle decline over a period of three years*

X) Combination of Scenarios 1-3

5) *Combination of Scenarios 1-3, along with a 25% reduction in feed costs, implying that domestic feed can be produced at the same cost as in Egypt (main fish feed producer) – thus saving all transaction costs associated with imports*

Figure 4 presents the changes in gross margins in each scenario on both the semi-intensive, as well as the intensive cage based production systems. In the semi-intensive system, effects range from US$ 0.5 per m^3 per annum if feed import fees are removed, to US$ 7.2 per m^3 per annum for the full combination of interventions. In the intensive cage based system, where feed accounts for a greater share of total cost, the effect is larger, ranging from US$ 2.6 per m^3 per annum when feed import fees are removed, to US$ 29.3 per m^3 per annum for the full combination of interventions.

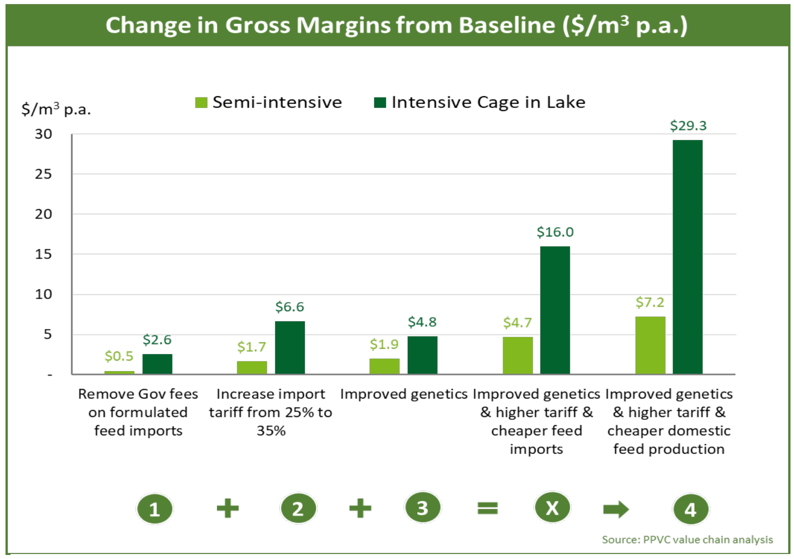

Figure 4: Change in gross margin under various scenarios

Figure 5 presents the associated changes in production that result from improved margins for each of the specified interventions, relative to 2019 volumes, as well as the baseline (business as usual) projection for 2030. Under the baseline, aquaculture production of almost 27 thousand tonnes would equate to only 9% of total demand for fish – similar to the current share contribution. If all interventions are implemented in combination, including lower cost production of high quality feed by a competitive domestic industry, this share can be increased to 24%, implying that aquaculture would contribute 72 thousand tonnes to domestic fish production. This would reduce the need for imports by an estimated value of US$ 31.4 million per annum relative to the baseline.

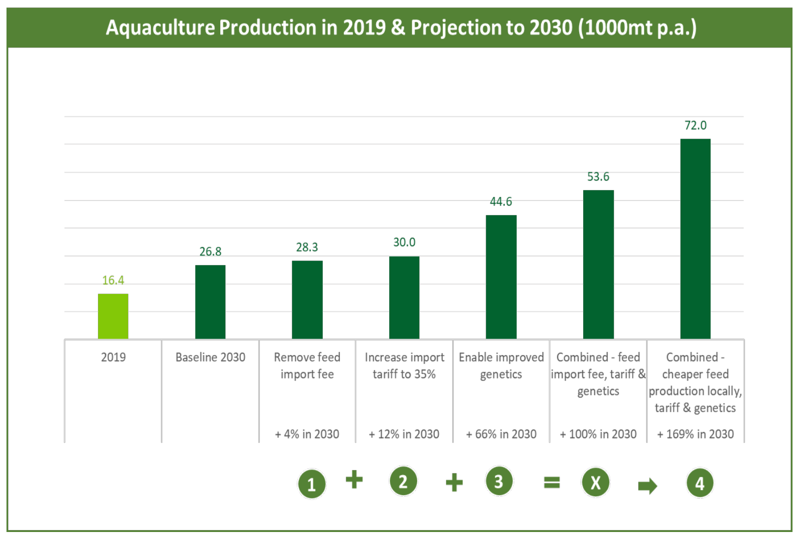

Figure 5: Aquaculture production in 2019 compared to the projection under various scenarios

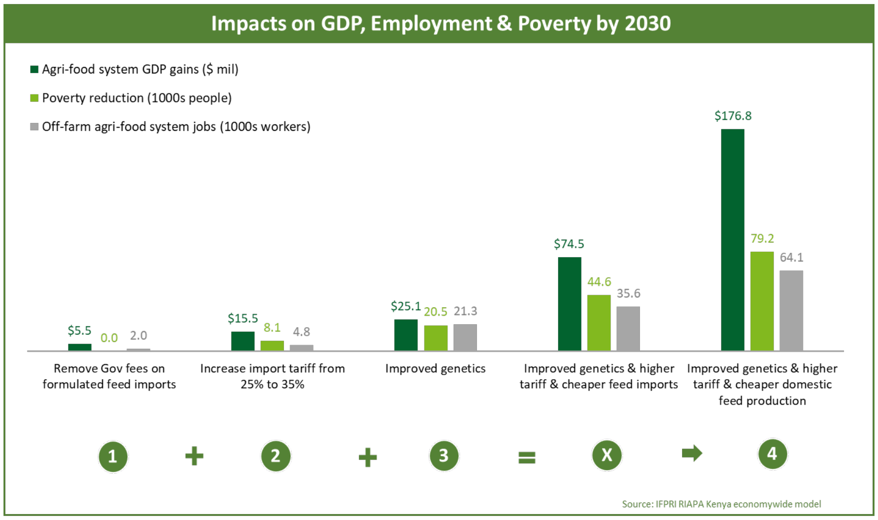

Figure 6: Impacts of various interventions on GDP, employment and Poverty

Figure 6 presents the effects of the various combinations of interventions on the broader economy – measured in terms of impact on GDP and employment within the agri-food system (i.e., farming, processing, trading and transport) as well as national poverty (i.e., rural and urban). It indicates that the effects of a simple, single intervention, such as removing government fees on imported imports, is minimal, but implementation of the full combination of interventions under scenario 4 could add US$177 million per year to agri-food system GDP by 2030. This generates 64 thousand full-time jobs within the agri-food system and reduces the number of poor people in Kenya by 79 thousand by 2030. It is clear from the Figure that, while the largest GDP gains come from the establishment of a domestic feed industry, the combination of tariff reforms and genetic improvements already generate substantial benefits, especially with respect to poverty reduction. It should be noted, however, that the development of a competitive domestic feed industry, while not a simple task, will also stand to benefit other sectors beyond aquaculture, such as poultry production and intensive beef finishing. There is thus compelling evidence, both at farm and economywide levels, that establishing a competitive smallholder-oriented aquaculture sector in Kenya could become another much-needed engine for broad-based agricultural transformation and national economic development.

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