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## PRIORITISING SANITARY AND PHYTOSANITARY (SPS) INVESTMENTS FOR MARKET ACCESS OF HORTICULTURE AND FISHERIES PRODUCTS IN BANGLADESH



Prepared by

**Swisscontact - SWISS FOUNDATION FOR TECHNICAL COOPERATION**

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## Acronyms

<b>ALPP</b>	Area of Low Pest Prevalence	<b>IPPC</b>	International Plant Protection Convention
<b>BAP</b>	Best Aquaculture Practices	<b>ISPM</b>	International Standards for Phytosanitary Measures
<b>BARI</b>	Bangladesh Agricultural Research Institute	<b>LDC</b>	Least Developed Country
<b>BBS</b>	Bangladesh Bureau of Statistics	<b>PCE</b>	Phytosanitary Capacity Evaluation
<b>BFVAPEA</b>	Bangladesh Fruits, Vegetables & Allied Products Exporters Association	<b>PFA</b>	Pest Free Area
<b>BLCFEA</b>	Bangladesh Live and Chilled Food Exporters Association	<b>P-IMA</b>	Prioritizing SPS Investments for Market Access
<b>BPEA</b>	Bangladesh Potato Exporters Association	<b>PRA</b>	Pest Risk Analysis
<b>CAC</b>	Codex Alimentarius Commission	<b>PT</b>	Phytosanitary Treatments
<b>CBO</b>	Capacity Building Option	<b>PTM</b>	Potato Tuber Moth
<b>CHT</b>	Chittagong Hill Tracts	<b>PTW</b>	Potato Tuber Worm
<b>DAE</b>	Department of Agriculture Extension	<b>PVS</b>	Performance of Veterinary Services
<b>DoF</b>	Department of Fisheries	<b>RMG</b>	Ready-Made Garment
<b>DP</b>	Diagnostic Protocols	<b>SDG</b>	Sustainable Development Goals
<b>DTIS</b>	Diagnostic Trade Integration Study	<b>SPS</b>	Sanitary and Phytosanitary
<b>EPB</b>	Export Promotion Bureau	<b>STDF</b>	Standards and Trade Development Facility
<b>EU</b>	European Union	<b>TFA</b>	Trade Facilitation Agreement
<b>FAO</b>	Food and Agriculture Organization	<b>TBT</b>	Technical Barrier to Trade
<b>FIQC</b>	Fish Inspection and Quality Control	<b>USAID</b>	United States Agency for International Development
<b>FTF</b>	Feed the Future	<b>USDA</b>	United States Department of Agriculture
<b>GAP</b>	Good Agricultural Practice	<b>VHT</b>	Vapor Heat Treatment
<b>GAT</b>	Global Agricultural Trade	<b>WB</b>	World Bank
<b>GoB</b>	Government of Bangladesh	<b>WHO</b>	World Health Organization
<b>GI</b>	Geographical Indicator	<b>WOAH</b>	World Organization for Animal Health
<b>HACCP</b>	Hazard Analysis and Critical Control Points	<b>WTO</b>	World Trade Organization
<b>MCDA</b>	Multi-criteria Decision Analysis		
<b>MDG</b>	Millennium Development Goals		
<b>MRL</b>	Maximum Residue Level		
<b>NPPO</b>	National Plant Protection Organisation		
<b>IAS</b>	Invasive Alien Species		

# Executive Summary



## Executive Summary

Swisscontact<sup>1</sup> Bangladesh<sup>2</sup> applied the Standards and Trade Development Facility's (STDF)<sup>3</sup> framework to *Prioritize Sanitary and Phytosanitary (SPS) Investments for Market Access (P-IMA)*<sup>4</sup> for the Horticulture and Fisheries sectors of Bangladesh. This assignment was supported by the government authorities in Bangladesh including i) Department of Agriculture Extension (DAE), Ministry of Agriculture; ii) Horticulture Export Development Foundation (HORTEX Foundation), Ministry of Agriculture, iii) Department of Fisheries (DoF), Ministry of Fisheries and Livestock; and iv) the World Trade Organisation (WTO) wing, Ministry of Commerce.

This P-IMA implementation process included an intensive Sanitary and Phytosanitary (SPS) capacity assessment of the horticulture and fisheries sub-sectors of Bangladesh, and subsequently identified the key SPS challenges affecting the export potential of selected horticulture and fisheries products. The study allowed Swisscontact to build on its two decades of work in the agriculture market systems in Bangladesh and leverage the existing relationships with relevant public and private actors to map the functions, incentives, and inter-relationships of the different actors in the SPS ecosystem. Furthermore, this exercise enabled a consensus among public, private, and non-profit stakeholders on the crucial SPS problems and systemic constraints affecting Bangladesh's export performance, and appropriate solutions.

This report presents the results and recommendations from the application of the P-IMA framework for selected horticulture and fisheries export products in Bangladesh. A total of 10 products were selected for the research, namely: Fresh Vegetable/Gourd, Potato, Leafy Vegetable, Mango, Lemon/Citrus, Betel Leaf, Shrimp and Prawn, Live and Frozen Crab, Live Freshwater Eel, and Frozen and Chilled Fish. A total of 13 SPS Investment Options were assessed based on the P-IMA priority setting framework. The priorities were set based on a structured process of consulting relevant stakeholders, and a rigorous application of a seven (7) steps P-IMA Framework. The process enabled identifying SPS investment options based on a list of "decision criteria", such as impact on export value, poverty reduction, environment, women, and other marginalised groups, etc. The total implementation cost (upfront investment and ongoing cost) of all the 13 investment options was estimated to be USD 4.7 million which in return, could potentially generate USD 109.1 million export earnings and contribute to improved income for approximately 1.9 million people. The following four (4) options came out on top after the P-IMA Bangladesh analysis:

Rank	Alternative	Score (out of 100)
1	Contaminant controls for chilled and frozen fish exports	68
2	Hygiene and contaminant controls for live and frozen crab exports	65
3	Plant disease & pest controls for potato exports	63
4	Pesticide residue controls for potato exports	56

<sup>1</sup> Swisscontact: <https://www.swisscontact.org/en/home.html>

<sup>2</sup> Swisscontact Bangladesh: <https://www.swisscontact.org/en/countries/bangladesh>

<sup>3</sup> STDF: <https://standardsfacility.org/>

<sup>4</sup> P-IMA: <https://standardsfacility.org/search/node/P-IMA>

# 1. Introduction

## 1. Introduction

The P-IMA framework provides an evidence-based and participatory approach to prioritize diverse SPS investments related to market access needs, based on an analysis of available (quantitative and qualitative) data. Swisscontact Bangladesh, with the support of an international expert on P-IMA, applied the framework to consult with a wide range of public and private stakeholders, which enabled the stakeholders to prioritise SPS investments for market access of export-oriented horticulture and fisheries products. This report is based on the findings from the consultations and final prioritisation using a multi-criteria decision analysis (MCDA) which helped develop a focused set of recommendations to improve market access for the selected agri-products.

The preparation of this analyses has also considered findings from SPS capacity assessments (i.e., the IPPC PCE tool) carried out in Bangladesh, administered by the United States Department of Agriculture (USDA) to evaluate the strength of Bangladesh, and submitted report in 2020 to the Government of Bangladesh (DAE, Ministry of Agriculture). This analysis also considered findings from past and ongoing studies, such as, the USDA report '*Assessing SPS Capacity in Bangladesh*'<sup>5</sup>, Bangladesh National Strategic Plan on Agricultural and Rural Statistics (2016-2030)<sup>6</sup>, and the National Agriculture Policy 2018<sup>7</sup>. Scopes of synergies are indicated in the SPS recommendations to encourage coordination on key issues between various public departments, private exports associations, and other partners. Hence, the application of P-IMA is expected to kick start a process that could potentially trigger regular coordination around crucial SPS problems within national and international stakeholders in Bangladesh.

The key objective of the application of P-IMA through an STDF-funded Project Preparation Grant (PPG) that is implemented by Swisscontact Bangladesh, is to prioritise SPS-related investments to help inform and support SPS planning and decision-making. The P-IMA application provided analyses and evidence to link SPS investments to National Agriculture Policy objectives which could likely be of interest to many donors. The report recommends prioritising and mainstreaming SPS investments into national sector investment plans for agriculture, trade and the environment in Bangladesh and identifies various opportunities to inform planning and prioritisation of investments within a lot of ongoing and future initiatives.

The P-IMA Bangladesh research experience is also expected to,

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<sup>5</sup> United States Department of Agriculture. (2012). Assessing SPS Capacity in Bangladesh. United States Department of Agriculture. <https://bookstore.ksre.ksu.edu/pubs/SB666.pdf>

<sup>6</sup> Bangladesh Bureau of Statistics (BBS). (2017). BANGLADESH STRATEGIC PLAN ON AGRICULTURAL AND RURAL STATISTICS (2016-2030). [https://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/b343a8b4\\_956b\\_45ca\\_872f\\_4cf9b2f1a6e0/SPAR\\_S\\_Final\\_BBS\\_Rev\\_090817.pdf](https://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/b343a8b4_956b_45ca_872f_4cf9b2f1a6e0/SPAR_S_Final_BBS_Rev_090817.pdf)

<sup>7</sup> Ministry of Agriculture. (2018). National Agriculture Policy 2018. [https://moa.gov.bd/sites/default/files/files/moa.portal.gov.bd/policies/a07a63ba\\_0084\\_4479\\_8ef2\\_4d1d50ccd8b7/NationalAgriculturePolicy-En-2018.pdf](https://moa.gov.bd/sites/default/files/files/moa.portal.gov.bd/policies/a07a63ba_0084_4479_8ef2_4d1d50ccd8b7/NationalAgriculturePolicy-En-2018.pdf)

- i) Convince and create a culture of evidence-based decision making and resource allocation within the public and private stakeholders.
- ii) Provide analysis and evidence to link SPS investments to broader objectives of Bangladesh's *National Agriculture Policy 2018* (profitable, sustainable agricultural production, develop agro-processing and agro-based industries, increase food production, ensure food security for all etc.).
- iii) Help build awareness among the public and private sector actors on the benefits of investing in SPS capacity building for market access.
- iv) Identify pathways to enhance the capacity of public and private stakeholders to undertake evidence and analysis-driven SPS and trade-related investment decisions.
- v) Facilitate dialogue among government and private sector on SPS investment priorities.
- vi) Enhance coordination on SPS capacity-building among donor agencies and other partners involved in Bangladesh and neighbouring countries.



## 2.

# Overview of Agri-Export and Related SPS Issues

## 2. Overview of Agri-Export and Related SPS Issues

Bangladesh is a rapidly growing economy. The country has been able to maintain an average growth rate of above 6 percent for more than a decade<sup>8</sup>. In addition to economic growth, Bangladesh has also achieved remarkable developments in other socio-economic fronts. The poverty rate and infant mortality rate have been reduced significantly over the last decades. On the other hand, literacy rate and life expectancy have increased considerably<sup>9</sup>.

As a result, Bangladesh has achieved lower middle income country status in 2015, as per the World Bank (WB) criteria. Bangladesh also achieved most of the Millennium Development Goals (MGDs) and are on-course to achieving majority of the envisioned Sustainable Development Goals (SDGs).<sup>10</sup> Additionally, Bangladesh has met all the criteria to graduate from the Least Developed Country (LDC) category and is set to graduate in 2026 after the end of the preparatory period.

Trade, particularly export has contributed a lot in Bangladesh's socio-economic development. Export earnings have been continuously increasing except during the COVID-19 pandemic period.<sup>11</sup> Continuous export growth is helping the country increase its foreign currency reserves while also creating huge employment opportunities through increased and new economic activities.

However, currently Bangladesh's export is highly concentrated into a single product, Ready-Made Garment (RMG), which contributes around 82 percent of the total export earnings<sup>12</sup>. The government of Bangladesh (GoB) has been trying to diversify its export basket for the last two decades. However, the expected diversification is yet to be achieved.

Among the potential export products, horticulture and fisheries products are the most important ones as Bangladesh produces a lot of fruits, vegetables, and fisheries<sup>13</sup>. However, their export is insignificant compared to production volume. One of the reasons for the low export of horticulture and fisheries products is the inadequate capacity to comply with SPS requirements of the importing countries. With the appropriate SPS capacity, horticulture and fisheries export could significantly increase, subsequently improving export diversification, one of the policy priorities of the government.

Despite being a small country with 147,570 square kilometres of cultivable land, Bangladesh has fertile land. With 198% cropping intensity, it has 2.1 million Hectares of single cropped area, 4.1 million Hectares of double cropped area, 1.9 million Hectares of triple cropped area and 22,662 Hectares of

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<sup>8</sup> Finance Division, Ministry of Finance, Government of the People's Republic of Bangladesh. (2021). BANGLADESH ECONOMIC REVIEW 2021. <https://mof.gov.bd/site/page/44e399b3-d378-41aa-86ff-8c4277eb0990/Bangladesh-Economic-Review-Archive>

<sup>9</sup> ibid

<sup>10</sup> Khatun, F., & Saadat, S. Y. (2021). Implementation of the SDGs in Bangladesh: Domestic challenges and regional considerations. United Nations ESCAP. <https://www.unescap.org/kp/2021/implementation-sdgs-bangladesh-domestic-challenges-and-regional-considerations>

<sup>11</sup> Japan International Cooperation Agency. (2023). JICA Country Analysis Paper for The People's Republic of Bangladesh. Japan International Cooperation Agency. [https://www.jica.go.jp/overseas/bangladesh/\\_icsFiles/afieldfile/2023/07/21/jcap\\_en\\_2.pdf](https://www.jica.go.jp/overseas/bangladesh/_icsFiles/afieldfile/2023/07/21/jcap_en_2.pdf)

<sup>12</sup> EPB, 2021 (export data analyses)

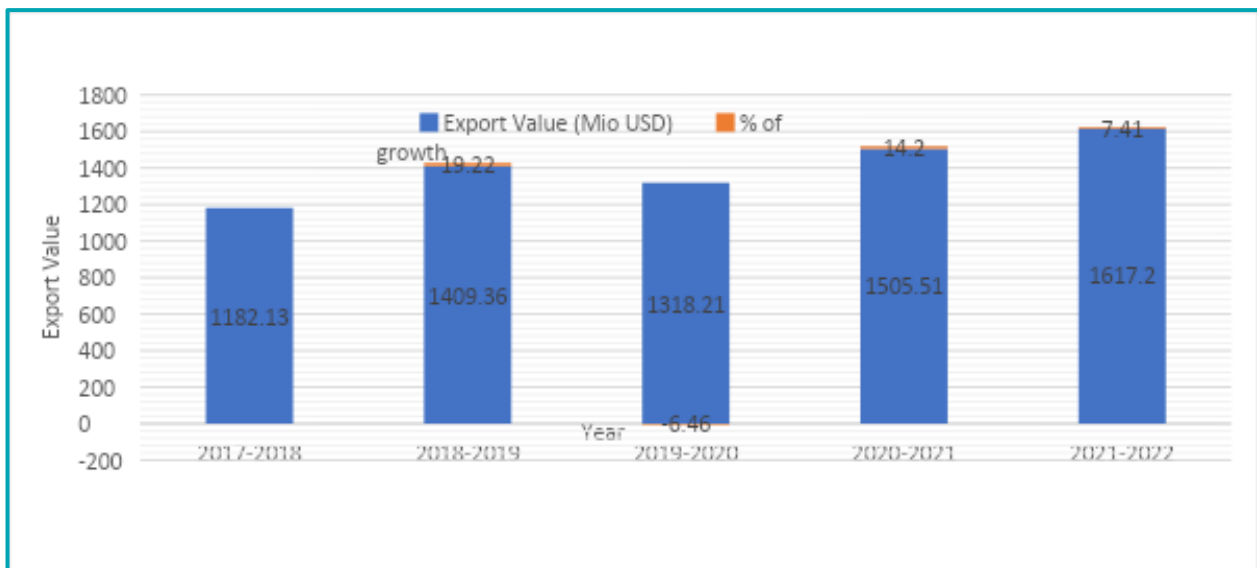
<sup>13</sup> Department of Agriculture Extension. (2020). DAE Annual Report 2020 [Annual Report]. Department of Agriculture Extension, Ministry of Agriculture.

quadruple crop-area.<sup>14</sup> As a result, Bangladesh has secured its position as the third largest producer of vegetable, second largest producer of Jute and Jackfruit, seventh largest producer of Mango, and eighth largest producer of Potato and Guava<sup>15</sup>. The staple food of Bangladesh is rice, with negligible production of other major cereal crops, like wheat. Jute, tobacco, fish, seasonal fruits, and vegetables are Bangladesh’s cash crops, which are produced largely by small and medium farmers. However, commercial largescale farming along with processed food has also gained momentum in recent years. With 700 rivers and 700 kilometres of costal land, fishing is also a major economic activity that employs 12 million people<sup>16</sup>. Bangladesh also has a large lake and five large Haor (large Lakes). Fishing is predominantly done by men, while fruits and vegetables cultivation is done by both men and women.

## 2.1 Agriculture Trade Landscape in Bangladesh

Out of the 172 products exported from Bangladesh, 70 are crop-based products. In 2019, Bangladesh's major agricultural exports, by value, were Potato (Key destination: Malaysia), Pumpkin, Squash, and Gourd (Key destination: Qatar), Vegetable (Key destination: UK and UAE), Rice (Key destination: USA and Saudi Arabia) and Betel Leaf (Key destination: Saudi Arabia). As depicted in Figure 1, Bangladesh’s agricultural export value in 2021-22 was USD 1617 million, which is only 3.1% of the total export value of the country. However, agricultural export from Bangladesh has been growing at a rate of 18% per year, which presents the opportunity to invest in export-oriented agricultural products.

**Figure 1: Agricultural Export Performance of Bangladesh**



As a signatory of the World Trade Organization (WTO) Bangladesh is obligated to follow WTO rules and regulations linked to agricultural trade. Relevant WTO agreements in this context are SPS, Technical Barrier to Trade (TBT) and Trade Facilitation Agreement (TFA). WTO member countries are

<sup>14</sup> Yearbook of Agricultural Statistics-2019. (2020). Bangladesh Bureau of Statistics (BBS). [https://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/1b1eb817\\_9325\\_4354\\_a756\\_3d18412203e2/20-05-18-03-38-d3332b38e92c1adb7900d1bb94290177.pdf](https://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/1b1eb817_9325_4354_a756_3d18412203e2/20-05-18-03-38-d3332b38e92c1adb7900d1bb94290177.pdf)

<sup>15</sup> ibid

<sup>16</sup> Karim, M. R., Saadi, A., & Tamanna, T. (2015). Labour in Fishing Sector of Bangladesh Mapping, Status and Awareness about Rights. Bangladesh Institute of Labour Studies. <http://bilsbd.org/wp-content/uploads/2018/01/Labour-in-Fishing-Sector-of-Bangladesh.pdf>

required to declare a National Plant Protection Organisation (NPPO), a National Enquiry Point, and an SPS Notification Authority. The GoB is committed to enhancing its capacity to participate in the Global Agricultural Trade (GAT) while protecting its domestic agriculture sector from entry of exotic pest (Invasive Alien Species – IAS).

WTO-SPS agreement recognises the three standard setting organisations. These three organisations are responsible for setting standards for food safety, animal health, and plant health. For food safety the standards, guidelines and recommendations are established by the Codex Alimentarius Commission (CAC) relating to food additives, veterinary drug, and pesticide residues, contaminants, methods of analysis and sampling, and codes and guidelines of hygiene practice. Bangladesh’s fresh fruits and vegetables are exported only by three ports: a) Hazrat Shahjalal International Airport, Dhaka, b) Hazrat Shah Amanat International Airport, Chattogram and c) Sea port, Chattogram, through four plant quarantine stations. There are Central Packing Houses in Shyampur, Dhaka, Hazrat Shahjalal International Airport, Dhaka, Hazrat Shah Amanat International Airport Chattogram and Sea Port, Chattogram.

## 2.2 Key Agri-Export Products, Destination and Challenges for Horticulture and Fisheries

With a fourfold increase in export earnings, Bangladesh has experienced unprecedented growth in agricultural exports in the last 10 years.<sup>17</sup> Despite this growth, Bangladesh has struggled to capture the mainstream international market for fresh agricultural produces and continues to cater predominantly to the sizable ethnic market in the Middle East, Europe, and Asia. A major reason behind this underperformance in exporting agricultural products is the lack of international confidence and poor track record in complying with international SPS standards, resulting in import embargoes and stricter SPS regulations from importing countries. Table 1 presents a list of agricultural products that have received different forms of embargoes, sanctions, and self-bans in the last decade due to violations of and concerns over SPS standards<sup>18</sup>:

**Table 1: List of agricultural products that received embargo/sanction/self-ban**

Sl.	Name of Product	Reason for Embargo/Sanction/Self-ban
1	Mango	Fruit fly, Stone weevil, Pulp weevil, Anthracnose, chemical residue above the maximum residue level
2	Guava	Fruit fly, Giant mealy bug
3	Lemon	Canker, Scab
4	Jackfruit	Giant mealy bug, Fungus
5	Bitter Gourd	Thrips, Fruit fly
6	Bean	Greenfly, chemical residue above the maximum residue level
7	Pumpkin	Fruit fly, Thrips
8	Eggplant	BSFB, Thrips

<sup>17</sup> Export Promotion of Bureau, Export Data. Retrieved from [http://epb.gov.bd/site/view/epb\\_export\\_data/](http://epb.gov.bd/site/view/epb_export_data/)

<sup>18</sup> Alam, M. S. (n.d.). Assistant Director, Plant Quarantine Wing, Department of Agriculture Extension (DAE).

9	Potato	Brown rot, Hollow heart, Tuber moth, Cyst nematode
10	Betel Leaf	Salmonella, chemical residue above the maximum residue level
11	Leafy vegetables	Leaf miner, White fly, Leaf worm
12	Turmeric	Chemical (Lead) residue above the maximum residue level
13	Chilli	Chemical (Lead) residue above the maximum residue level
14	Mustard Oil	Chemical residue above the maximum residue level
15	Betel Leaf Spices	Chemical (Rhodamine B, E-594) residue above the maximum residue level
16	Tobacco	Chemical (E-594) residue above the maximum residue level, Fly
17	Rice	Beetle, chemical (Carbendazim, Tricyclazole, Chloropicrin) residue above the maximum residue level
18	Peas	Chemical (E-102, E-133) residue above the maximum residue level
19	Lentils	Aflatoxin
20	Peanuts	Issue with health certificate
21	Cinnamon	Chemical (Lead) residue above the maximum residue level
22	Cumin seed	Chemical (Lead) residue above the maximum residue level

Meanwhile, in the fisheries sub-sector, the SPS ecosystem is more mature, given Bangladesh's long history of exporting frozen fish around the world. Despite a better SPS ecosystem, Bangladesh has seen a 20% decline in export earnings from the fisheries sub-sector in the last decade (USD 598 million in 2011-12 to USD 477 million in 2020-21).<sup>19</sup> This slump has been largely driven by decreasing productivity of and demand for black tiger shrimp<sup>20</sup> (consisting of 80% of frozen and live fish export earning of Bangladesh), and import embargoes on other frozen and live fish products due to quality and health concerns, such as China's ban on import of Crab and Eel<sup>21</sup>, and Saudi Arab's ban on import of freshwater fish from Bangladesh<sup>22</sup>.

Diving deep into the P-IMA Bangladesh analysis, the working group<sup>23</sup> has selected a total of ten products from Horticulture and Fisheries export, based on their trends, merits, and impacts on export earning, as well as economic and other relevant significance in the national economy. The products are, from Horticulture: 1) Fresh Vegetable/Gourds 2) Potato, 3) Leafy Vegetable, 4) Mango, 5) Lemon/Citrus, 6) Betel Leaf, and from Fisheries: 7) Shrimp and Prawn, 8) Live and Frozen Crab, 9) Live Freshwater Eel and 10) Frozen and Chilled Fish.

<sup>19</sup> ibid

<sup>20</sup> Tuhin, A. H. (2020, January 12). Bangladesh loses export market to Whiteleg shrimp. The Business Standard. <https://www.tbsnews.net/economy/trade/bangladesh-loses-export-market-whiteleg-shrimp-35693>

<sup>21</sup> Karim, R. (2020, July 14). China bans import of crab, eel from Bangladesh. The Financial Express. <https://thefinancialexpress.com.bd/trade/china-bans-import-of-crab-eel-from-bangladesh-1594700433>

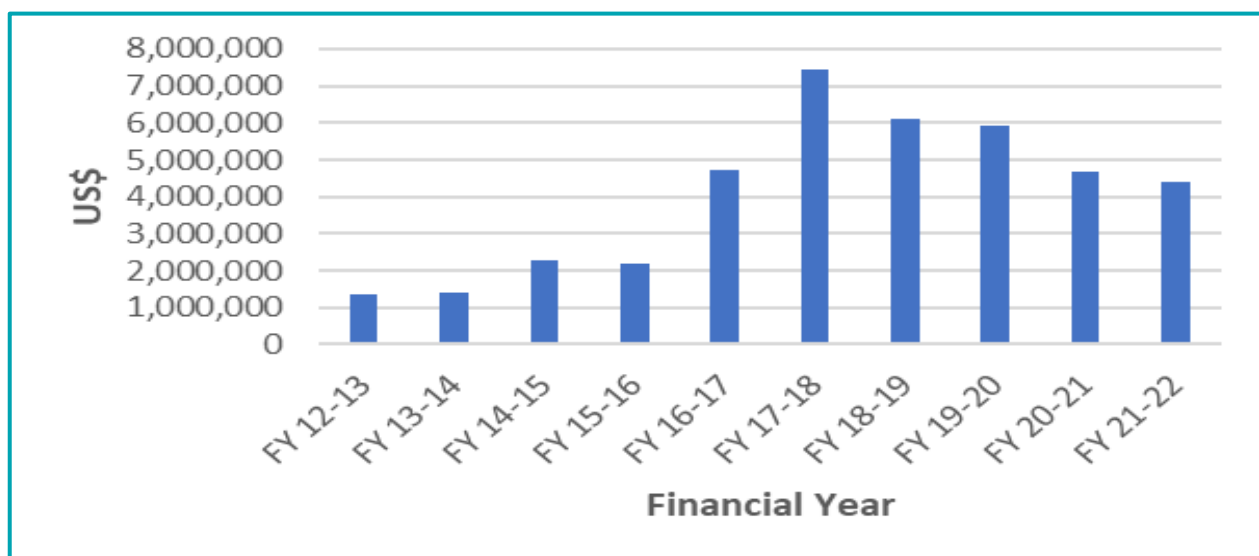
<sup>22</sup> Ara, A. (2021, March 15). Bangladesh frozen fish exporters in a fix over Saudi embargo. The Financial Express. <https://thefinancialexpress.com.bd/trade/bangladesh-frozen-fish-exporters-in-a-fix-over-saudi-embargo-1615691880>

<sup>23</sup> The working group consisted of representatives from the WTO wing Ministry of Commerce, Bangladesh Trade and Tariff Commission, Export Promotion Bureau, Department of Fisheries, Department of Agriculture Extension, external national trade, horticulture and fisheries experts, and Swisscontact.

### 2.2.1 Fresh Vegetables/Gourds

Bangladesh’s key export destination for gourds is European Union (EU), Middle East, Singapore, Malaysia, Canada, and USA. While gourds are grown everywhere in the country, the major gourd-producing districts are Narsingdi, Jashore, Cumilla, Bogura, Dhaka, Chattogram, Pabna and Shariatpur. About 15 million metric tonnes (MT) of vegetable and gourd are produced annually<sup>24</sup>, predominantly by small and medium farmers. Around 16.2 million people are engaged in cultivation. According to DAE estimates, Bangladesh exported around than 40,340 MT of vegetable & gourd in 2021-2022. Although Bangladesh produces significant volume of various kinds of vegetable every year, the export volume of vegetable is still insignificant. Export trend of fresh vegetables for the last 10 years has been shown in Figure 2 below:

**Figure 2: Export trend of fresh vegetables (Source: EPB)**

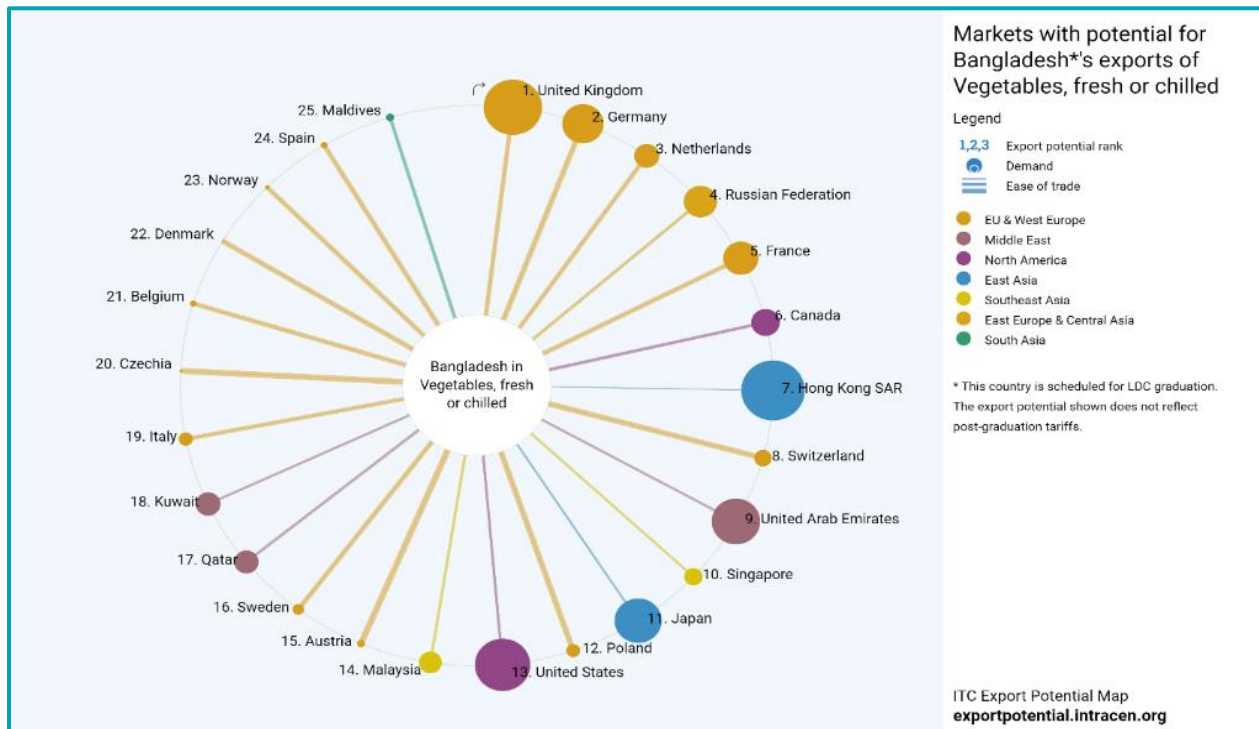


Currently fresh vegetable is being exported to middle eastern countries, EU, USA, Malaysia, Singapore, etc. Figure 2 also shows a decreasing trend of vegetable export. Figure 3 depicts that the markets with greatest potential for Bangladesh’s fresh or chilled vegetable are United Kingdom, Germany, and Netherlands. Hong Kong SAR has the highest demand for fresh or chilled vegetable.

<sup>24</sup> 2021-2022, DAE Statistics



**Figure 3: Potential market destinations for Bangladesh's Export of vegetables, fresh or chilled**



The SPS challenges for fresh vegetable and gourd occur due to the presence of harmful organisms like fruit fly and thrips. In some cases, Maximum Residue Level (MRL) issues have also emerged in different countries. MRL is the highest level of a pesticide residue that is legally tolerated in or on food or feed when pesticides are applied correctly. The level of residues found in food must be safe for consumers. To address the MRL issue, a pesticide residue decline study with bio-efficacy study is required. Bangladesh Agricultural Research Institute (BARI) is currently conducting the research, while Plant Protection Wing of DAE is also trying to address this issue.

Establishment of Pest Free Area (PFA) can address both issues related to harmful organisms and MRL for gourd and other vegetable. In 2022, Bangladesh received a strong suggestion from the EU countries that unless exported vegetable are not harvested from a PFA, all gourd varieties will be prohibited to enter the EU countries<sup>25</sup>. Hence, Bangladesh needs to establish PFA and Area of Low Pest Prevalence (ALPP) to address destination market requirements and expedite gourd export. Possible measures also include improving laboratory testing and identification expertise in entomology. Bangladesh also needs to create an expert field monitoring team to monitor traceability and use of chemical and bio-pesticide, follow harvesting index and time, maintain cool-chain, and handling and packaging of products. These measures will require investment for procuring and setting up pheromone traps, maintaining records and traceability, conducting surveillance activities, and capacity development of stakeholders, followed by a study to validate the establishment of PFA. Investment is also required for

<sup>25</sup> EU notification letter to Plant Quarantine wing, DAE, Ministry of Agriculture, memo number – 12.01.0000.500.99.116.18 – 5918/1(6), date – October 28, 2021

ensuring judicious use of pesticides, surveillance, setting up traps of different types. The use of bio-pesticide is also expected to reduce environmental damage.

### 2.2.2 Potato

According to the DAE statistics 2021-22, Bangladesh produces around 11.4 million MT of potato each year, while exporting only 56,000 MT. Bangladeshi potatoes are mostly exported to Malaysia, Singapore, Sri-Lanka, Middle East, Russia, and Vietnam. About 18.43 million people are engaged directly or indirectly in potato cultivation and the total cultivation area is about 466,127 hectares. There are also small and big farmers producing potatoes.

Export trend of potato for the last 10 years is shown in Figure 4 and Figure 5 below. Potatoes are being exported to many countries around the world. The markets with greatest potential for fresh potato export are Nepal, Vietnam, and Sri Lanka, while Russian Federation has the highest demand potential (Figure 6).

**Figure 4: Export trend of Potato (Source: EPB)**

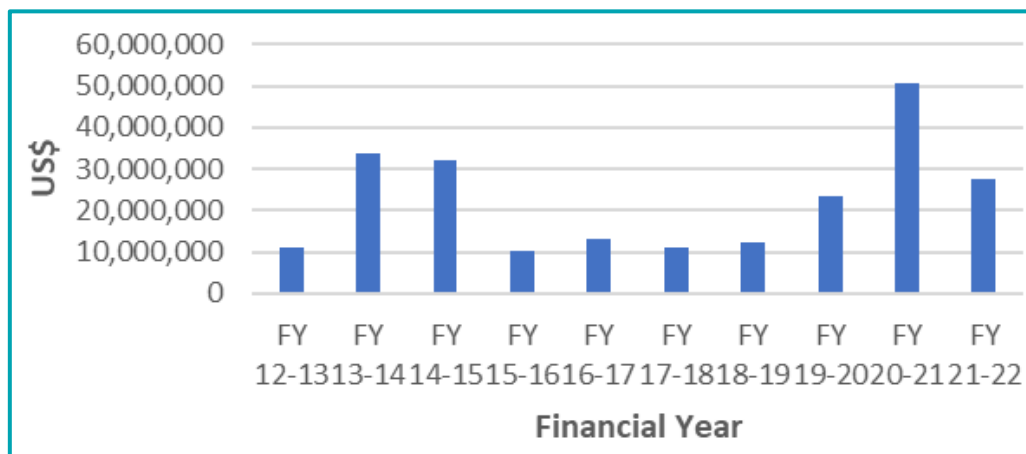


Figure 5: Destination-wise Export trend of Potato (Source: EPB)

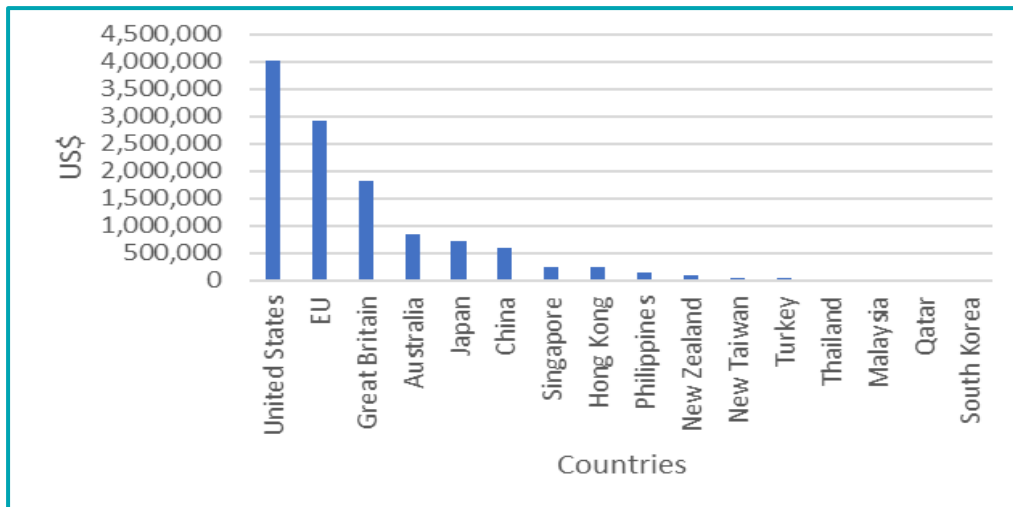
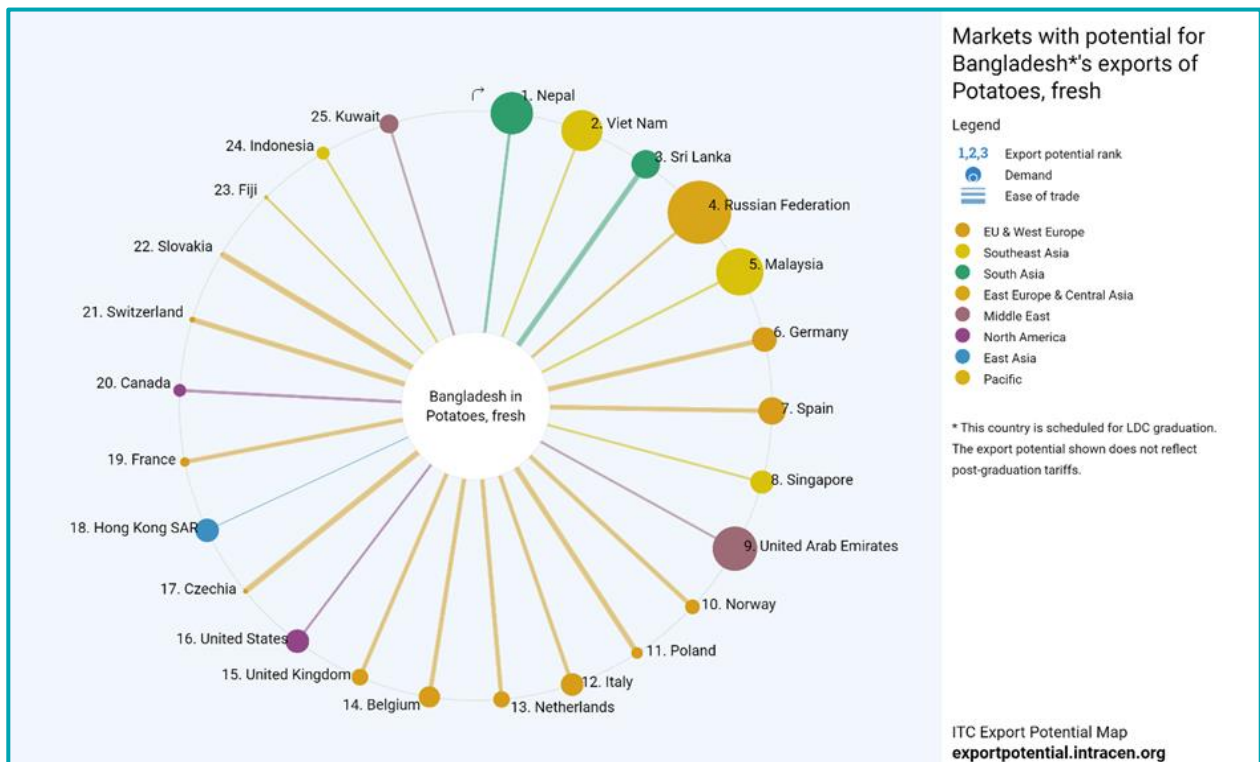


Figure 6: Markets with potential for Bangladesh's Export of Potatoes, fresh



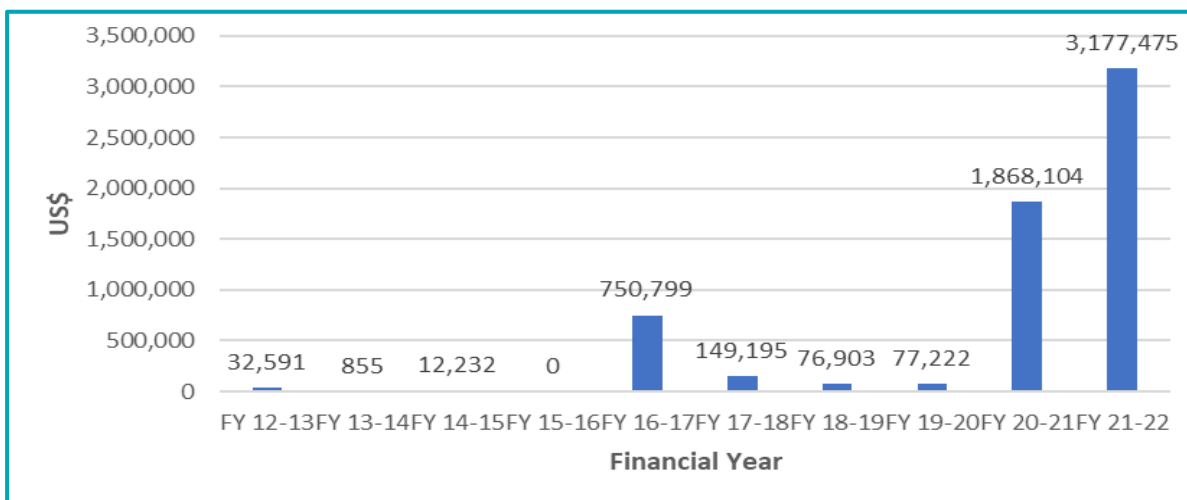
After identifying the presence of harmful organisms in a potato consignment in 2015, Russian Phytosanitary Service commissioned and conducted an audit, which identified Brown Rot (*Ralstonia solanacearum*), a type of bacteria, together with an insect infestation, called Potato Tuber Moth (PTM). The audit team also expressed concern regarding the possibility of presence of cyst nematode. Indonesia later informed similar concerns. Consequently, Bangladesh was instructed to confirm laboratory clearance before exporting. However, that has not been done until today. Recently, Bangladesh has signed an MoU with Russian Federation to export 500,000 MT annually, but the plant quarantine issues must be addressed to reach that figure. Just by containing the diseases, export of

potatoes can be increased by manifold and 331,7253 small and marginal men and women farmers will benefit, contributing to poverty reduction.

### 2.2.3 Leafy Vegetables

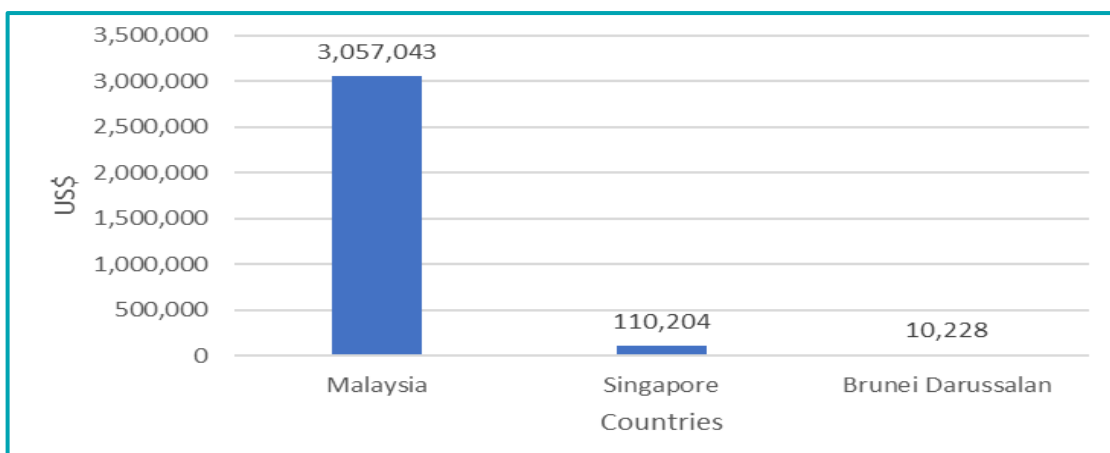
According to DAE statistics 2021-22, leafy vegetable is cultivated in 272,926 Hectares of land area in Bangladesh. The leafy vegetable producing zones are the same as gourd. There is no separate data on how many people are involved exclusively for production of leafy vegetables, but as per government estimates, more than 150,000 farmers are engaged in leafy vegetables cultivation, including small and marginal farmers<sup>26</sup>. Export trend of leafy vegetables for last 10 years has been shown in Figure 7 and Figure 8 below:

**Figure 7: Export trend of leafy vegetables (Source: EPB)**



*N.B: (During covid period in 2020 to 2022, many countries like EU, UK and Middle East countries gave export entry into their countries)*

**Figure 8: Destination-wise exports of Leafy Veg in FY 2021-22 (Source: EPB)**



*N.B: This kind of vegetable is exported to very limited countries and exports are not regular.*

<sup>26</sup> Department of Agriculture Extension. (2020). DAE Annual Report 2020 [Annual Report]. Department of Agriculture Extension, Ministry of Agriculture.

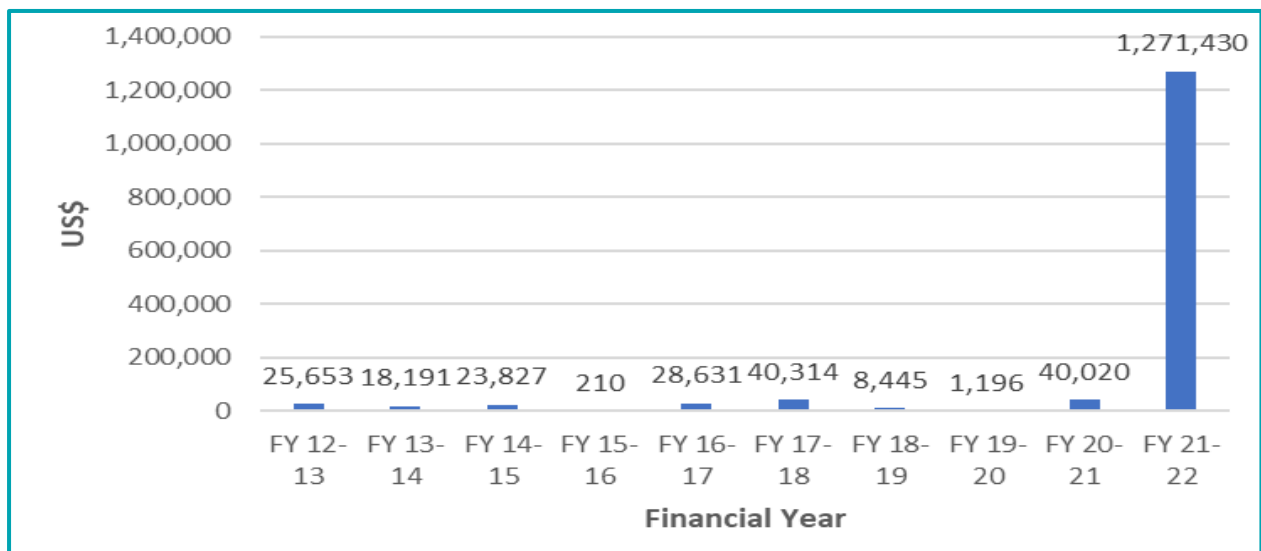
Three most prevalent phytosanitary problems found in leafy vegetables are Leaf minor, Cutworms, and pesticide residue. Addressing pesticide residue issues require similar interventions shared in **Section 2.2.1**. Cutworms and Leaf minors will require introducing and maintaining hygiene (HACCP) practices. The farming practice requires additional caution for maintaining hygiene practice during harvesting, transporting, washing, and packaging. Successfully addressing these phytosanitary issues can potentially double the export volume. Additionally, around 20,000 vulnerable and small farmers will be commercially benefitted. Simultaneously, as a part of the hygiene practice, the use of bio-pesticide will minimise the negative affect of chemical pesticides on the environment.

### 2.2.4 Mango

Despite producing around 2.4 million MT (DAE statistics, 2021-22) of mangoes per annum, Bangladesh exports only around 1,788 MT.<sup>27</sup> The Plant Quarantine Wing (PQW) of DAE has identified opportunities to access high value markets through mango export. However, Bangladesh currently exports mangoes to selective middle eastern countries and a small quantity to the EU ethnic markets at low price.

While Chapainawabganj and Rajshahi are the most prominent mango-growing areas, an early variety indigenous to Satkhira district is the most exported variety. Out of the 200+ varieties of mango grown in Bangladesh, only 4-5 varieties are exportable, which underscores a scope to develop more exportable varieties. In addition to Satkhira, exportable mango varieties are also grown in Dinajpur, Thakurgaon, Rangpur, Natore, Meherpur, Kushtia, Jhenaidah, and Chittagong Hill Tracts (CHT). Figure 9 below shows the export trend of last 10 years:

**Figure 9: Export trend of Mangoes (Source: EPB)**

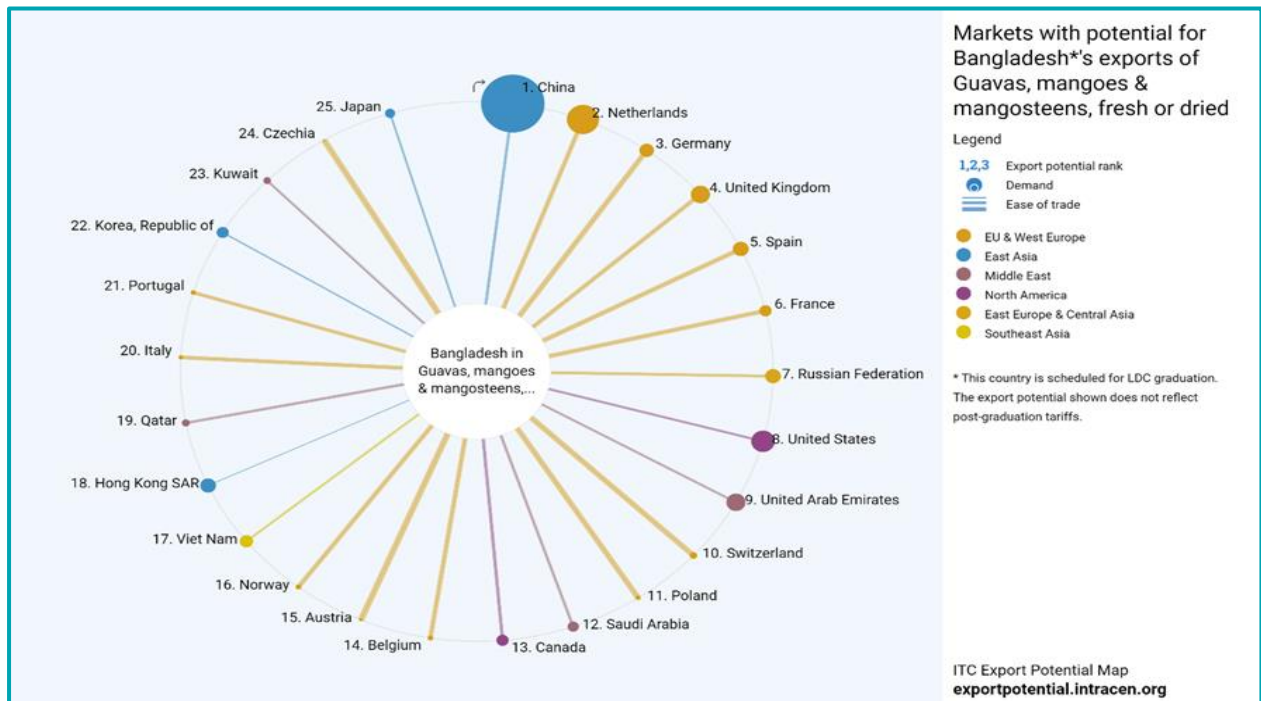


*N.B: (During covid period in 2020 to 2022, many countries like EU, UK and Middle East countries gave export entry into their countries)*

The markets with greatest potential for Bangladesh’s exports of fresh or dried mangoes are China, Netherlands, and Germany (Figure 10). China also emerges as the market with the highest demand potential for fresh or dried mangoes.

<sup>27</sup> DAE statistics, 2021-2022

**Figure 10: Markets with potential for Bangladesh's Export of Mango, fresh or dried**



Mango is grown by around 100,000 small, medium, and large farmers in approximately 202,968 hectares of area. Presence of fruit-fly, stone weevil, pulp weevil and anthracnose disease is some of the major phytosanitary issues in mango. Bangladesh already has the protocol for curbing infestation by stone weevil and pulp weevil. However, Bangladesh also needs to follow the International Standards for Phytosanitary Measures (ISPMs) for establishing PFA or ALPP. Bangladesh's export consignments are mostly rejected and intercepted by the EU for the presence of fruit-fly. Bangladesh needs to follow the IPPC (International Plant Protection Convention) standards i.e., ISPMs and Codex standards for the mango consignments to be accepted by the importing countries.

While, the government is conducting many activities, Bangladesh needs to do more to address the challenges. Controlling fruit-fly (a Plant Quarantine issue), in conjunction with Good Agricultural Practice (GAP) for traceability and establishing a Vapor Heat Treatment (VHT) facility is expected to increase mango export by ten-fold. Increased mango export will help poor and vulnerable farmers and would increase employment manifold, resulting a reduction in poverty. The compliance will also have a positive impact on the environment by reducing excessive use of harmful pesticide.

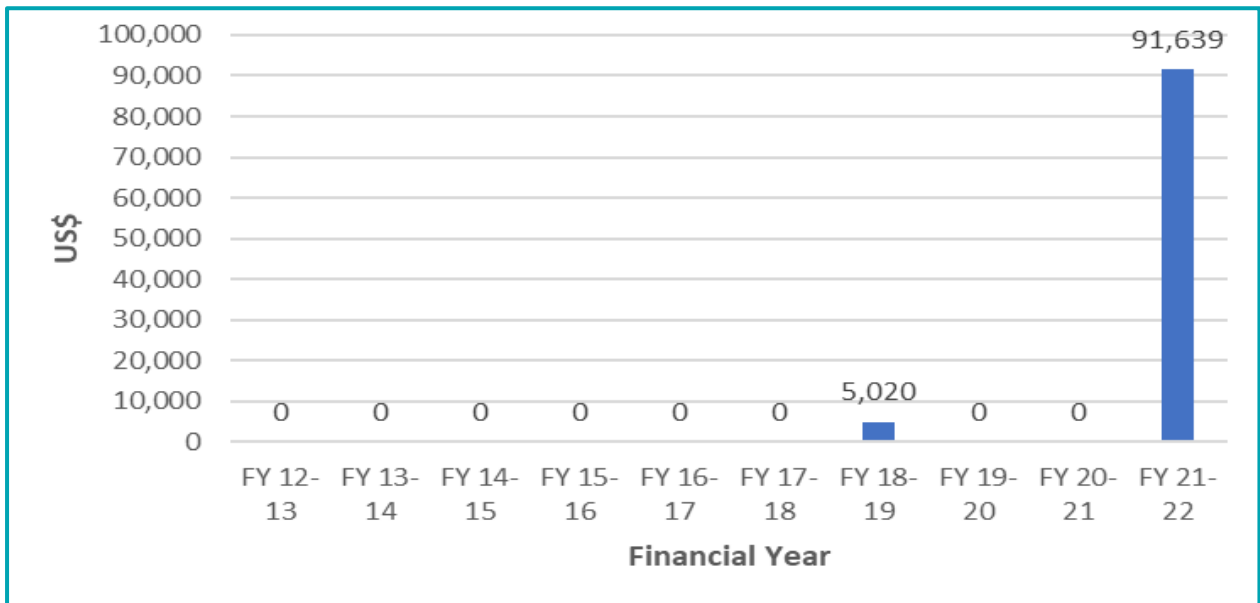
### 2.2.5 Lemon/Citrus

Ten varieties of citrus are currently grown in Bangladesh. The major producing areas are greater Sylhet, Narsingdi, Tangail, Dhaka, and CHT. 100,000 small, marginal, and large farmers engaged in production of citrus in roughly 20,127 Hectares of land area.<sup>28</sup> Bangladesh exports limited amount of lemon/citrus. Export trend of lemon/citrus for last 10 years has been shown in Figure 11 below:

<sup>28</sup> Various source – DAE/EPB



**Figure 11: Export trend of Lemon/Citrus (Source: EPB)**



Citrus was first banned in the UK and EU in 2007. Following that incident, the authority conducted an audit in Bangladesh. Consequentially, in 2010, the EU lifted ban on one variety i.e., Jara/Colombo lemon. Other varieties are still banned in the EU. Currently citrus is only exported to the UK. No other EU countries currently accept Bangladeshi citrus because of the presence of harmful organisms. Some other varieties are exported to a few middle eastern countries.

The main SPS problem is the presence of a bacterial disease called citrus canker. The other issues are citrus scab and the citrus black spot. Recent trend shows that citrus export is declining because of high presence of scab. No steps are being taken to address the problem. While use of chemical pesticide is the only practical solution to this problem, there is lack of understanding about the required pesticide category, the actual dose/judicial use, and time of use. The country needs to control right dosage of pesticide, as per the ISPMs of IPPC directive to address the risk of pests while ensuring low pesticide residue in the final product.

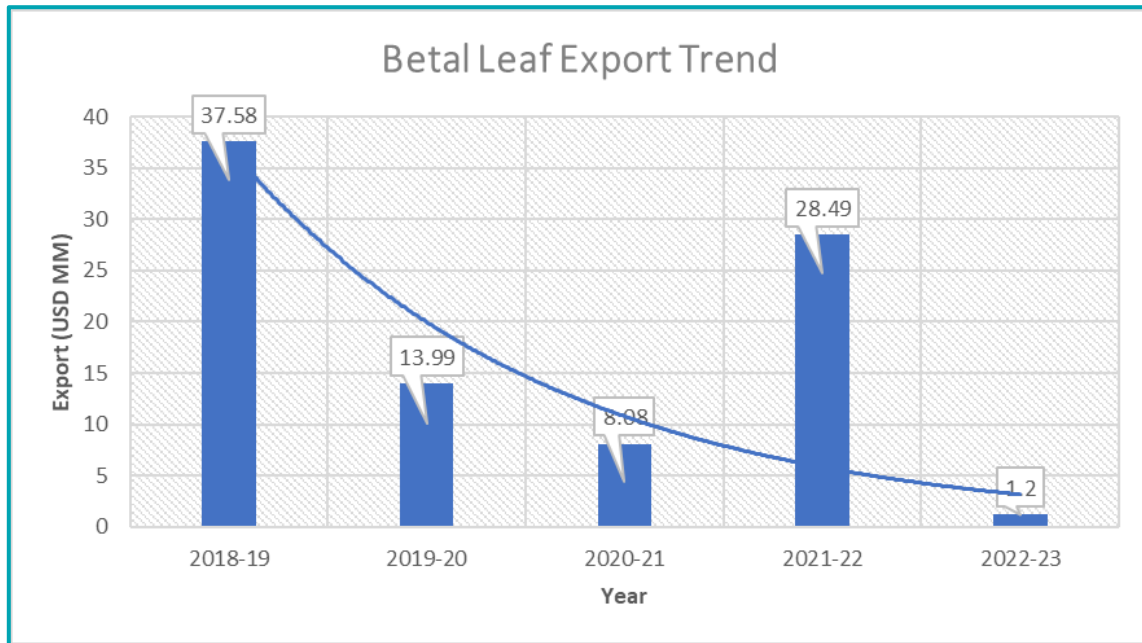
### 2.2.6 Betel Leaf

Betel leaf is an herbaceous plant containing medicinal properties. It is commonly consumed by people in South Asia, the gulf countries, Southeast Asia, and the Pacific region. The herbal properties of betel nuts are scientifically recognised. Betel leaf is grown in various parts of the country, including Panchbibi, Jaipurhat, Durgapur, Rajshahi, Dinajpur, Jhenaidah, Barisal, Comilla, Chittagong, Ukhia, and Maheshkhali in Cox's Bazar.

According to DAE, about 50,000 people are involved directly or indirectly for cultivation of Betel leaf in Bangladesh. According to Bangladesh Bureau of Statistics (BBS), in the FY 2021-2022, the total Cultivation Area of betel leaf is about 22,470 Hectares and the total production was about 214,652 MT. According to the Bangladesh Fruits, Vegetables & Allied Products Exporters Association (BFVAPEA), Bangladesh exported about 6,180 MT which is merely 2.87% of the total production. Bangladesh mainly exports betel leaf to Saudi Arabia, United Arab Emirates, Jordan, Kuwait, Lebanon, Malaysia, Oman, Qatar, Canada, Great Britain etc. Bangladesh has huge potential for earning foreign currency through exporting betel leaf to the existing market and diversifying the markets. But The

exporters face SPS challenges for international market access. Export trend of betel leaf over the last 10 years has been shown in Figure 12 and market potentials in Figure 13 below:

**Figure 12: Export trend of Betel Leaf (Source: EPB)**



**Figure 13: Markets with potential for Bangladesh's Export of Betel Leaf**



A type of bacteria called Salmonella is often present in betel leaves. In 2014, Salmonella was found in shipments of betel leaves to Europe, and at that time, EU stopped the export of betel from Bangladesh. The EU will allow the export of betel leaf if it is salmonella-free and fulfil some other regulations, such as having health certificate from an international standard testing lab. Apart from this, the EU also asked to prioritize cleanliness issues during betel production, processing, and shipment. Betel leaf

exports to Europe were stopped for several years as Bangladesh could not meet the requirements fully. These issues require the special attention and vigilance of producers, traders, exporters, and governments. Bangladesh also faces MRL-issues for betel leaf exports to the middle east.

Major Constraints in betel leaf sector in Bangladesh are presence of diseases, such as root rot and leaf rot and bacterial contamination from field to port (*Salmonella* spp. Total coli, *E. coli*), and lack of awareness and expertise in post-harvest handling and packaging. Additionally, inappropriate transportation and storage facility decreases the quality and increases the chance of contamination. Unethical practices by middleman and exporters to mix low quality leaves reduces the overall quality and traceability. Other issues for Betel Leaf export include environmental degradation due to indiscriminate use of pesticide, unavailability of central packing house, lack of secondary processing facilities available for betel leaves, etc.

### 2.2.7 Shrimp and Prawn

Two types of shrimp and prawn are produced in Bangladesh; shrimp grown in brackish (salt) water, contributes round 72% of production rest 28% by freshwater Giant Prawn. For better understanding the two groups together will be commonly referred to as Shrimp. It is estimated that shrimp-based industries in Bangladesh directly employ roughly 700,000 people with at least three million dependents. With an annual export earning of USD 360 to 365 million, shrimp export ranks second only to garments in earning foreign exchange for Bangladesh. The area under shrimp cultivation expanded rapidly from less than 20,000 Hectares in 1980 to approximately 263,025 Hectares in 2022<sup>29</sup>. It is assumed that 55% of shrimp-prawn grown in shrimp farms are consumed locally.

Growth in shrimp exports steadily increased throughout the early 2000s due to interventions on a governmental and international level, but soon hit stagnation and even a short fall around the year 2008-2009, when Bangladesh was consecutively hit by Cyclone Sidr in 2007, the economic recession in 2008 and Cyclone Aila in 2009. The shrimp industry suffered a loss of USD 35.7 million due to Cyclone Sidr and again a loss of USD 142.9 million from Cyclone Aila in 2009, damaged around 38,335 hectares of shrimp fields (ghers). Despite the hurdles, shrimp farming continues to be more profitable than paddy cultivation, which influenced integration of new land areas under shrimp farming in the southern part of Bangladesh.

In the subsequent five years, Bangladesh's share in the world shrimp market had fallen from 4% to 2%, and shrimp exports by 33%. Additionally, production has also shrunk by 28.5%<sup>30</sup>. Besides increased world competition from cheaper alternatives, such as white-leg (*Vannamei*) shrimp squeezed the black tiger shrimp's market. Shrimp and prawn are high potential export products of Bangladesh. However, the full potential is yet to be tapped. Export trend of shrimp & prawn for last 10 years has been shown in Figure 14, top major markets in Figure 15 and export potentials in Figure 16 below:

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<sup>29</sup> Bangladesh Frozen Food Exporters Association. (n.d.). Basic Information on Frozen Foods Industry in Bangladesh.

<https://www.bffea.net/export.php>

<sup>30</sup> DoF and EPB, 2019

Figure 15: Export trend of Shrimp and Prawn (Source: EPB)

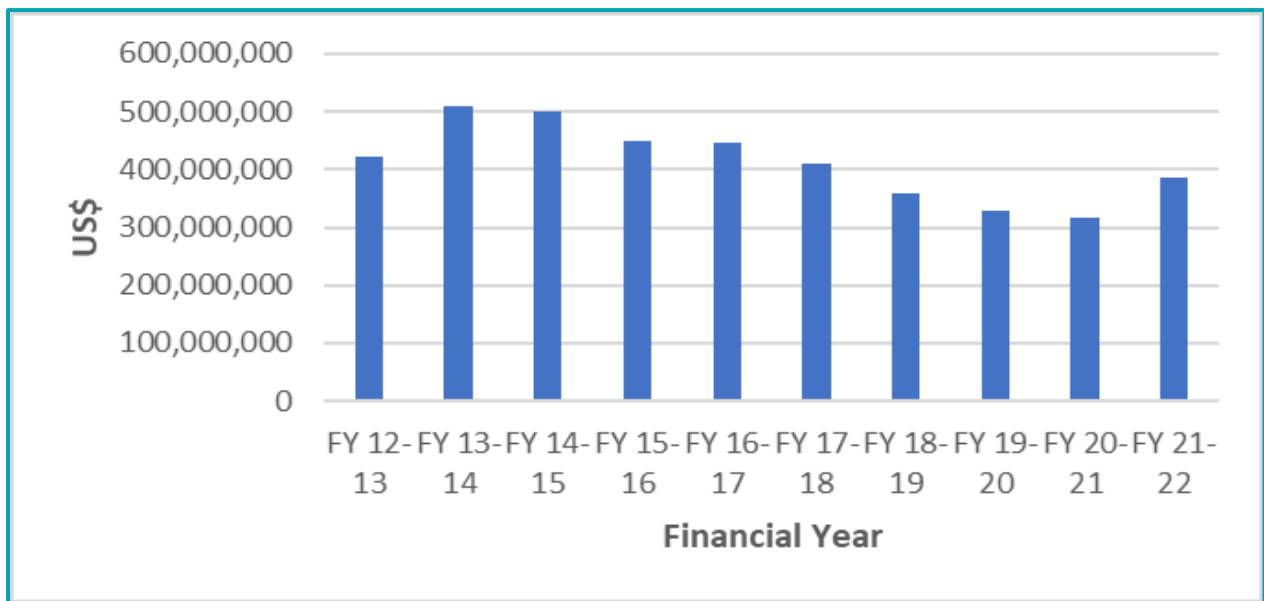
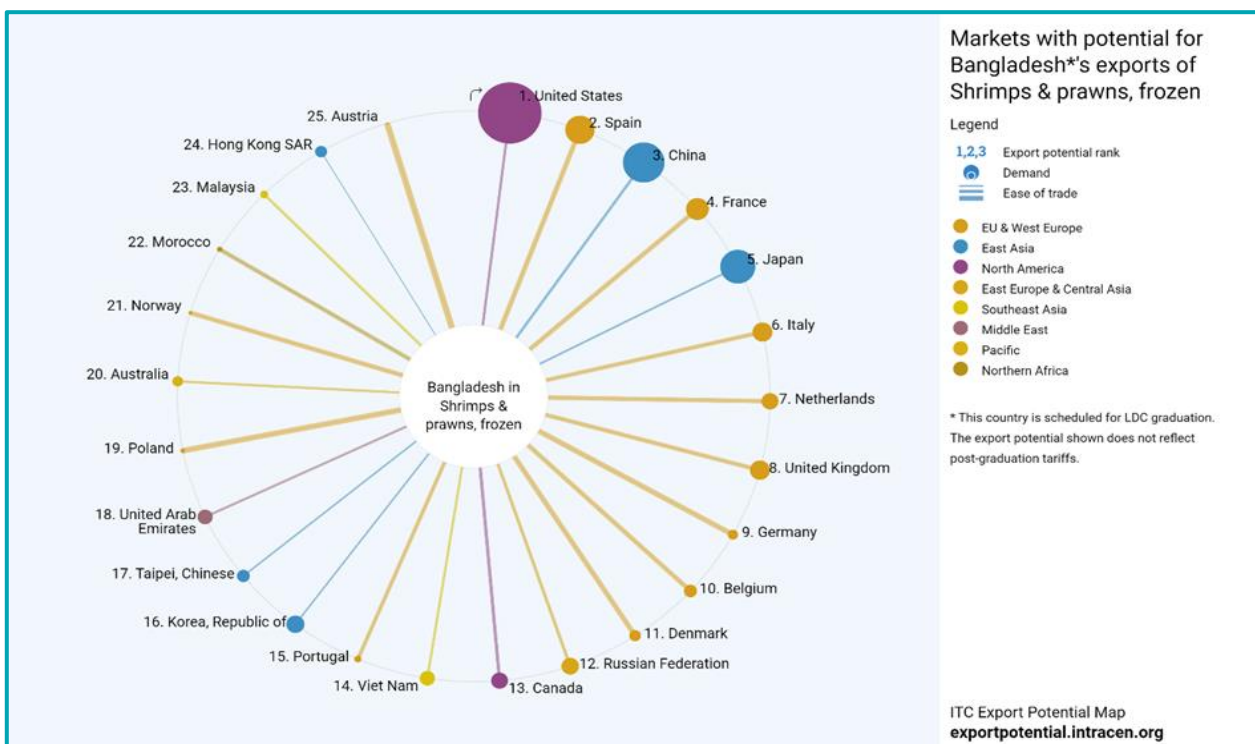


Figure 16: Export potential of Shrimp and Prawn, frozen in major markets



The markets with greatest potential for Bangladesh’s exports of frozen shrimps & prawns are the United States, Spain, and China. United States is the market with the highest demand potential.

In recent years, Bangladesh has faced increasing global pressure due to detection of silicone, gum, water, rice starch, and other substances in a few black tiger shrimp shipments. On the other hand, due to the lack of proper post-harvest handling of shrimp along the informal supply chain, the quality of shrimp deteriorates with risk of contamination and damages to texture.

To overcome the issues and create a stable export market for the stakeholders of the sector, the following recommendations have emerged:

- Continuing the legacy of black tiger shrimp production for branding in the world market. In 2021, the DoF applied for the Geographical Indicator (GI) certificate for black tiger shrimp, which will recognise it as a national treasure of Bangladesh.
- At present, the shrimp supply chain is highly inefficient with several intermediaries who do not maintain quality and proper storage procedures during transportation. Due to the highly fragmented value chain, an efficient framework for traceability and proper documentation at all stages of the value chain is required.
- Training for farmers on the Best Aquaculture Practices (BAP) should be ensured.
- Proper graded quality of input such as shrimp feed and larvae need to be ensured.
- Currently, shrimp cultivation in the country is done under mostly extensive farming methods (98%), that means the shrimps are grown in watery paddy field (before or after paddy production).
- Assurance of compliance with appropriate certification regarding quality export need to be introduced.
- Capacity building of laboratory, Fish Inspection and Quality Control (FIQC) and competent authority (equipment, machinery, test kits consultants, skill development etc.).

### 2.2.8 Live and Frozen Crab

Recognising the potential of mud crab as the next big seafood export product from Bangladesh, the GoB has earmarked the crab (live and processed crab) into the special development category in its Export Policy Act 2018-21 and 2021-2024. The mud crab value chain analysis revealed that the chain started with crab collection (cultivated and wild harvest), before sale to local vendors, and ended with exporters through several intermediaries. Results noted that most ( $\pm 95\%$ ) exportable crab came from natural sources, with the rest ( $\pm 5\%$ ) from the aquaculture sector. Despite the high profitability in domestic and international markets, the livelihood of the value chain actors has remained difficult. Multi-pronged approaches, like a nursery or increasing farming and backyard seed production, and value addition at the farm level may help farmers.

Over the years, mud crab farming in the southwest of Bangladesh has witnessed a sharp rise, as increased farmers are finding it lucrative to rear crabs. As of 2009, mud crab fishing has supported the livelihoods of more than 50,000 fishers, traders, brokers, transporters, and exporters in Bangladesh<sup>31</sup>, and has now increased to about 300,000 households<sup>32</sup>. Key reasons for the interest in mud crab is due to soaring prices and is less prone to diseases compared shrimp farming. In crab fattening, farming, collection, processing, seed collection and marketing around 20% women are involved.

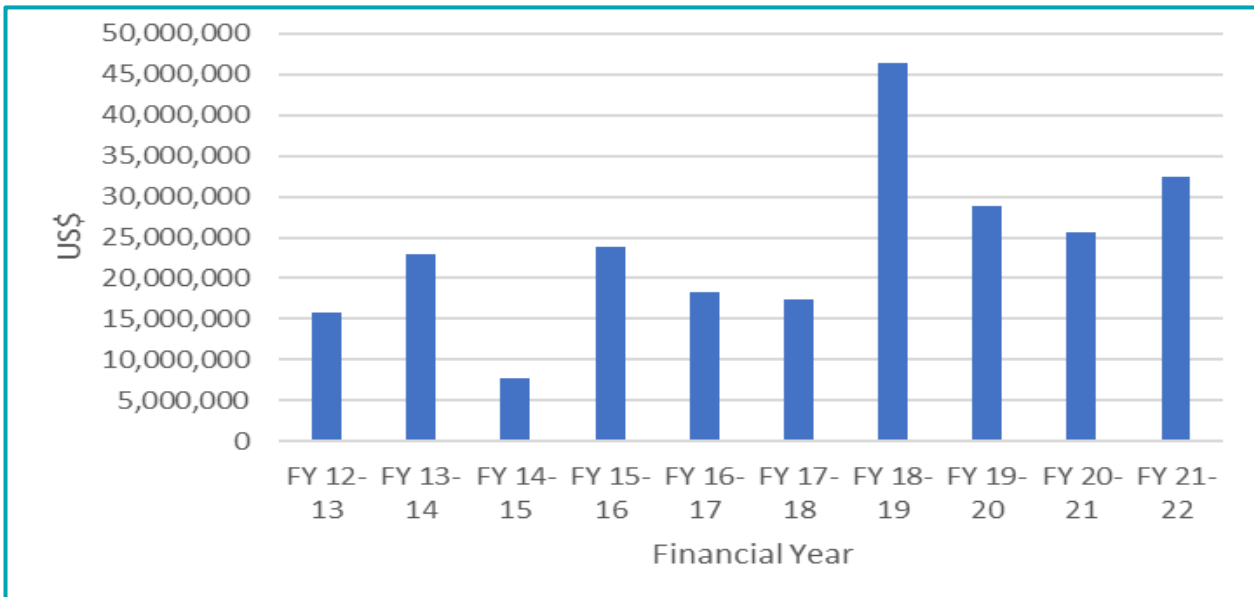
During 2018-19 FY USD 33 million of frozen and USD 9.8 million live crab was exported which was USD 9.4 million and 7.9 million respectively during 2017-2018 FY. Crabs are exported in two forms: Live or Frozen. Live crabs are usually exported to Asian countries because of high demand and logistical limitations. Frozen soft-shell crabs are popular among western countries with Australia and United Kingdom leading the way as major exporting destinations. Both live and frozen crabs are being exported from Bangladesh. Export trend of crab for last 10 years has been shown in Figure 17 below:

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<sup>31</sup> Molla et. al., (2009)

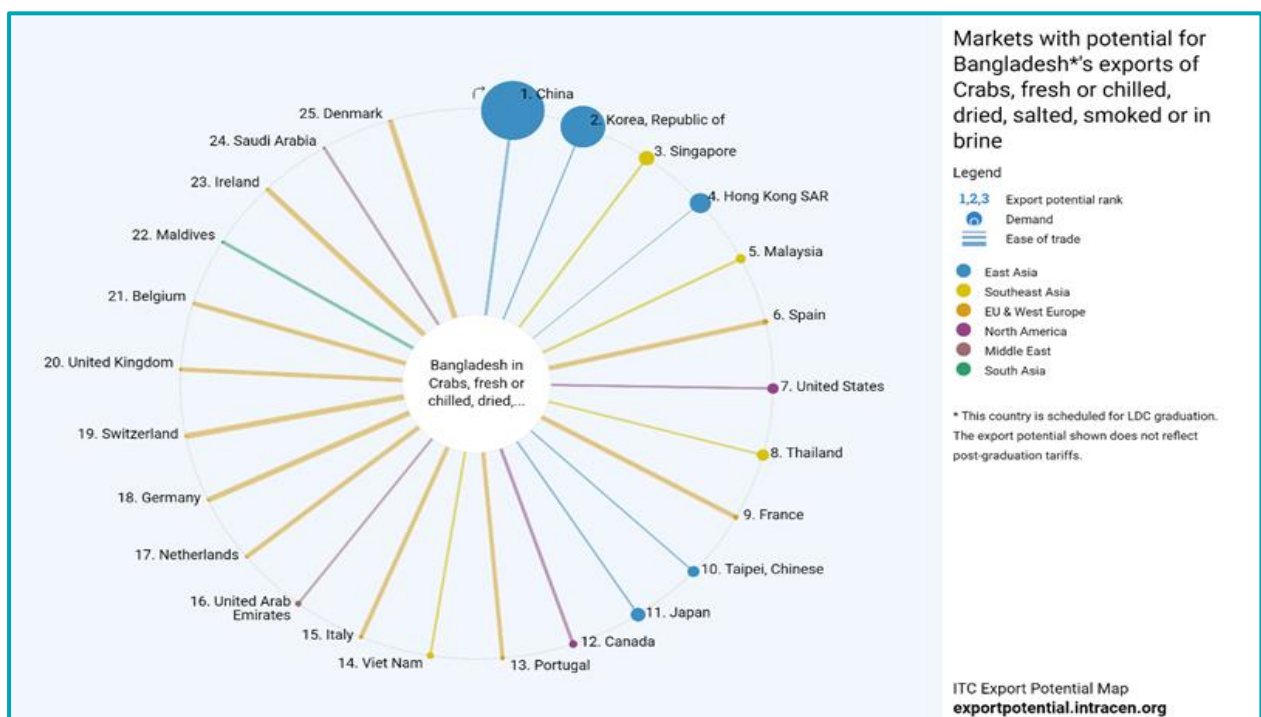
<sup>32</sup> Islam et. al., (2015)

**Figure 17: Export trend of Crabs (Source: EPB)**



Crabs, both live and frozen are being exported to many countries, including EU and South-east Asian countries. However, the trend for exports is not regular. The markets with greatest potential for Bangladesh’s exports of fresh or chilled, dried, salted, smoked or in brine crabs are China, Korea, Republic of and Singapore. China is the market with the highest demand potential for fresh or chilled, dried, salted, smoked or in brine crabs, as shown in Figure 18 below:

**Figure 18: Export potential of Crabs, fresh or chilled in major markets**





Here are the challenges and solutions of Crab export:

- Live and process crab needs health certificate (FIQC) during export. Current exporting packaging protocol and Standard Operating Procedure (SoP) are not export friendly as it takes longer time to get the product inspected and certificated which is a threat for live crab's export. In captive condition the hormonal and enzymatic situation of crab changes which may deteriorates the quality and increases mortality.
- The SoP developed for the export and buyers' requirement is complicated which need simplification in accordance with buyers' requirement. It may be harmonized with other crab exporting countries.
- Inappropriate infrastructure posed challenges related to lack of seawater supply, natural light, proper aeration, drainage systems and biosecurity.
- More attention to environment protection during natural collection of crab let needs to be ensured.
- The government may develop an individual packaging and processing area near Dhaka for the product as developed for other agricultural products.
- Capacity building of laboratory, FIQC and competent authority (equipment, machinery, test kits consultants, skill development etc.), capacity development of other stakeholders, like collector, producer, and cool chain development is required to ensure compliance with the global requirements.

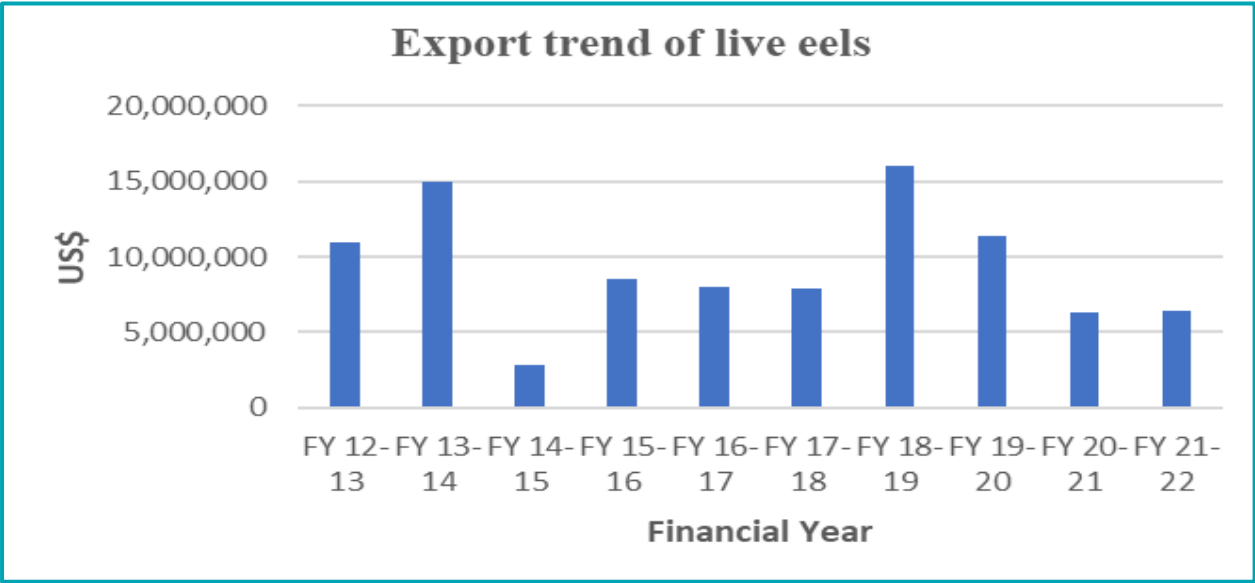
### 2.2.9 Live Freshwater Eel

Four species of Eels are available in Bangladesh. Among them *Monopterus Cuchia*, commonly known as Gangetic mud Eel, is commercially important due to its high demand for export. Eel is found in every region of Bangladesh. However, due to habitat degradation, overcrowding and the use of pesticides in agriculture, the abundance of the Eel is gradually decreasing and now it is almost vulnerable in Bangladesh.

A lot of poor people in Bangladesh are earning livelihood through Eel collection, transport, maintenance, and processing, resulting in employment generation which plays a vital role in the socioeconomic development of the people of Bangladesh. Around 50,000 collectors are involved in natural Eel collection from almost all wetland areas of Bangladesh, among them 20% (10,000) are women. Besides, more than 20,000 people are engaged as *faria (middleman)*, depot holder, transport, packaging, rearing at collecting centres and export trades. Women workers are also working in packaging centres. More than 200 packers are working the live Eel packaging and processing, all members of Bangladesh live and chilled food exporters association (BLCFEA), who owns packaging and holding centres and few other relevant facilities.

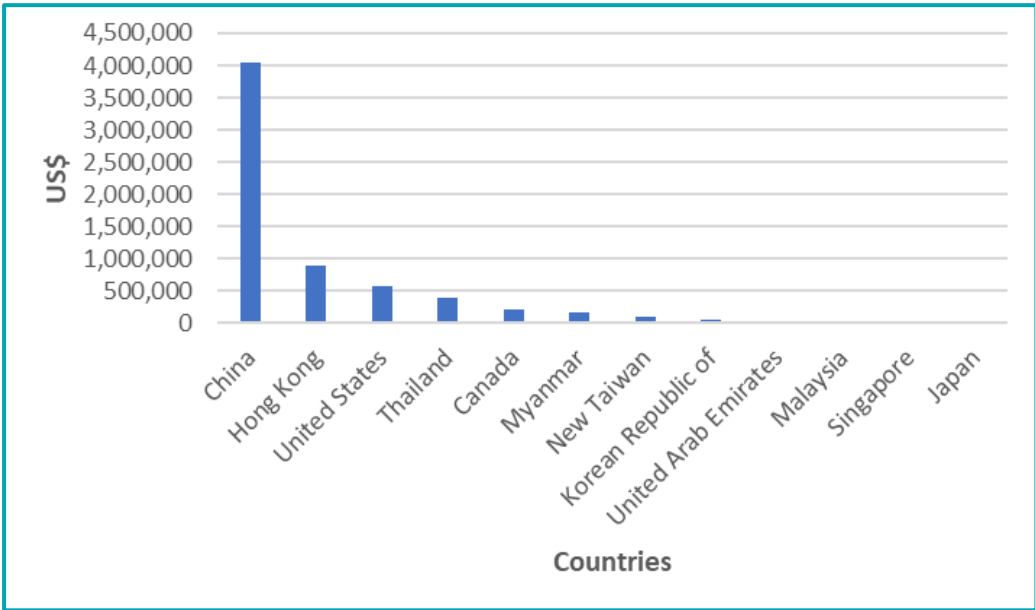
There are factors like; timing and season of collection, export processing, quality control issues, heavy metal, toxicity, hormone etc. contamination and hazards affecting the price of freshwater Eel in local and international markets, particularly as the supply of freshwater Eel is depending on wild source. There are 17 countries that import mud Eel from Bangladesh. The total export volume was USD 15 million in FY 2017-18. Bangladesh exported 6,570 tonnes of Eels in the FY 2019-20 which came down to 4.375 tonnes in 2020-21 and to 3430 tons in FY 2022 due to COVID-19 restriction. Bangladesh Government has prioritised the sector in Export Promotion Policy and aquaculture production. Export trend of live Eels for last 10 years has been shown in Figure 19 below:

Figure 19: Export trend of live Eel (Source: EPB)



To have a further idea about the export markets, destination-wise exports of live Eels for FY 2021-22 are shown in Figure 20 and export potentials in Figure 21 below:

Figure 20: Export destinations of live Eels (Source: EPB)



**Figure 21: Export potential of live Eels in major markets**



The markets with greatest potential for Bangladesh’s exports of Live Eels are Japan, Korea, Republic of and China. Japan shows the largest absolute difference between potential and actual exports in value terms, leaving room to realise additional exports worth USD 335,000.

Here are the key solutions of improvements in live Eel export:

- Capacity of FIQC (DoF) for testing the sample is inadequate as required by the packers and exporters. The laboratory needs equipment, testing kits and chemicals to meet the requirements of tests. Laboratory facilities need to be increased or may be sourced in other laboratories which is related to policy and regulations of Bangladesh government.
- Before export and laboratory testing longer time (6-10 days) is required; the live Eels are kept in packaging centers in tanks. During this period, the Eels are starving; lose weight, infected with disease, risk of chemical and biological contamination increased. To overcome the situation the testing protocol and SoP of the packaging centers need modification.
- The total value chain of live Eel needs to be reviewed and improved.
- The capacity of the related trade association need improvement. A policy guideline on Eel fisheries may be initiated by the associations in collaboration with relevant agencies.
- The government may develop live Eel holding and storage centers with common facilities of water electricity supply and improved sanitation around airport for the packers.

### 2.2.10 Frozen and Chilled Fish

The Fisheries sector contributes 3.57% of national GDP and 26.50% of agricultural GDP. The export contributes 1.24% of total. 1,950,000 people are directly or indirectly engaged in the sector, of which

140,000 are women<sup>33</sup>. In fish export, 78,000 people are directly or indirectly engaged, of which women are around 23,400 (women are more involved in processing and value chain activities) including other fisheries commodity exports. Individually in chilled and frozen fish export it would be 40% engagement i.e., 28,000 thousand people are engaged of which 7,000 are women<sup>34</sup>.

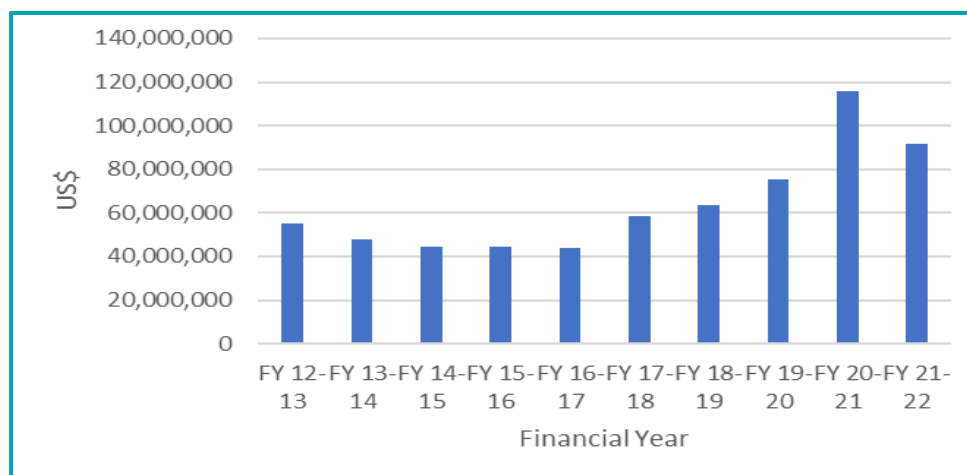
According to chilled fish export association; Bangladesh exports chilled fish and prawn of worth USD 100-120 million annually. According to DoF and EPB, it exports 23,932 tonnes of chilled and frozen fish, valued around USD 60 million. Rupchanda, Tilapia, Rui, Katla and other freshwater fishes and sea fishes in the form of chilled items are being exported to Malaysia, Singapore, Taiwan, Hong Kong, India, Kuwait, Qatar, Saudi Arabia, the UAE, and different countries in Europe.

Chilled fish is being exported through Airport and frozen fish through seaports. The chilled fish export is increasing gradually in Asian markets and frozen fish in both Asian and other countries. Fish grown in aquaculture system and wild catch are exported; contribution of aquaculture fish (including Chilled Prawn) is less than 30% and other fishes from sea, river and open water contribute 70% of export.

During export, the product must comply with the compliances of existing rules and regulations of both export and import country. In Bangladesh, the quality regulatory authority is FIQC of DoF besides there are sever organisations are directly or indirectly involved in the export sector. Very frequently the exportable fish fails to maintain the quality and compliances of export, gets rejected for export and later sold in local market.

Various kinds of fresh and chilled fish are being exported. Export trend of fresh fish for last 10 years has been shown in Figure 22 below:

**Figure 22: Export trend of chilled and frozen Fish (Source: EPB)**

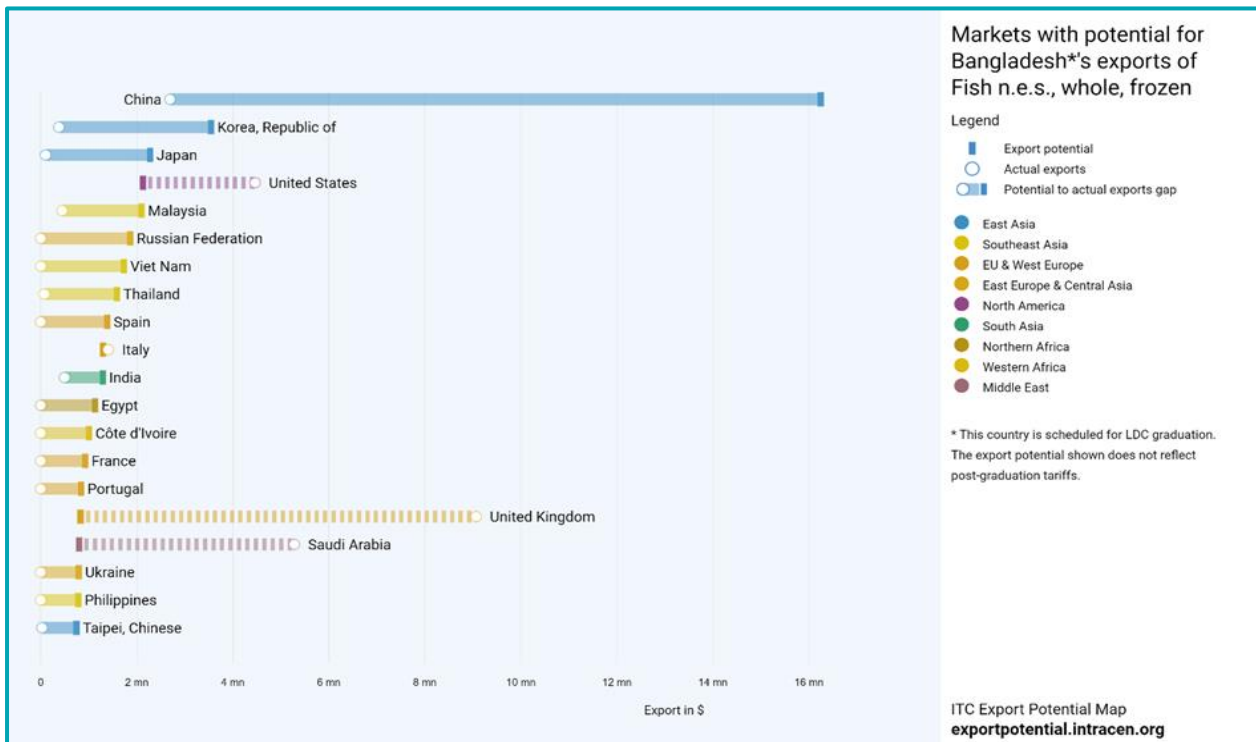


Though such fishes are being exported to several countries, only India accounts for the big chunk of the exports. Exports in other countries are not so significant as is observed from the above graph. The markets with greatest potential for Bangladesh’s exports of whole and frozen fish are China, Korea, Republic of and Japan. China shows the largest absolute difference between potential and actual exports in value terms, leaving room to realize additional exports worth USD 13 million, as shown in Figure 23 below:

<sup>33</sup> DoF, 2022

<sup>34</sup> ibid

Figure 23: Export potential of Fish, chilled and frozen in major markets



The exporter and regulatory competent authority opined on improvement of quality of exportable chilled and frozen fish. Accordingly, the following areas may be addressed for better stable export market:

- FIQC of DoF has workforce and equipment shortage compared to the need of the exporters and sample tests. Delayed certification and inspection very often deteriorate the quality of export fish.
- Improving cool chain maintaining from harvest to export scientifically is one of the prime requisites. The cool chain system must be ensured with relevant stakeholders through training, motivation, and vigilance.
- The traceability of the exportable product should be confirmed with proper movement documents.
- The processing and packaging centres are managed and operated poorly; it needs improvement. Government can provide an area with necessary facilities like water supply, electricity, communication, hygiene, sanitation etc. Besides, the association can play a vital role for its improvement if they develop their capacities in that regard.

### 2.3 SPS Issues and Rejection History

To comply with the WTO compliance, Bangladesh is required to follow the IPPC Standards (ISPMs) as well as establishment of accredited laboratory in accordance with ISO-17025 for diagnosis of pest and diseases. With poor competency to analyse pesticide residue, heavy metals, contaminants, and additives etc. is required with proper post-harvest treatment and packaging facilities for enhancing trade of agricultural products.

The GoB is committed to comply with the WTO-SPS requirements. However, the existing policies of the Government are yet result in full compliance with the WTO-SPS Agreement. Hence, the Ministry of Agriculture has sought technical assistance from FAO in Bangladesh for establishment of a laboratory accredited in accordance with ISO/IEC-17025 and modern packaging house for enhancing trade of agricultural products.

For boosting up exports of agricultural commodities we need to establish laboratory in accordance with ISO/IEC-17025 and modern packaging house as well as competency in Diagnostic Protocols (DPs), Phytosanitary Treatments (PTs), Pest Risk Analysis (PRA), Establishment of PFA or ALPP, Phytosanitary Inspections, Survey and Surveillance etc. and the standards laid down in IPPC of FAO.

Bangladesh is having difficulties to export agricultural products to USA, Canada, Australia, EU, UK, Russia, Japan and many more countries for pesticide residue, heavy metals, contaminants, pest issues. This is because of the presence of heavy metals in powdered spices and food products, presence of plant pests and pesticide residues and related issues to agricultural commodities. Above all, presence of pest and absence of pest free areas in respect to many fresh fruits and vegetables restricting exportation of fruits and vegetables in UK and European countries, potato pest and MRL issues to Russia, Vietnam, Indonesia, and nearby countries. Because of mango fruit fly, salmonella, e-coli contaminants in betel leaf etc. are also examples of restricted exports. This problem is aggravated by limited capacity for pest surveillance, phytosanitary inspections, and phytosanitary treatments with standards laid down in IPPC of FAO in the form of ISPMs.

According to the data presented in Table 2, the most significant SPS concerns for the capacity building options for the considered products are as follows:

- Bacterial contamination
- Pesticide residues
- Hygienic condition/controls
- Heavy metal

**Table 2: Rejection Data Analysis: Considering countries: Australia, China, EU-28, Japan, United States (Year: 2010 to 2020) (Source: UNIDO, Trade Rejection Analysis)**

Reasons for Rejection	Total Number of Rejections		
	HS08-Fruit and nuts	HS07-Vegetables	HS03-Fish and crustaceans
Additive	23	7	
Adulteration/missing document	57	24	8
Bacterial contamination	0	149	391
Heavy metal			1
Labelling	96	40	54
Mycotoxins	1		
Pesticide residues	3	15	6
Veterinary drugs residues			42
Hygienic condition/controls	51		115



Packaging	2		
Microbiological contaminants			2
Other contaminants		2	2

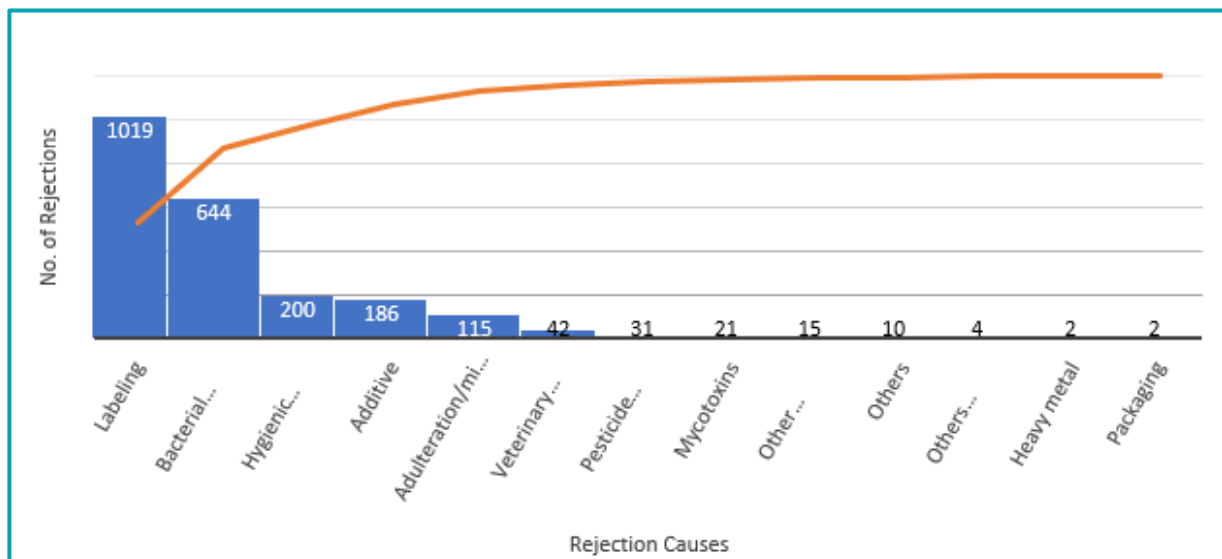
*N.B: Labelling & Packaging are TBT (Technical Barriers to Trade) issues not SPS (Sanitary & Phytosanitary issues)*

By complying with the requirements of the importing countries, Bangladesh has the potential to increase its export volume manifold. Some of the neighbouring countries like Pakistan exports more than 200,000 MT of Mango, where Bangladesh could reach only 1,700 MT. Vietnam, India and many other countries have improved their export performance of agricultural commodities by properly addressing compliance issues, whereas Bangladesh’s progress for complying with the WTO-SPS standards are not yet to fully acceptable level.

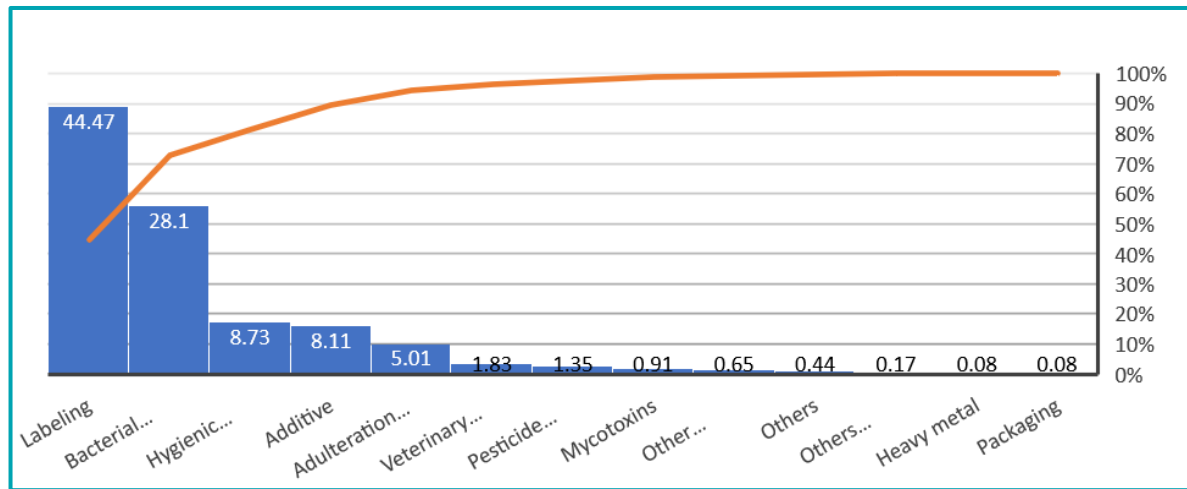
**Table 3: Total rejections for Bangladesh by year in the EU, US, China, Japan and Australia**

Market	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Grand Total
Australia	0	0	0	0	0	0	1	0	4	1	1	7
China	0	0	0	0	0	0	0	0	0	5	0	5
EU-28	9	4	2	0	1	1	4	4	1	3	1	30
Japan	0	0	0	0	0	0	0	1	0	0	0	1
United States	50	31	31	19	14	10	22	19	11	24	16	247
<b>Grand Total</b>	<b>59</b>	<b>35</b>	<b>33</b>	<b>19</b>	<b>15</b>	<b>11</b>	<b>27</b>	<b>24</b>	<b>16</b>	<b>33</b>	<b>18</b>	<b>290</b>

**Figure 24: Total Rejection by Market by Reasons**



**Figure 25: Total per centage of Rejection by Reasons**



Countries around the world conducted Phytosanitary Evaluation (PCE) for country's ability to comply with the phytosanitary requirements of the importing countries only for boosting up their export. Bangladesh conducted the PCE in 2018 and the report was submitted to PQW of Department of Agricultural Extension (DAE) and the Ministry of Agriculture (MoA). In the PCE it got revealed that there is a huge gap lying with the current system of export. However, until now, no reliable policies and infrastructure with logistic support that address the SPS issues have been established. Table 4 presents a snapshot of the frequencies of problems (Non-compliances) Bangladesh is encountering while exporting agricultural products:

**Table 4: Total Rejection by Market by Product (HS01 – HS1-23) (Source: UNIDO, Trade Rejection Analysis)**

HS code/market	Australia	China	EU-28	Japan	United States
HS01: Animals; live					
HS02: Meat and edible meat offal					
<b>HS03: Fish and crustaceans, mollusks and other aquatic invertebrates</b>	<b>7</b>	<b>5</b>	<b>30</b>	<b>1</b>	<b>247</b>
HS04: Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included	1		1	1	6
HS05: Animal originated products; not elsewhere specified or included					
HS06: Trees and other plants, live; bulbs, roots and the like; cut flowers and ornamental foliage					
<b>HS07: Vegetables and certain roots and tubers; edible</b>	<b>3</b>		<b>173</b>		<b>22</b>
<b>HS08: Fruit and nuts, edible; peel of citrus fruit or melons</b>	<b>1</b>		<b>5</b>		<b>122</b>
HS09: Coffee, tea, mate and spices	17		8	6	127

HS10: Cereals			2		5
HS11: Products of the milling industry; malt, starches, inulin, wheat gluten	1				
HS12: Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit, industrial or medicinal plants; straw and fodder		13			
HS13: Lac; gums, resins and other vegetable saps and extracts					
HS14: Vegetable plaiting materials; vegetable products not elsewhere specified or included					
HS15: Animal or vegetable fats and oils and their cleavage products; prepared animal fats; animal or vegetable waxes	1		7		31
HS16: Meat, fish or crustaceans, molluscs or other aquatic invertebrates; preparations thereof	1			1	
HS17: Sugars and sugar confectionery			3	1	12
HS18: Cocoa and cocoa preparations					1
HS19: Preparations of cereals, flour, starch, or milk; pastrycooks' products	5		1	2	118
<b>HS20: Preparations of vegetables, fruit, nuts, or other parts of plants</b>	<b>3</b>		<b>1</b>	<b>3</b>	<b>18</b>
HS21: Miscellaneous edible preparations	9		1	3	29
HS22: Beverages, spirits, and vinegar	2	2		2	8
HS23: Food industries, residues and wastes thereof; prepared animal fodder					2
HS1-23: Food and feed	51	20	232	20	748

There are other reasons for non-compliance. If agricultural products destined for importing countries carry pests, contain pesticide residues, additives, contaminated with contaminants shall be intercepted and either rejected, reshipped, or destroyed. If the interceptions continue, the ultimate result will be an embargo from the importing country, causing reduction of exports of agricultural commodities from Bangladesh. So, to avoid border rejection, Bangladesh has planned to establish a laboratory in accordance with ISO/IEC-17025 where the facilities for detection and diagnosis of pest and diseases, pesticide residues, mycotoxins, contaminants etc. with an organogram where human resources will be available to conduct the laboratory testing and a modern packaging facility which will provide all possible facilities of post-harvest treatment and certification with a view to comply with the WTO-SPS Agreement. Currently we have a packaging house and laboratories, but it has poor facilities and human resources with a lack of proper equipment.

As per WTO norms exporting members claiming that areas within their territories are pest-or disease-free areas or areas of low pest or disease prevalence shall provide the necessary evidence thereof to objectively demonstrate the importing member that such areas are, and are likely to remain, pest or disease-free areas or areas of low pest or disease prevalence, respectively. For this purpose, reasonable access should be given, upon request, to the importing member for inspection, testing and other relevant procedures. SPS measures include all relevant laws, decrees, regulations, requirements and procedures including, inter alia, end product criteria; processes and production methods; testing, inspection, certification and approval procedures; quarantine treatments including relevant

requirements associated with the transport of animals or plants, or with the materials necessary for their survival during transport; provisions on relevant statistical methods, sampling procedures and methods of risk assessment; and packaging and labelling requirements directly related to food safety.

For harmonisation, the standards among member countries include the establishment, recognition, and application of common SPS measures by different members, aligned with international standards, guidelines, and recommendations:

- a) for food safety, the standards, guidelines, and recommendations established by the Codex Alimentarius Commission relating to food additives, veterinary drug and pesticide residues, contaminants, methods of analysis and sampling, and codes and guidelines of hygienic practice.
- b) for animal health and zoonoses, the standards, guidelines and recommendations developed under the auspices of the International Office of Epizootics.
- c) for plant health, the international standards, guidelines, and recommendations developed under the auspices of the Secretariat of the International Plant Protection Convention in cooperation with regional organizations operating within the framework of the International Plant Protection Convention.

In general, the main reasons for non-compliance and not maintaining the standards set by the standards setting bodies of WTO include:

**For Food Safety:** the presence of pesticide residue above the MRL, contaminants like, Salmonella, additives like, Carrageenan, and heavy metals Like, Lead, Chromium, Arsenic etc.

**For OIE:** The standards are taken care of by Ministry of Livestock and Fisheries under the Act: "Bangladesh livestock and livestock products, quarantine laws, 2005"

**For Plant Health:** The laboratory related ISPMs are: ISPM 27. Diagnostic protocols for regulated pests-FAO.org (Currently there are 31 Diagnostic protocols) and ISPM 28. Phytosanitary treatments for regulated pests (Currently there are 44 Diagnostic protocols). Moreover, there are more ISPMs related to laboratory activities like ISPM 4, 6, 8, 10, 13, 17, 19, 22, 37, 38, 41 etc.). though these are related to laboratory activities but other ISPMs are mostly related to packaging house but all the ISPMs are related exports and safeguards countries agriculture by preventing and establishing the destructive foreign insect pests (Invasive Alien Species – IAS).

# 3.

## The P-IMA Framework

### 3. The P-IMA Framework

The P-IMA framework employed here aims to present a more comprehensive analysis of options for SPS capacity-building that can feed into the development of a prioritised action plan for SPS capacity enhancement. Thus, the ultimate objective is *to generate a prioritised list of options for SPS-related capacity-building in Bangladesh based on a range of economic, social, and environmental criteria*.

The rationale behind the framework, therefore, is that priorities need to be established based on a range of economic, environmental, and social considerations that may be otherwise difficult to reconcile. The prioritisation exercise assumes that the rationale for SPS capacity-building investments is enhancing economic, social, and environmental benefits accrued from improved SPS standards, whether in terms of enhanced exports, incomes of poor and marginalised groups, promotion of agricultural productivity, and domestic public health, etc. The framework provides an approach for different decision criteria to be considered, even though they may be measured in diversified ways.

Thus, with that objective, the P-IMA framework aims to:

- Identify the current set of SPS related capacity-building options (CBOs) in the context of existing and/or potential exports of agri-products.
- Determine the *decision criteria* that should drive the establishment of priorities between SPS related CBOs and the relative importance (*decision weights*) to be attached to each.
- Prioritise the identified SPS related CBOs based on the defined decision criteria and weights.
- Examine the sensitivity of established priorities to changes in parameters of the framework.

The P-IMA framework employs a highly structured process that aims to be applied in a wide variety of contexts and to provide various graphical and quantitative outputs. The framework and its practical application processes are described in detail in a user's guide<sup>35</sup>.

In this context, Swisscontact utilised the STDF's P-IMA approach to identify, analyse, and prioritise key SPS barriers in the horticulture and fisheries subsectors. During the study Swisscontact engaged an International P-IMA Expert and three National Experts.

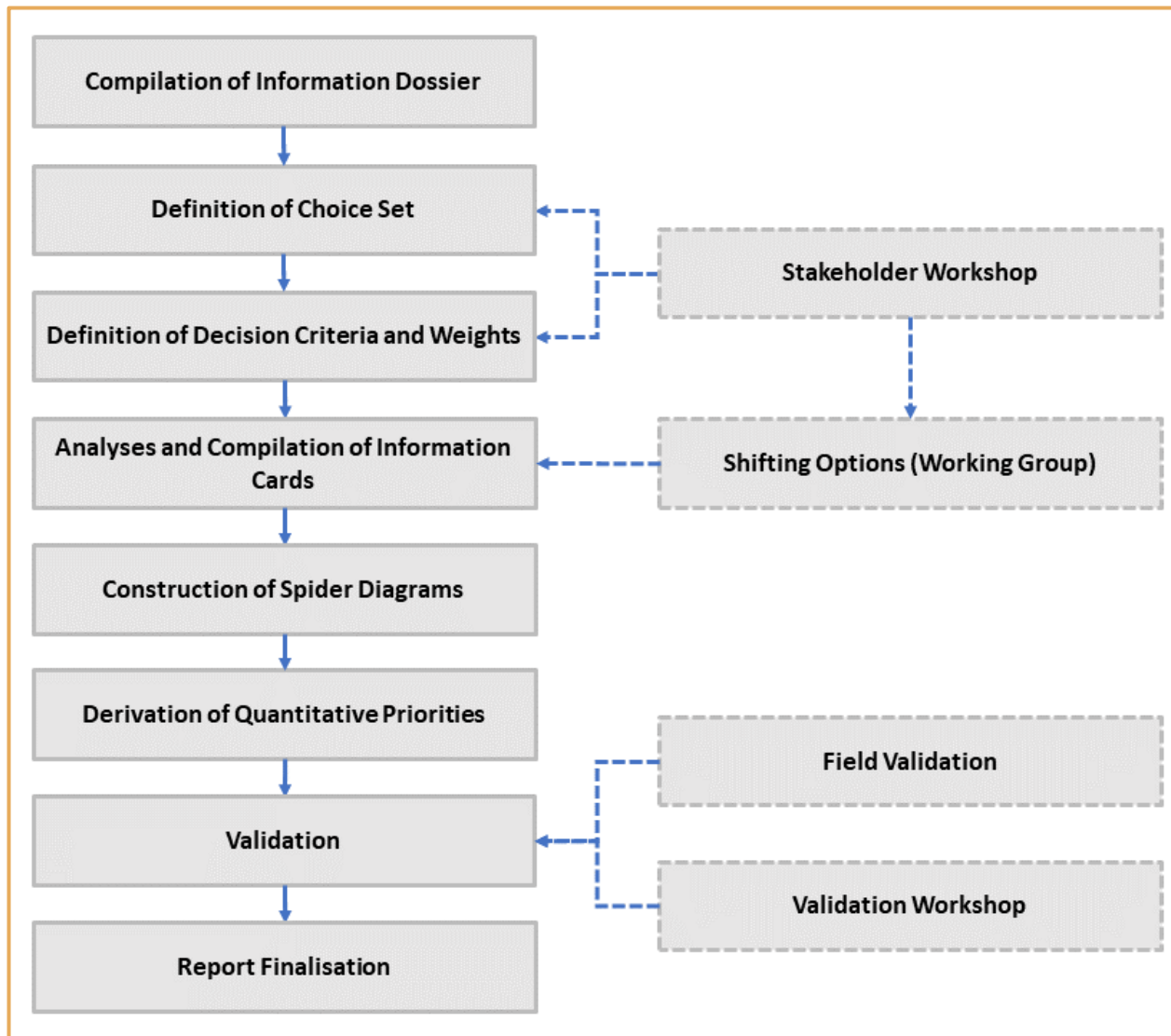
The International P-IMA Expert conducted a comprehensive training program on the P-IMA Approach for a 15-member working group, consisting of five Swisscontact Bangladesh staff members, three National Experts, and a total of seven participants from the Ministries of Commerce, Agriculture, and Fisheries and Livestock. The training comprised 14 virtual sessions and hands-on application of the P-IMA methodology, facilitated by the D-Sight software. This training was followed by the initiation of the P-IMA Bangladesh research and related processes.

Figure 26 provides a brief outline of the seven stages of the framework, with a particular focus on how this process was planned and implemented in Bangladesh.

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<sup>35</sup> P-IMA Framework Guide (<https://standardsfacility.org/>), See: [For more details](#)

Figure 26: Stages in multi-factorial prioritization of SPS capacity building options



### 3.1 Stage 1: Compilation of Information Dossier

The first stage of the analysis involved the compilation of a comprehensive dossier of existing information on the SPS challenges facing agri-food exports from Bangladesh and the associated capacity-building needs. The information obtained during this stage has been subsequently incorporated into this document in Section 2. The aim was to determine and factor in existing information regarding SPS capacity-building needs in the horticulture and fisheries sectors. This work also included findings from meetings with key informants in organisations and development partners that are implementing or have recently implemented projects in agriculture or trade related sectors, to gather their analyses or reports.



### 3.2 Stage 2: Definition of Choice Set

In identifying the SPS capacity-building options to be considered in the priority-setting framework, preliminary secondary research was conducted, which led to the provisional selection of five horticulture products — Mango, Potato, Gourd, Leafy Vegetables, and Citrus — and four fisheries products — Shrimp and Prawn (Frozen), Crab (Live and Frozen), Fish (Chilled and Frozen), and Fresh Water Eel (Live) — for in-depth analysis. The identification of SPS and Trade-related issues for these products involved secondary research, 40 Key Informant Interviews (KII) with relevant stakeholders, and a day-long stakeholder consultation workshop with representatives from public and private actors. The consultation workshop influenced the addition of Betel Leaf as the sixth horticulture product and unveiled six new SPS barriers for horticulture products. Hence, at the end of this stage the study team was able to finalise a list of six major horticulture products and nine associated SPS barriers, as well as four major fisheries products and four associated SPS barriers. A roundtable discussion with relevant government and development partner stakeholders was also organised to further validate the identified SPS barriers and gain insights into existing and planned initiatives for ensuring complementarity and averting duplication.

A total of 46 and 26 stakeholders attended the workshop and the roundtable, drawn from the government, private sector, and development partners. The participants were presented with the purpose of the P-IMA analyses, a brief history and trend of the sectors, products, and trade (export, import, related barriers) information, and were asked to participate in series of group discussions to identify the SPS capacity-building needs of Bangladesh, based on the following criteria:

1. the product(s) affected.
2. the specific SPS issue faced by exports of this product(s).
3. the market(s) where these SPS needs were an issue.
4. the capacity-building option(s) that would solve the SPS issue being faced.

Building on these consultations through these four leading pointers, participants and discussants were tasked to define as many specific SPS capacity-building needs as relevant. The views of all discussants were collected, analysed, and then reported back to them during the workshop. The collection of items was then discussed within the working group to remove any ambiguities and to ensure that all SPS related issues were presented.

The 13 capacity-building options remaining after this process are outlined in Table 5. These options were then prioritised as part of the P-IMA process.

**Table 5: SPS capacity-building options**

Option	Brief Description of Identified Solution
<p>1 Plant pest &amp; pesticide residues controls and hygiene for fresh vegetable and gourd exports to the EU, UK &amp; Middle East</p>	<p>Establishment of PFA and ALPP, building Phytosanitary inspection and pest-control capability, Implementation of HACCP for the exporting products, Improvement of the testing capacity of the laboratory and skilled manpower for better hygiene control of the exporting products.</p>
<p>2 Plant disease &amp; pest controls for potato exports to Russia and Indonesia</p>	<p>Establishment of brown rot free area, improvement of testing capacity of the laboratory, skilled manpower, implementation of HACCP to ensure quality export products.</p>

3	Pesticide residue controls for potato exports to Malaysia	Improvement of testing capacity of the laboratory, skilled manpower to ensure Malaysian import MRL requirements.
4	Plant pest and hygiene controls for leafy vegetable exports to the EU, UK, and USA	Establishment of PFA and ALPP, improvement of testing capacity of laboratory and skilled manpower, development of SPS inspection capability and pest ID for exporting products.
5	Pesticide residue controls for leafy vegetable exports to the Middle East	Improvement of testing capacity of the laboratory and skilled manpower, implementation of HACCP practices to ensure quality exporting products.
6	Salmonella controls for betel leaf exports to the EU	Implementation of HACCP to ensure quality export products.
7	Pesticide residue controls for betel leaf exports to the Middle East	Improvement of testing capacity of the laboratory, skilled manpower to ensure Middle Eastern import MRL requirements.
8	Plant pest control & Pesticide residue controls for mango exports to the EU, USA, Japan & Korea	Introduction of VHT, establishment of PFA for Mango exporting.
9	Plant pest controls for lemon/citrus exports to the EU	Rearrangement/rejuvenation of citrus gardens, treatment of citrus before exportation and phytosanitary certification, establishment of PFA for exporting products.
10	Animal disease, and hygiene controls for shrimp and prawn exports to Thailand, Korea, Mexico, EU, USA, Japan, and Australia	Improvement of laboratories, inspection and competent authority, improvement of cool chain management and implementation of HACCP, establishment of traceable products from disease and pollution-free areas for the exporting products.
11	Hygiene and contaminant controls for live and frozen crab exports to China, Australia, EU, USA, Japan, Korea	Skill development of producers and packers, improvement of collection, transportation, and packaging centres, development of competent authority for quality exporting products.
12	Hygiene & contaminant controls for live eel exports to China, Korea, USA, Canada, Singapore & Japan	Capacity enhancement of FIQC and other laboratories, study on presence of <i>Estradiol</i> hormone and preventive measures, establishment of improved live Eel holding and storage centres for exporting products.
13	Contaminant controls for chilled and frozen fish exports to EU, USA, Gulf & Middle East	Improvement of cool chain, capacity development of laboratories and inspection, establishment of traceable products from disease and pollution-free area for exporting products.

### 3.3 Stage 3: Definition of Decision Criteria and Weights

In the next stage, the working group members defined an appropriate set of criteria to drive the priority-setting process and to assign weights to these. First, working group members were presented with a series of potential decision criteria organised into four categories and asked which (if any) should be excluded and whether any potentially important criteria were missing.

To define the decision weights, the working group members were each asked to assign 100 percentage points amongst the 10 decision criteria. The scores of participants were then collated and averaged. The average weights were then reported back to the members of the working group to identify any scope for adjustments. The final agreed decision criteria and the associated weights are reported in Table 6.

**Table 6: Decision criteria and weights for setting priorities of SPS capacity-building options**

No.	Decision Criterion	Weight (%)
1	Up-Front Investments	20
2	On-Going Costs	10
3	Challenges faced in implementation	5
4	Change in value of exports	20
5	Diversification of exports	10
6	Agricultural productivity	10
7	Impact on Environmental protection	5
8	Impact on domestic public health	5
9	Impact on level of income poverty	10
10	Impact on other marginalised groups	5
<b>Total</b>		<b>100%</b>

### 3.4 Stage 4: Construction of information cards

Having identified the SPS CBOs, decision criteria and weights, the available information was assembled into a series of information cards. The aim of these cards was to ensure consistency in the measurement of each decision criterion across the CBOs and make the priority-setting exercise more transparent and open to scrutiny.

First, each SPS CBO was analysed based on review of existing literature and consultation with stakeholders. The metrics to be employed for each of the 10 decision criteria were then defined, taking account of currently available data and the range of plausible ways in which each of the criteria might be represented. Table 7 sets out the final metrics. Note that the choice of metrics involved a difficult compromise between the availability and quality of data, and the imperative to employ continuous quantitative measures. However, it is important to recognise that the aim of the framework is not to provide a final and definitive prioritisation of the CBOs. Rather, the priorities that are derived should be revisited on an on-going basis and revised as more and/or better data for the decision criteria become available.

**Table 7: Decision criteria measurement**

Decision Criterion	Measurement
<b>Cost and Challenges of implementation</b>	
Up-Front Investments	Monetary Cost (USD)
On-Going Costs	Annual Monetary Cost (USD)
Challenges faced in implementation	Low (1,2), Medium (3,4), High (5,6,7)
<b>Trade impacts</b>	
Change in value of exports	Monetary Cost (USD)
Diversification of exports	Low (1,2), Medium (3,4), High (5,6,7)
<b>Domestic Spillovers</b>	
Agricultural productivity	Low (1,2), Medium (3,4), High (5,6,7)
Impact on Env. protection	Low (1,2), Medium (3,4), High (5,6,7)
Impact on domestic public health	Low (1,2), Medium (3,4), High (5,6,7)
<b>Social impacts</b>	
Impact on Income Poverty	Number of people impacted
Impact on marginalised	Low (1,2), Medium (3,4), High (5,6,7)

Information cards for each of the 13 SPS capacity-building options were then compiled. These are reported in Annex 2. Each card presents data for the ten (10) decision criteria, measured according to the scales outlined in Table 7. For each criterion, details are provided of how measures for each of the decision criteria were derived.

There is also an indicator of the level of confidence in the measure reported. A low or medium level of confidence is indicated where there is a lack of available or quality data. On the other hand, mostly where rigorous and comprehensive prior research is available, a high level of confidence is reported. These confidence measures need to be considered in interpreting the results of the prioritisation exercise, and in considering how the analysis might be refined in the future.

### Methodology

The 13 information cards were developed in collaboration with national level public and private sector partners, as well as national and international consultants, based on selected goods, decision criteria, measurement scale, indicator-wise weight, and confidence estimation. Each CBO sheets quantitative data is calculated using a rational, methodical process that draws from both domestic and foreign data sources.

Generally, the data from ITC Trade Map and Export Promotion Bureau (EPB) has been considered for analysing trade-related data. The production-related calculations for horticultural products, including average production, no. of producers, no. of women and other marginalised groups are based on information obtained from the Bangladesh Potato Exporters Association (BPEA),

Bangladesh Fruits, Vegetables & Allied Products Exporters Association (BFVAPEA), and Agricultural Statistics (DAE, 2021-2022). For the fisheries products, DoF Statistics 2021-22 has been considered. The ITC Trade Map was used to determine the average export performance (million USD) of each product under consideration for P-IMA Analysis over the past three years (2020 to 2022). The EPB, a national source of export data, was also referred to ascertain the annual total export performance of each product from FY 2019-20 to 2021-22.

For example, let us consider the calculation method of the first CBO: Plant pest, pesticide residues & hygiene controls for fresh vegetable and gourd exports to the EU, UK & Middle East. First, the impact on trade resulting from the resolving of SPS challenges is calculated in USD. According to ITC Trade Map, the average three-year (2020-2022) export value of vegetables and gourds to the EU, US, and the Middle East was approximately 12.49 million USD. Based on the analysis of existing trend and expert opinions, a 30% increase in export value (3.747 million USD) to the EU, UK and Middle East was considered upon the resolution of the identified SPS issues.

After approximating the potential increase in export value, we determined the equivalent export volume (MT) required to satisfy the export value of 3.75 million USD. The total volume of vegetable and gourd exports for the fiscal year 2021-2022 is detailed in the DAE statistics book. The approximate total volume of exports from Bangladesh was 40,340 MT in 2021-2022, which corresponds to an equivalent increase of 1185.65 MT export volume.

The necessary export volume of 1185.65 MT enabled us to calculate the necessary production to meet the need for increased exports. DAE Statistics reports that the aggregate production of vegetables and gourds in 2021-2022 amounted to 14,727,990 MT. Based on the impact on the change in export value, required increase in production was estimated at approximately 432,879 MT.

The calculated increase in production enabled us to then calculate the corresponding requirements for cultivation area. According to DAE, the total cultivated area for vegetables and gourds is approximately 640,501 hectares for a production of 14.8 million MT production, which indicates a requirement of 18,825.32 hectares of cultivation area for the envisioned increase in production (432,879 MT).

For the decision criteria "Level of poverty" the measurement criteria are the number of people impacted through the intervention. In this case, according to the DAE, roughly 16.2 million people are directly or indirectly involved in producing different kinds of vegetables in Bangladesh. Hence for the required area of cultivation of 18,825 Hectares, 476,135 people will be positively impacted (including 29,391 women).

The approximated cultivation area also enabled us to calculate the required total initial and ongoing expenses. For CBO 1, the initial investment (USD 383,818) and recurring expenses (USD 104,545) for the duration of one year have been calculated in consultation with industry professionals, considering the necessary solutions and the prevailing market price.

The remaining decision criteria were evaluated using the following scales of measurement: High (5,6,7), Medium (3,4), and Low (1-2). For each CBO document, the measurement scale is determined

by consulting with the relevant stakeholders. In this scenario, the measurement scale for the decision criteria are challenges faced in implementation (+3), diversification of exports (+5), agricultural productivity (+3), impact on environmental protection (+3), and impact on domestic public health (+3).

### 3.5 Stage 5: Construction of Spider Diagrams

The aim of Stage 5 was to present the content of the information cards in a manner that permits easier comparison of the 13 CBOs. Thus, spider diagrams were derived that plotted the 13 SPS capacity-building options against each of the 10 decision criteria. Scrutiny of these diagrams identified the decision criteria against which each of the CBOs performed relatively well/badly compared to the other capacity-building options in the choice set.

### 3.6 Stage 6: Derivation of quantitative priorities

Through Stages 1 to 4, the formal priority-setting analysis involved the use of the D-Sight software package for the ranking. The mechanics of the analysis are described in some detail in the user guide of the framework<sup>36</sup>. The inputs to the model are the data assembled in the information cards. Most of the decision criteria preferences were modelled using a level function since these were measured using categorical scales. However, the up-front investment, on-going cost and criteria were measured continuously and modelled using linear functions. Three models were estimated using D-sight:

- A combined baseline model for all CBOs using decision weights derived in Stage 3.
- A model disaggregated based on sub-sectors (horticulture and fisheries) using decision weights derived in Stage 3.
- Equal weights model in which all the decision criteria are weighted equally.

The baseline model is considered to provide the most reliable set of priorities as it uses the full set of information derived through Stages 1 to 4. The second model is estimated to present the prioritisation of each of the sub-sectors separately to enable decision making for stakeholders that are interested in either of the sub-sector exclusively. The third model examines the extent to which the derived priorities are sensitive to changes in the decision weights. If the ranking of the 13 SPS CBO remains broadly the same under the scenarios presented by the three models, we can be reasonably confident that the results of the framework are robust. The sensitivity of the derived rankings to changes in decision criteria measures for which there are low levels of confidence was also explored.

### 3.7 Stage 7: Validation

The final stage of the priority-setting analysis involved sensitivity analysis of the baseline prioritisation, notably to changes in the decision weights, and a process of stakeholder feedback. The summary of the draft report was circulated widely amongst stakeholders across public and

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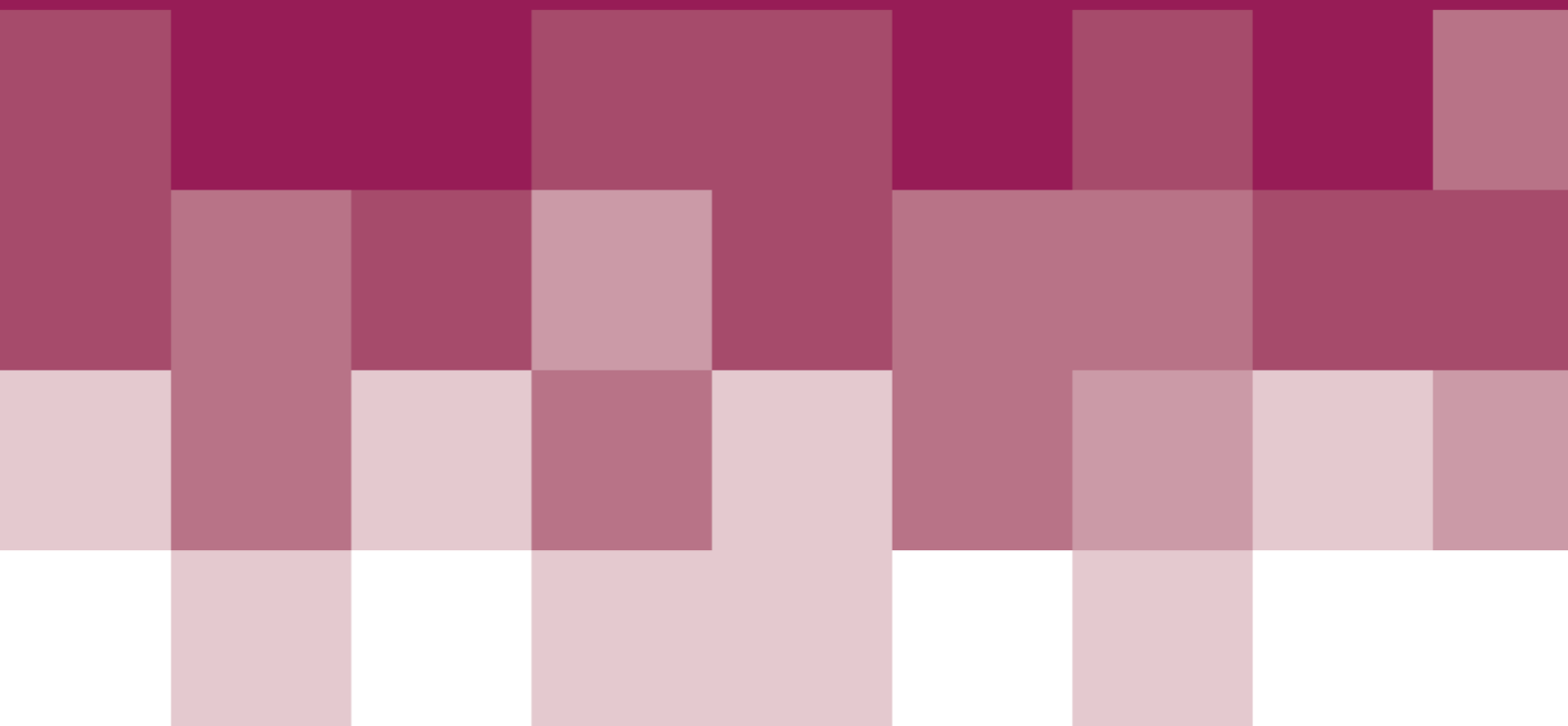
<sup>36</sup> Henson and Masakure (2011). Op cit.

private sectors by email with a request to participate in a validation workshop to present their views. Prior to the validation workshop, the research team also conducted a rigorous field validation, covering seven (7) districts to interview private value chain stakeholders, public extension services, researchers, and farmers of the products to validate the information used in the P-IMA analysis. The field validation report is attached in Annex 3. A validation workshop was held on 24 November 2023, where the specific criterion-wise and overall findings for the study was presented to the relevant participants from the public and private stakeholders. The participants critically examined the reported findings and provided suggestions for improvement in the results and presentation of the report. This includes the consensus to include the disaggregated model as specified in section 3.6, which was previously not part of the analysis.



## 4.

# The Capacity Building Options (CBOs)



## 4. The Capacity Building Options (CBOs)

This section provides a more detailed description and rationale for each of the 13 SPS CBOs considered in the priority-setting analysis. The total investment needed for the 13 SPS CBOs is estimated at 4.7 million USD. This comprises of 3.1 million USD to cover horticulture related priorities and 1.6 million USD for fisheries.

Each of the CBOs discussed below provides information regarding the technical specifications of the SPS issue and how it has impacted Bangladesh's trade performance for that product. Explanation is provided on how addressing the capacity building needs will contribute to different socio-economic and environmental benefits, as well as a summary of the upfront investments and ongoing costs further detailed in Annex 2.

### 4.1 Horticulture Products

#### 4.1.1 Plant pest, pesticide residues & hygiene controls for fresh vegetable and gourd exports:

Plant pest, pesticide residues & hygiene controls are important SPS issues for the fresh vegetable and gourd exporters in Bangladesh. In Bangladesh, the major pest affecting fresh vegetable and gourd is the pest Thrips Palmi (also known as Melon Thrips) which is a plant quarantine pest in the EU and UK. Thrips causes damage to wide range of glass house ornamental and vegetable crops, particularly plants of Cucurbitaceae and Solanaceous crops, such as cucumber, aubergine (eggplant/brinjal), tomato and sweet pepper. Adults and nymphs feed by sucking the cell contents from leaves, stems, flowers, and the surface of the fruits causing silvery scars and leaf chlorosis. As the insect is very tiny, it can hide under peduncle and sometimes its presence cannot be visible to the naked eyes and transmitted to other countries while they are exported.

Hygiene encompasses all conditions and measures necessary to ensure the suitability of food at all stages of the food chain. For fresh vegetable, hygiene means personal cleanliness, using clean and disinfectant tools or equipment, sanitation, disinfected poly bags and cartoons. Hygiene practices start from production process to packaging to avoid any contamination. So, the concept of hygiene from a broader angle is about all necessary measures to produce safe and healthy food, any means to prevent contamination (such as freeing salmonella bacteria) and measures to improve fitness for consumption.

HACCP is a well-recognised systematic approach for the identification, assessment, and hazard control of a particular food operation. It aims to identify problems before they occur and establish measures for their control at different stages of the value chain that are critical to ensuring the safety of food. Control is based on scientific knowledge and is proactive, since remedial action is taken in advance of problems occurring. The key elements of HACCP fall into four main categories: quality of the raw materials used, the type of process used, which may include VHT, irradiation, heat treatment, irradiation, high pressure technology, etc., product composition, including addition of salt, acids, gas or preservatives and storage conditions, involving storage temperature and time, gas packaging etc. The effects of the last three categories on the hygienic condition of the end-product are predictable

and relatively easy to determine. Effective management of these categories allows all food safety requirements to be met.

Another major SPS issue for fresh vegetables and gourd is the presence of pesticide residue beyond the MRL. Pesticide residue is a crucial SPS issue as it induces adverse health effects including cancer, effects on reproduction, immune or nervous system. The main reasons behind high pesticide residue in fresh vegetable and gourd in Bangladesh is the use of chemical pesticides in agriculture to protect crops against insects, bacteria, viruses, fungi, weeds etc. In particular, the problem occurs due to indiscriminate use of pesticide in Bangladesh and ignorance of bio-pesticide as a last dose of pesticide. The pesticides are readily available everywhere in Bangladesh and the farmers can buy any pesticide readily and apply when they deem it necessary or fearing of potential pest attack without taking any advice from agriculture extension department officials.

It is estimated that addressing the described SPS issue will impact cultivation in approximately 18,825 Hectares of area, with an equivalent production of 432,878 MT and export volume of 1,185 MT. According to ITC Trade Map Bangladesh exported vegetables and gourds on average to the following countries: EU (5.22 million USD), UK (3.76 million USD) and Middle East (3.51 million USD) for the last three years (2020-2022). So, the total export value of vegetables in the EU, the UK and the Middle East is roughly 12.49 million USD. It is expected that the total export value in the mentioned countries may increase by 30% after solving the problems. Hence, the probable change in value of exports = (12.49 million USD \* 30%) = 3.747 million USD.

In Bangladesh, approximately 16.2 million people are directly or indirectly involved in producing different kinds of vegetables. According to the change in value of exports, the area of cultivation needed is about 18,825 Hectares, where approximately 476,135 people will be positively impacted. And approximately 29,391 Women will be positively benefitted. According to the change in value of exports, the required volume of production is about 432,879 MT, i.e., roughly a 2.93 % increment to the total production. During the production system-cycle, less use of chemical pesticides will impact positively on the environment. Reduction of indiscriminate use of chemical pesticides, increased use of bio-pesticide, using traps in the field level and ensuring training to the relevant stakeholders on hygiene practice will enhance domestic public health.

**The upfront expenditure** is about USD 383,818 that are related to the expenses for the purchase of trap, stick and related accessories, pesticides (chemical & bio-pesticides), developing traceability book manual and digital solution, buying of HACCP practices materials for field level to packaging, procuring laboratory upgradation machinery & accreditation, procuring of the column of HPLC's & GCMS, blixer machine, developing cool chain management, conducting study on Bio efficacy test, sprayers, HACCP practices materials for field level to packaging, and conducting Residue decline. study.

Considering minimum one (1) annual crop year **the recurring ongoing expenditure** is about USD 104,545 which are related to maintenance & service of pheromone trap, stick and related accessories, additional expenses for HACCP practices materials, necessary chemical for testing, sample collection, carrying and labour charges for setting, capacity building of the manpower for maintaining traceability and records and conducting training to relevant stakeholders.

#### **4.1.2 Plant disease & pest controls for potato exports:**

Brown rot is a disease caused by the bacterium *Ralstonia solanacearum*. The disease has the potential to cause significant yield loss through the rotting of tubers in affected host plant. In 2015, Russia rejected a Bangladeshi consignment of potato due to prevalence of Brown Rot in the potatoes. Some other Asian countries, such as Indonesia, also want laboratory registration (FFPO- Fresh Fruit Plant

Origin). Another major SPS issue in Bangladeshi potatoes is the Potato tuber moth (PTM) or tubeworm (PTW), which is the most widely distributed potato insect in the world. It is usually found in warm climates for overwinter survival and considered a subtropical pest. The moth or worm is considered the most serious pest of potato in tropical and subtropical regions. Recently PTM/PTW has been found in traps. Whether this northern migration is due to global warming, mutation, etc. is not known.<sup>37</sup> Since it is not a good flier, its migration is attributed primarily due to the movement of tubers carrying the pest into storage facilities further north. Pan-water traps are recommended due to ease in cleaning between readings. In general, it is suggested to place four traps in each quadrant of a circle, about 50 ft from periphery. Traps should be checked twice per week. Note that economic thresholds have not been determined for potato damage and marketable yield loss. Although there is no threshold determined, a reported guide is 15 to 20 PTMs per trap per night would trigger a spray recommendation. Another guide is if the average PTM/trap/night is 10 during the season to that point then field should be treated.

According to the DAE Statistics (2021-2022), the total cultivation area of potatoes in Bangladesh is about 466,127 Hectares, the total production is about 11,401,726 MT and According to the Bangladesh Potato Exporters Association (BPEA), Bangladesh exported about 56,000 MT in the world. In this PIMA analysis, the area of cultivation considered is about 66,065 Hectares, where production is about 1,615,992 MT and export volume is about 7,937 MT in line with the potential Change in value of exports.

According to the EPB, Bangladesh exported on average about 33.86 million USD for the last three years (2019-20 to 2021-22). According to BPA (Bangladesh potato association) statistics, in 2014 -2015 the export value was 16 million USD. After that the export was restricted. It's expected that the export may resume to at least 30% of the previous export value to these countries after solving the problems.  
**The probable change in value of exports = (16 million USD\* 30%) = 4.8 Million USD.**

In accordance with the Change in value of exports, about 66,065-Hectare area of cultivation is considered, where approximately 2,612,116 people will be positively impacted and approximately 470,160 women and marginalised group of people will be positively impacted. According to the change in value of exports, production may increase by 1,615,992 MT, i.e., roughly 4.99 % of the total production. Less use of chemical pesticides in the farming system will impact positively on the environment. Reduction of indiscriminate use of chemical pesticides, increased use of bio-pesticide, and ensuring training to the relevant stakeholders on hygiene practice will enhance domestic public health.

**The upfront investment** is about USD 378,181 for purchase of machinery for upgradation of laboratory, necessary chemicals & reagents for labs, tarpaulin, pesticides (methomyl, indoxacarb, diazinin, carbaryl), neem oil/extraction, mask/protective materials for spraying, expenses of developing survey team & collecting of sample, carrying and labour charges for spraying & display, conducting necessary studies and capacity building trainings.

**The ongoing investment is about USD 111,818 for one year** for recurring expenditure of survey team development and sample collection, capacity building for laboratory testing, inspection, sample collection at different stages, laboratory testing (soil, seed, irrigation, water, surrounding Solaneous crops) etc., chemicals & reagents, calibration, pesticides, necessary accessories, travelling for

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<sup>37</sup> Cropwatch. (n.d.). POTATO TUBER MOTH - TUBERWORM. Institute of Agriculture and Natural Resources CROPWATCH.  
<https://cropwatch.unl.edu/potato/tubermoth>

collection of samples, pesticides (methomyl, indoxacarb, diazinin, carbaryl), neem oil/extraction, mask/protective materials for spraying, carrying and labour charges for spraying & display, data collection and examination. The main implementation challenges are associated with capacity building of relevant stakeholders for ensuring pest free area or low pest prevalence and cost of materials needed for conducting the activities.

#### 4.1.3 Pesticide residue controls for potato exports:

The reasons of this problem in Bangladesh are Indiscriminate use of pesticide in potato field. The problem Causes health hazard even cancer to human. this problem impacting in the exporting markets like Malaysia & Indonesia severely because they want registration of accreditation of laboratory in accordance with ISO/IE-17025 and Bangladeshi laboratories are not in accordance with these standards.

According to the EPB, Bangladesh exported on average about 33.86 million USD for the last three years (2019-20 to 2021-22). According to ITC Trade Map Bangladesh has exported potatoes to Malaysia on average for the last three years (2020-2022) is about 8.62 million USD. It is expected that the export may increase to at least 20% of export value to Malaysia after solving the problems. **The probable change in value of exports = (8.62 million USD \* 20%) = 1.72 million USD.** In the P-IMA analysis for this scenario the area of cultivation is considered about 23,728 Hectares, where production is about 580,410 MT and export volume is about 2,850 MT required for absolute change in export value.

In Bangladesh roughly 18.43 million people are directly or indirectly involved in producing Potatoes. According to the Change in value of exports, the area of cultivation (Hectares) needed to be considered about 23,728 hectares, where approximately 938,188 people will be positively impacted where approximately 168,863 women and marginalised group of people will be positively impacted. According to the change in value of export the production may increase 580,410 MT i.e., roughly 5 % of the total production. Less use of chemical pesticides in the farming system will impact positively to the environment. Reduction of indiscriminate use of chemical pesticides, increased use of bio-pesticide, and ensuring training to the relevant stakeholders on Pesticide residue controls will enhance domestic public health.

**The upfront expenditure** is assumed to USD 219,090 for procuring machinery for establishing MRLs (Maximum Residue Level) testing in laboratories. (The expenses are for purchasing of the column of HPLC's, GCMS, reagents, media, equipment calibration, conducting the training to make skilled manpower for analysing the test and sample collection procedure, implementing the process of laboratory accreditation, conducting the studies on pesticide residue decline and bio-efficacy test etc.)

**The ongoing expenditure for one crop year is considered USD 100,000** for recurring expenditure of maintenance and servicing of procuring of the column of HPLC's & GCMS, equipment calibration, buying additional chemicals & reagents for conducting test, HACCP, hygiene, and sanitation materials for the laboratory, time to time sample collection and impact assessment, further trainings for the stakeholders.

#### 4.1.4 Plant pest and hygiene controls for leafy vegetable exports:

Leaf miner is any one of numerous species of insects in which the larval stage lives in, and eats, the leaf tissue of plants. Most leaf-mining insects are moths (Lepidoptera), sawflies (Symphyta, the mother clade of wasps), and flies (Diptera). Some beetles also exhibit this behaviour. The moth's effects are quite disastrous, destroying economically important agricultural crops and decreasing yield

in some plants completely. Their potential impact on the many different cultivated crops, and subsequently the local agricultural economy, has led to serious efforts to control the pests.

According to the DAE Statistics in 2021-2022, Total cultivation area for cultivation of leafy vegetables was about 272,926 Hectares, total production was about 5,781,759 MT and according to BFVAPEA statistics the export volume was 1,002 MT which is only 0.017% of the total production volume. In this P-IMA analysis scenario, the area of cultivation is considered about 13 Hectares, where production is about 281 MT and export volume is about 0.048 MT for absolute change in export value. According to ITC Trade Map Bangladesh exported leafy Vegetables on average to the following countries: EU (0.01 million USD), UK (0.01 million USD) and USA (No export) for the last three years (2020-2022). So, the average total export value of vegetables in the EU, UK and USA is about 0.02 million USD. It is expected that the total export value in the mentioned countries may increase by 30 % after solving the problems. **The probable change in value of exports = (0.02 million USD\*30%) = 0.006 million USD.**

There is no separate data on how many people are involved for producing leafy vegetables only. But roughly 16.2 million people are directly or indirectly involved in producing different kinds of vegetables in Bangladesh. According to the change of value of export involvement of 309 people and about 154 women and marginalised people need to be considered. According to the change in Value of export, the production needs to be considered about 281 MT. Less use of chemical pesticides in the farming system will impact positively the environment. Practicing hygiene and HACCP as well as following GAP, would limit hazards for human health and positively enhance the domestic public health.

**The upfront expenditure is presumed about USD 143,636** related to purchase of necessary HACCP practices materials for Packhouse, field level to packaging, conducting capacity building trainings for the farmers, exporters, officials for maintaining traceability and records, buying required chemicals, developing cool chain management system, and purchasing necessary laboratory testing accessories for contaminants and others.

**The on-going expenditure is supposed about USD 84,545** for one annual crop year for maintaining pest free area for leafy vegetables. The expenses are related to buying additional HACCP practices materials for Packhouse, field level packaging, capacity building of the farmers, exporters, officials for maintaining traceability and records, additional purchases of required chemicals for the labs.

#### **4.1.5 Pesticide residue controls for leafy vegetable exports:**

The reasons of this problem in Bangladesh are Indiscriminate use of pesticide in leafy vegetables. The problem causes health hazard even cancer to human. According to ITC Trade Map Bangladesh exported leafy Vegetables on average to Middle east (0.058 million USD) for the last three years (2020-2022). It is expected that the total export value in Middle East may increase by 30% after solving the problems. **The probable change in value of exports = (0.058 million USD\* 30%) = 0.0174 million USD.** The area of cultivation is considered about 37 Hectares, where production is about 788 MT and export volume is about 0.136 MT required for absolute change in export value.

In this scenario, according to the change of value of export involvement of 309 people and about 154 women and marginalised people has been estimated. The equivalent required increase in production is 281 MT. Less use of chemical pesticides in the farming system will impact the environment positively. Practicing HACCP and GAP will also reduce hazards for human health domestically that will positively enhance the domestic public health.

**The upfront expenditure is estimated to be USD 189,090** related to purchasing of laboratory machinery, procuring of the column of HPLC's & GCMS, chemicals & reagents for conducting test, expenses related to sample collection, procurement of sample materials, conducting the training to make skilled manpower for analysing the test and sample collection procedure, expenses for implementing the process of laboratory accreditation, and purchasing blixer machine.

**The on-going cost is presumed to USD 76,363** for one annual crop year for maintenance and servicing of the column of HPLC's & GCMS, equipment calibration, buying additional chemicals & reagents for conducting test, HACCP, hygiene, and sanitation materials. Conducting further laboratory and capacity building trainings.

#### 4.1.6 Salmonella controls for betel leaf exports:

Salmonella bacteria is a contaminant on betel leaf, it is not a disease of betel leaf. Salmonella bacteria can contaminate other products also. It can contaminate in the production field, during harvesting, during freshening of betel leaf, during transportation, and while packaging.

According to Bangladesh Bureau of Statistics (BBS), the total cultivation area and production of betel leaf in Bangladesh, in 2021-22, were 22,470 Hectares and 214,652 MT respectively. According to BFVAPEA, Bangladesh exported 6,180 MT which is only 2.87% of the total production of betel leaf. This was equivalent to 16.85 million USD in the world in 2021-2022. Currently there is no export in EU due to compliance issues. It is expected that the export may resume in EU market and may contribute about 10% of the total current export value in EU market after solving the problem. **The probable change in value of export = (16.85 million USD\* 10 %) = 1.68 million USD.** In the P-IMA analysis, about 2,247 Hectares of cultivation area is considered, where production volume required is about 21,465 MT and the equivalent export volume required is about 618 MT.

According to DAE statistics 2021-2022, about 50,000 people are involved directly or indirectly in cultivation of betel leaf. Thus about 5,000 people and about 2,000 women and marginalised people need to be considered for the beneficiaries to justify the change in value of export. Practicing HAACP will indirectly bring positive impact to the environment. As there will be no hazards for human health because of following hygiene and HACCP practice, there will be a positive impact on domestic public health.

**The upfront expenditure is assumed to be USD 159,090** for the purchase of HACCP practices materials for field level packaging, packaging, conducting capacity building of the manpower (farmers, exporters, officials etc.) for maintaining traceability and records, developing cool chain management, purchasing chemicals (Sodium Orthophenyl Phenate like substances) and laboratory testing accessories for contaminates and others.

**The ongoing expenditure is about USD 81,818** for one annual crop year for repairing & maintenance of washing plants, purchase of additional HACCP practices materials for field level packaging, further capacity building trainings of the manpower (farmers, exporters, officials etc.) for maintaining traceability and records, enhancing cool chain management services, further buying chemicals and laboratory test accessories for contaminates and others.

#### 4.1.7 Pesticide residue controls for betel leaf exports:

According to ITC, Bangladesh Exported betel leaf on average 7.298 million USD to Middle East for the last three years (2020-2022). It is expected that the export may increase about 30% to Middle east after solving the pesticide residue problem. **The probable change in export values = (7.298 million**



**USD\* 30%) = 2.1894 million USD.** The area of cultivation considered is about 2,919 Hectares, where production is about 27,885 MT and export volume is about 802 MT required for equivalent change in export value. According to DAE statistics 2021-2022, the total cultivation area of betel leaf in Bangladesh is about 22,470 Hectares and about 50,000 people are involved directly or indirectly for cultivation of betel leaf. In this scenario, about 2,919-Hectares area of cultivation is considered for the estimated change in export value. Thus, about 6,495 people and about 2,598 women and marginalised people is expected to benefit, and the required increase in production is 27,885 MT. Ensuring pesticide residue free products will bring positive impact to environment. It will help producing below MRL level which will also reduce the damage to domestic public health.

**The upfront expenditure is assumed to be USD 162,727** for procuring of pesticide & bio-pesticide, column of HPLC's & GCMS, chemicals & reagents, HACCP, hygiene, and sanitation materials for the laboratory, expenses on sample materials and collection, conducting the training to make skilled manpower for analysing the test and sample collection procedure and implementing the process of laboratory accreditation.

**The recurring expenditure is considered about USD 84,545** for additional procuring of pesticide & bio-pesticide & demonstrating the judicial use, maintenance and servicing procuring of the column of HPLC's & GCMS, further buying of additional chemicals & reagents for conducting test, additional purchase of HACCP, hygiene, and sanitation materials for of the laboratory, sample collection, equipment calibration and miscellaneous cost.

#### **4.1.8 Plant pest control & Pesticide residue controls for mango exports:**

Fruit fly *Bactrocera dorsalis* species, commonly referred to as the oriental fruit fly, is the main insect that causes serious damage to mango. Given the *Bactrocera dorsalis* species is not distributed all over the world, it is a serious quarantine pest in our exporting countries. On the other hand, Stone Weevil is *Sternochetus mangiferae*, a weevil commonly known as the mango seed weevil, mango stone weevil, or mango weevil. Mango seed weevil is also considered a pest on mangoes. Similarly, Pulp Weevil is Mango pulp weevil (*Sternochetus frigidus*), which is a serious exotic insect pest that tunnels into the flesh of mangoes, making them unfit to eat. The pest can cause significant fruit damage, resulting in economic loss to the mango industry. Mango pulp weevil is similar in appearance to mango seed weevil but eats the fruit flesh rather than the seed. While mango stone weevil and pulp weevil are yet to appear as non-compliance issues, but fruit fly is a serious concern as we got non-compliance notifications. Consequently, Bangladeshi mango did not get entry into Japan and Korea. The two countries wanted pest list of Bangladesh to conduct PRA and is keen to provide VHT to Bangladesh to import mango from Bangladesh. Fruit fly is also the main problem for entry into USA. In addition to the insects and pests highlighted, pesticide residue above MRL is also an SPS issues for Bangladesh.

According to BFVAPEA, about 100,000 people and about 25,000 women and marginalised people are involved directly or indirectly in mango cultivation. Controlling the use of pesticides will have a significant impact on arable land and the overall environment as it will involve less use of pesticide. Reduced pesticide use will also positively impact the domestic public health.

According to BFVAPEA, the area of cultivation of mangoes in Bangladesh is about 202,968 Hectares, the total production is about 2,350,499 MT, and the total export volume is 1,788 MT which is 0.07% of the total production. These figures are considered as the basis of analysis for absolute change in export value.

**The upfront expenditure is about USD 358,181** for setting up or installation of smaller vapor heat treatment facility with all activities, expenses related to buying pheromone trap, bagging, lure for

male, carrying and labour charges for bagging, lure for female, labour charges for setting traps, conducting capacity building of farmers, exporters, officials etc. for maintaining traceability and records, purchase of pesticides, chemicals & reagents, trap servicing, conducting residue decline study, bio efficacy test study, sprayers, and miscellaneous cost, purchase of machinery for laboratory upgradation, procuring HPLC's & GCMS columns, purchase of HACCP, hygiene, and sanitation materials for the laboratory, procurement of sample materials, equipment calibration, implementing the process of laboratory accreditation & processing report and buying of blixer machine etc.

**The recurring expenditure is assumed at about USD 112,727** for maintaining and servicing pheromone traps, lure for male, bagging, labour charges for additional bagging, lure for female, carrying and labour charges for additional setting of traps, further capacity building of farmers, exporters, officials etc. for maintaining traceability and records, buying additional pesticides, chemicals & reagents, trap servicing, maintenance of laboratory upgradation machinery, additional purchase of HACCP, hygiene, and sanitation materials for the laboratory and equipment calibration

#### 4.1.9 Plant pest controls for lemon/citrus exports:

Citrus Canker is a citrus disease caused by the bacterium *Xanthomonas Citri* subsp. *Citri* (synonym *X. axonopodis* pv. *citri*). While not harmful to humans, canker significantly affects the vitality of citrus trees, causing leaves and fruit to drop prematurely. A fruit infected with canker is safe to eat but has reduced marketability as fresh fruit. The bacteria that cause citrus canker enter leaves through stomata, or through wounds caused by weather damage or insects, such as the citrus leaf miner (*Phyllocnistis Citrella*). Citrus species, such as grapefruit, lime, and lemon, are most susceptible to citrus canker.

Citrus Scab is another prominent citrus disease caused by the fungus *Elsinöe Australis*, which results in scab-like lesions on fruit, and less frequently on leaves and twigs. It can cause premature fruit drops and stunt young nursery trees and new field plantings but has little impact on fruit quality. While there is no danger to humans, the blemished fruit has reduced marketability. Sweet oranges and tangerines are common hosts; however, all Citrus species are vulnerable.

Citrus black spot (CBS) is a citrus disease caused by the fungus *Phyllosticta Citricarpa* (previously known as *Guignardia Citricarpa*). This fungus affects citrus plants throughout subtropical climates, reducing both fruit quantity and quality. Sometimes exported fruits carry these bacterial and fungal disease-causing refusal of entry and non-compliance notifications from the EU.

According to BFVAPEA, the total cultivation area is about 20,127 Hectares, the total production is 206,961 MT, and the export volume is about 1,982 MT in 2021-22. In the lemon/citrus sector about 100,000 people and 50,000 women and marginalised groups of people are involved directly or indirectly in Bangladesh. In this scenario, these figures are considered as the basis of analysis for absolute change in export value.

According to ITC trade Map, Bangladesh exported lemon/citrus to EU on average 0.18 million USD for the last three years (2020-22). It is expected that export may increase 30% from the current export value after solving the problems. **The probable change in export values = (0.18 million USD \* 30%) = 0.054 million USD.**

**The upfront investment is assumed at USD 200,000** for expenses on rejuvenation of citrus garden, purchase of pesticides (insecticide & fungicide), mask/protective materials for spraying, expense for carrying and labour charges for spraying & display, capacity building of farmers, exporters, officials etc. for maintaining traceability and records, developing traceability book manual and digital solution,

purchase of protective materials for entering garden and sanitation of equipment with chemicals for work in the field, buying of chemicals for equipment sanitation with Sodium Orthophenylene Phenate substances conducting necessary studies (data collection and research & report processing).

**The recurring expenditure is about USD 95,454** for one annual crop year for additional purchase of pesticides, mask/protective materials for spraying, regular expenses linked to spraying, capacity building of farmers, exporters, officials etc. for maintaining traceability and records, time to time sample collection and impact assessment and conduct of further capacity building trainings.

## 4.2 Fisheries Products

### 4.1.10 Animal disease, and hygiene controls for shrimp and prawn exports to:

Since 1996 viral diseases like WSSV (white spot syndrome virus), YHV (Yellow head virus) spread out, onward after 2008 EMS (Early mortality syndrome) disease spread-out. RNA virus (ssRNA) sometime cause disease in Prawn. Now most of the buyers need certification on the infection. Filthy materials (unwillingly, carelessly), metal, adulterants (increase weight) contaminate the product which cause due to careless handling need awareness building and surveillance. Biological contaminants added from miss/poor handling, cool chain management, transportation, processing etc. chemicals and antibiotics are mostly driven from bad aquaculture practice and marketing process. Veterinary residue comes from ignorance of disease treatment and drains along with water and adjacent farming system.

The reasons of this problem in Shrimp and Prawn in Bangladesh are ignorance and knowledge of the stakeholders, insufficient capacity of competent authority and weakness of trade association involved. For this problem sometimes exports are restricted, the quality of the products becomes inferior, and it defames the country image and ultimate get less price rate. The mentioned SPS issues must be tested and analysed in the laboratory and certified based on its acceptable limits or absence. Sometime Bangladesh gets alert notice from byers' end, on few occasions the export consignment is rejected and sent back to exporter or destroy.

According to the DoF statistics 2021-22, the total cultivation area of shrimp and prawn is about 262,980 Hectares, the total production is about 137,021 MT, and the export volume is about 30,571.4 MT which is roughly 22.31 % of total production. In this scenario, the area of cultivation is considered about 61,636.16 Hectares for absolute change in export value. According to the DoF, it is expected that the production will increase by 32,114.41 MT, i.e., a 23% increment to the total production. where approximately 164,063 people and about 46,875 women and marginalized people will be positively impacted.

According to the ITC Trade Map, Bangladesh exported shrimp and prawns to the world on average for about 352.75 million USD for the last three years (2020–22). On the other hand, Bangladesh exported shrimp and prawn on average to the following countries: Thailand (0.88 million USD), Korea (0.84 million USD), Mexico (No export), EU (286.57 million USD), USA (29.68 million USD), Japan (15.88 million USD), and Australia (0.055 million USD) for the last three years. So, the average export value in Thailand, Korea, Mexico, the EU, the USA, Japan, and Australia is about 333.92 million USD. It's expected that the total export value in the mentioned countries may increase by 25% after solving the problems. The expected change in value of exports is  $(333.92 * 25\%) = 83.48$  Million USD.

**The upfront expenditure is presumed to USD 472,727** for the purchase of machinery for the DoF laboratory upgradation, expense on upgrading sampling process, increasing capacity of three laboratories of DoF for inspection, testing & certification, purchase of necessary laboratory equipment, testing tools and kit, upgrading sampling process and SoP development on sampling of exportable shrimp & prawn, purchasing HACCP practices materials at hatcheries, farm, transport and processing stages, strengthening, and, developing efficient traceability system, reviewing and strengthening GAP in shrimp and Prawn production and maintaining compliances for entering foreign markets.

**The recurring expenditure is about USD 240,909** for one annual crop year for conducting capacity building trainings of the officials for testing, inspection, and certification, maintenance and servicing of laboratory equipment tools and kits, awareness & capacity building workshop and trainings on HACCP practices and prohibited antibiotic & chemicals usages in farming system etc.

#### **4.1.11 Hygiene and contaminant controls for live and frozen crab exports:**

Several Crustacean virus carriers are crab and few of them infect crabs both in nature and in culture (soft-shell crab production and fattening) Importers reject infected crab and need health certificate on not contaminated by WSSV virus. Chemical contaminants come from culture and fattening processing (rearing sub adult crab to adult marketing stage). Illegally few producers use the chemical and antibiotic to safeguard against the diseases. Besides, in few cases it comes from poultry and livestock farming if the litter is not disposed properly. It comes from poor water used during washing, transportation and collected from waste polluted water area. The reasons behind this problem in Live and Frozen Crab in Bangladesh are ignorance and poor skill of producers, poor handling and transportation, poor environment, and insufficient capacity of the competent and surveillance authority problem.

According to the DoF statistics 2021-22, the total cultivation area of Live and frozen crab is about 9,353 Hectares, the total production is about 13,397 MT, and the export volume is about 7,729.99 MT which is roughly 57.69% of total production. In this scenario, the area of cultivation is considered about 1,741 Hectares for absolute change in export value. According to the DoF, it is expected that the production will increase by 1,159.49 MT, i.e., a 15% increment to the total production. Approximately 65,150 people and about 37,228 women and marginalised will be positively impacted.

According to the ITC Trade Map, Bangladesh exported live and frozen crab to the world on average for about 19.02 million USD for the last three years (2020–22). On the other hand, Bangladesh exported live and frozen crab on average to the following countries: China (25.57 million USD), Australia (2.07 million USD), EU (9.65 million USD), USA (11.38 million USD), Japan (1.52 million USD), and Korea (0.22 million USD) for the last three years. So, the average export value in China, Australia, EU, USA, Japan, and Korea is about 50.48 million USD. It is expected that the total export value in the mentioned countries may increase by 10% after solving the problems. **The expected change in value of exports is (50.408 million USD \* 10%) = 5.048 million USD.**

**The upfront expenditure is about USD 189,090** which is related to purchase of necessary accessories for skill & capacity development of the supply chain actors involved in production, transportation, and storage system.

**The recurring expenditure is about USD 81,818** is for one annual crop year for the Efficiency improvement trainings of the competent authority and awareness building seminars and trainings to maintain compliances to international market access.

#### 4.1.12 Hygiene & Contaminant controls for live Eel exports:

SPS problems such as Occurrence of Estradiol hormone, chemical contaminants, biological contaminants, heavy metal for live Eels appear during export product analysis and certification. The possibilities of chemical and biological contaminations may occur round the year in collection and farming areas even in holding areas during export process. The occurrence of Estradiol hormone is during the breeding season, but it is difficult to segregate during harvesting and export. Test and analysis process by competent authority requires longer time, which is not congenial for export of live Eel. The reasons of this problem in Freshwater Live Eel in Bangladesh are Poor and inefficient collection, holding and transport, Natural pollutant during handling and transportation, Degradation of collection area and Poor management during export and laboratory analysis process. This problem impacting in the exporting markets like China, Korea, USA, Canada, Singapore, Japan as rejection of the export and Frequent alert from exporting country on quality and contaminants.

According to the DoF statistics 2021-22, Total Annual of catch of Eels (Culture and Capture) is about 9,488 MT. In this scenario, the total Annual catch of live Eels is considered 2,158.05 MT for absolute change in export value where approximately 45,490 people and 22,745 women & marginalised group of people will be benefitted. According to the ITC Trade Map, Bangladesh exported live Eels to the world on average for about 1.30 million USD for the last three years (2020–22). On the other hand, Bangladesh exported live Eels on average to the following countries: China (0.2 million USD), Korea (No export), USA (2.09 million USD), Canada (0.03 million USD), Singapore and Japan (No export) for the last three years. So, the average export value in China, Korea, USA, Canada, Singapore & Japan is about 2.32 million USD. It's expected that the total export value in the mentioned countries may increase by 20% after solving the problems. **The expected change in value of exports is  $(2.32 \times 20\%) = 0.464$  million USD.**

**The upfront expenditure is about USD 154,545** and relates to purchase of necessary accessories for Improvement of eel holding and storage centres.

**The recurring expenditure is about USD 95,454** for one annual crop year that is related to awareness & capacity building trainings for all the supply chain stakeholders and efficiency improvement seminars for the competent authority.

#### 4.1.13 Contaminant controls for chilled and frozen fish exports:

The chilled fish is frequently putrefied due to poor cool chain maintenance. The icing and packaging are not properly done, or the process is hampered due to excess time required during the export process. Frequently TVN (total volatile based nitrogen) increases which is rejected at port of exit during analysis by competent authority or at port of entry. Heavy metal may get added during aquaculture activities and cleaning/processing. Biological and physical contaminations happen during handling, marketing, and packaging or processing of fish export. The reasons behind this problem in Chilled and Frozen Fish in Bangladesh are poor handling, bad aquaculture practices, poor cool chain maintenance, poor skill and awareness of the stakeholders and Insufficient capacity of the competent authority. This problem impacts the exporting markets like EU, USA, Gulf & Middle East countries as rejection of the export., frequent alert and temporary ban on the export.

According to the DoF statistics 2021-22, the total inland cultivation area of fishes is about 4,706,171 hectares, the Annual Fish production of Inland waterbodies is about 4,052,701 MT, and the export volume is about 26,126.89 MT which is roughly 0.64 % of total production. The area of cultivation is

considered about 1,168,812 Hectares and 1,006,518 MT production for absolute change in export value. Approximately 484,297 people and about 34,770 women & marginalised will be positively impacted.

According to the ITC Trade Map, Bangladesh exported chilled and frozen fish to the world on average for about 29.36 million USD for the last three years (2020–22). Bangladesh exported chilled and frozen fish on average to the following countries: EU (11.69 million USD), USA (4.91 million USD), Gulf (4.83 million USD) and Middle East (5.15 million USD) for the last three years. So, the average export value in these countries is about 26.58 million USD. It is expected that total export value may increase by 20% after solving the problems. **The expected change in value of exports is (26.58 million USD\* 20%) = 5.31 million USD.**

**The upfront expenditure is presumed to be USD 309,090** related to improving cool chain management system i.e., ensuring temperature-controlled supply chain from harvesting to consumer.

**The recurring expenditure is about USD 79,090** for awareness building, developing skills and capacities of the supply chain actors on cool-chain management system. The implementation challenges are related to building awareness among all the value chain actors, mainly the producers, on the improvement of SPS issues and improvement of the capacities of the competent authorities and poor transport and packaging process.

## 5. Results

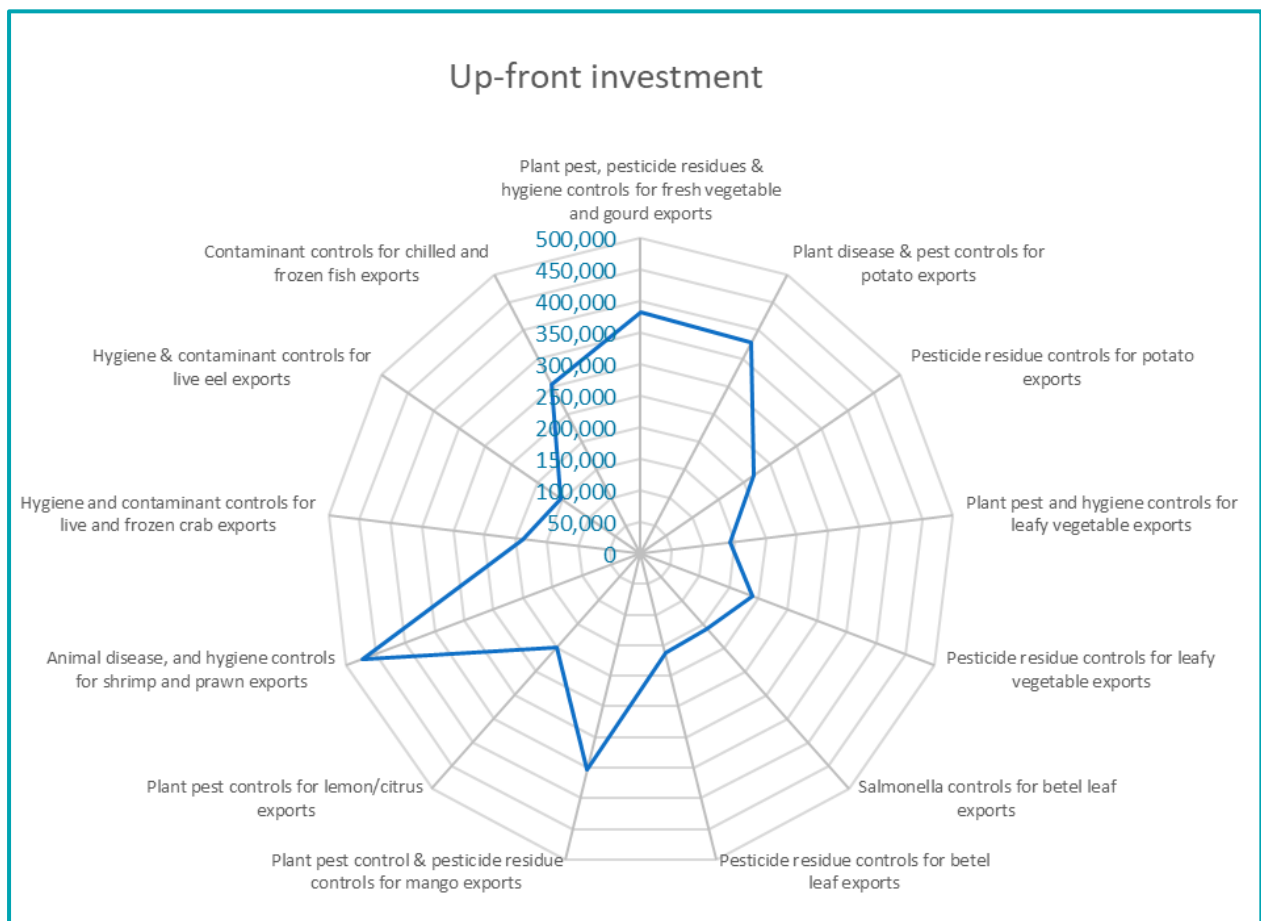


## 5. Results

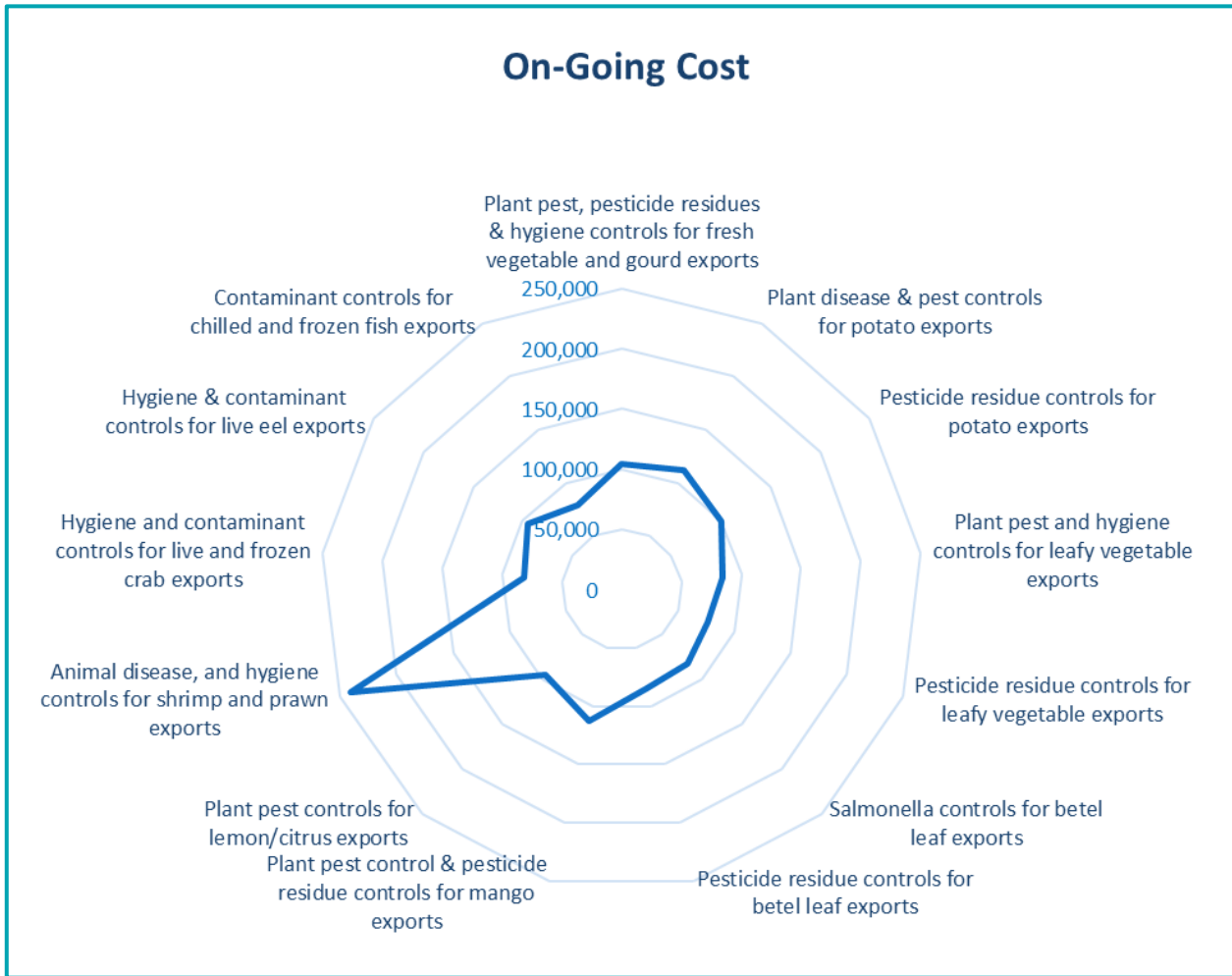
The descriptions presented above, and the results of the stakeholder workshops, suggest all thirteen (13) of these options are credible options for SPS capacity-building in Bangladesh. However, the associated costs and resulting benefits may differ substantially, such that it is possible to define clear priorities amongst the options based on the defined decision criteria and weights. Below the results of the prioritisation exercise are presented. These are derived using outranking analysis through the software package D- Sight.

To provide a first scan of the relative strengths and weaknesses of the 13 CBOs, spider diagrams were constructed (Figures 27 to 36) for each of the 10 decision criteria. Although this depiction only permits comparison of the capacity-building options according to the decision criteria on a one-by- one basis, it does enable the key dimensions along which each of the options performs relatively well/badly to be identified. As such, the spider diagrams are a useful way in which to present information on the SPS capacity-building options to more general (less technical) decision- makers.

**Figure 27: Decision criteria measures scores for SPS CBOs – up-front Investment (USD)**



**Figure 28: Decision criteria measures scores for CBOs – on-going costs (USD)**

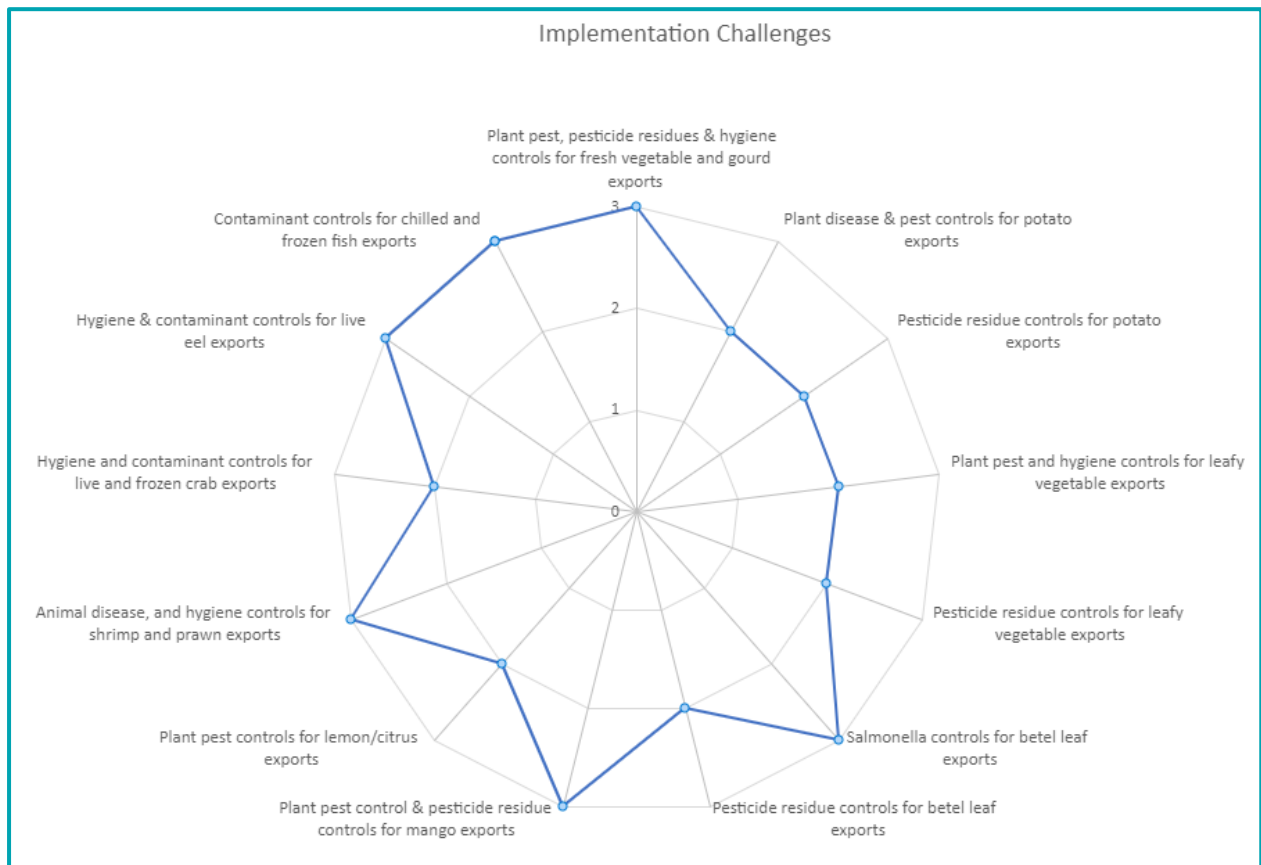


Figures 27 and 28 present the up-front investment and on-going costs profiles of the thirteen (13) SPS capacity- building options. It is immediately obvious that the most expensive capacity-building option in terms of up-front investment are *Animal disease, and hygiene controls for shrimp and prawn exports (USD 472,727)*, *Plant pest, pesticide residues & hygiene controls for fresh vegetable and gourd exports (USD 383,818)*, *Plant disease & pest controls for potato exports (USD 378,181)*, *Plant pest control & Pesticide residue controls for mango exports (USD 358,181)*. The option with the lowest upfront investment is *Plant pest and hygiene controls for leafy vegetable exports (USD 143,636)*.

The highest ongoing cost is required for the option *Animal disease, and hygiene controls for shrimp and prawn exports (USD 240,909)*. The options with the lowest ongoing costs are *Pesticide residue controls for leafy vegetable exports (USD 76,363)* and *Contaminant controls for chilled and frozen fish exports (USD 79,090)*. All other options' ongoing cost is nearly 100,000 USD.

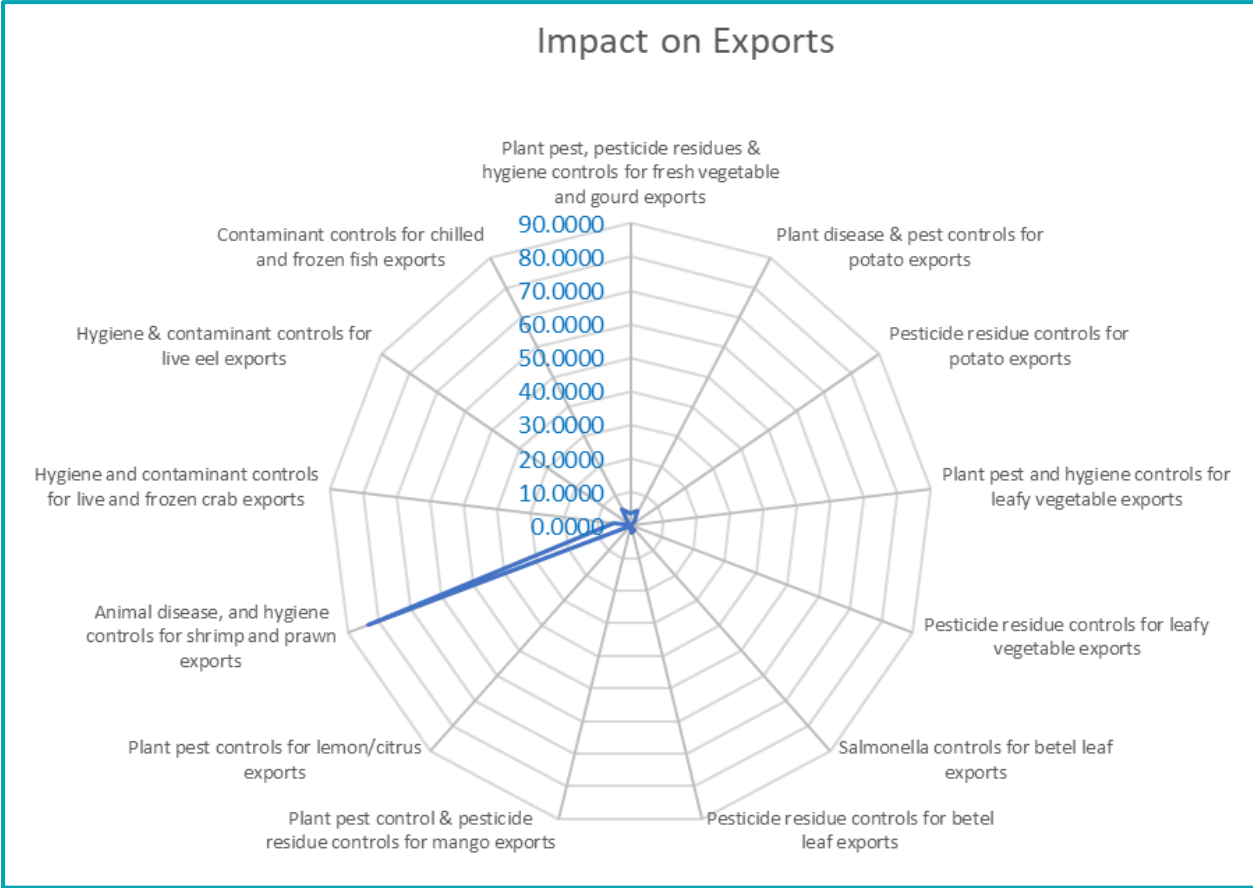
The 13 CBOs are judged in a scale of 1 to 7 to have Low (1-2), Medium (3,4), High (5,6,7) implementation challenges. The options *Plant pest, pesticide residues & hygiene controls for fresh vegetable and gourd exports*, *Plant pest control & pesticide residue controls for mango exports*, *Salmonella controls for betel leaf exports*, *hygiene & contaminant controls for live Eel exports* and *Contaminant controls for chilled and frozen fish exports* have been deemed to have medium (+3) level of difficulty. All other options are considered to have low-level difficulty (+2).

**Figure 29: Decision criteria measures scores for CBOs - Challenges faced in implementation**



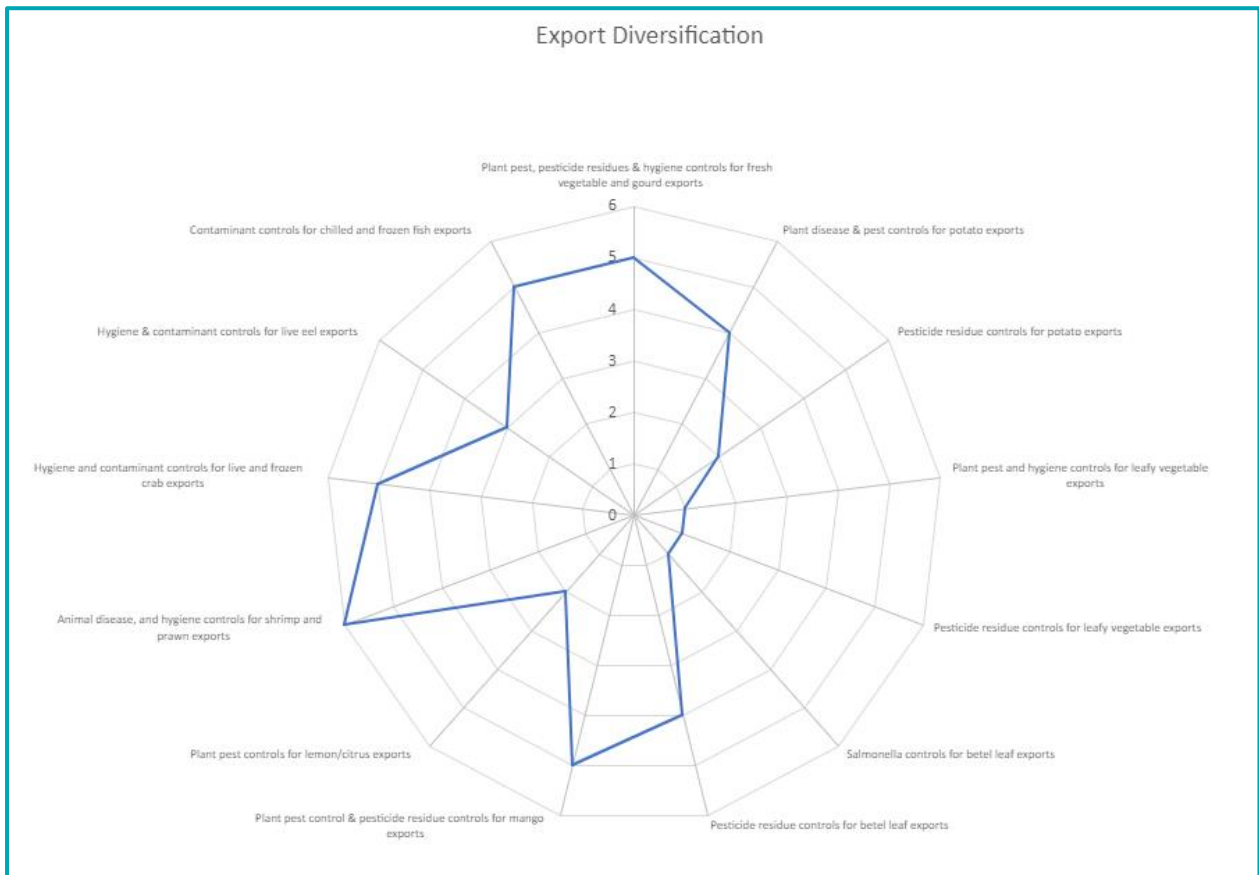
The measurement indicators for impact on export has been defined by monetary cost for all the thirteen (13) capacity building options. The option *Animal disease, and hygiene controls for shrimp and prawn exports* has the highest impact in value of exports (83.5 million USD), the option with the lowest impact on trade is *Pesticide residue controls for leafy vegetable exports* (0.00174 million USD). All other options have the values between 2 million USD to 5 million USD in terms of impact on trade.

Figure 30: Decision criteria measures scores for CBOs – Impact on Export



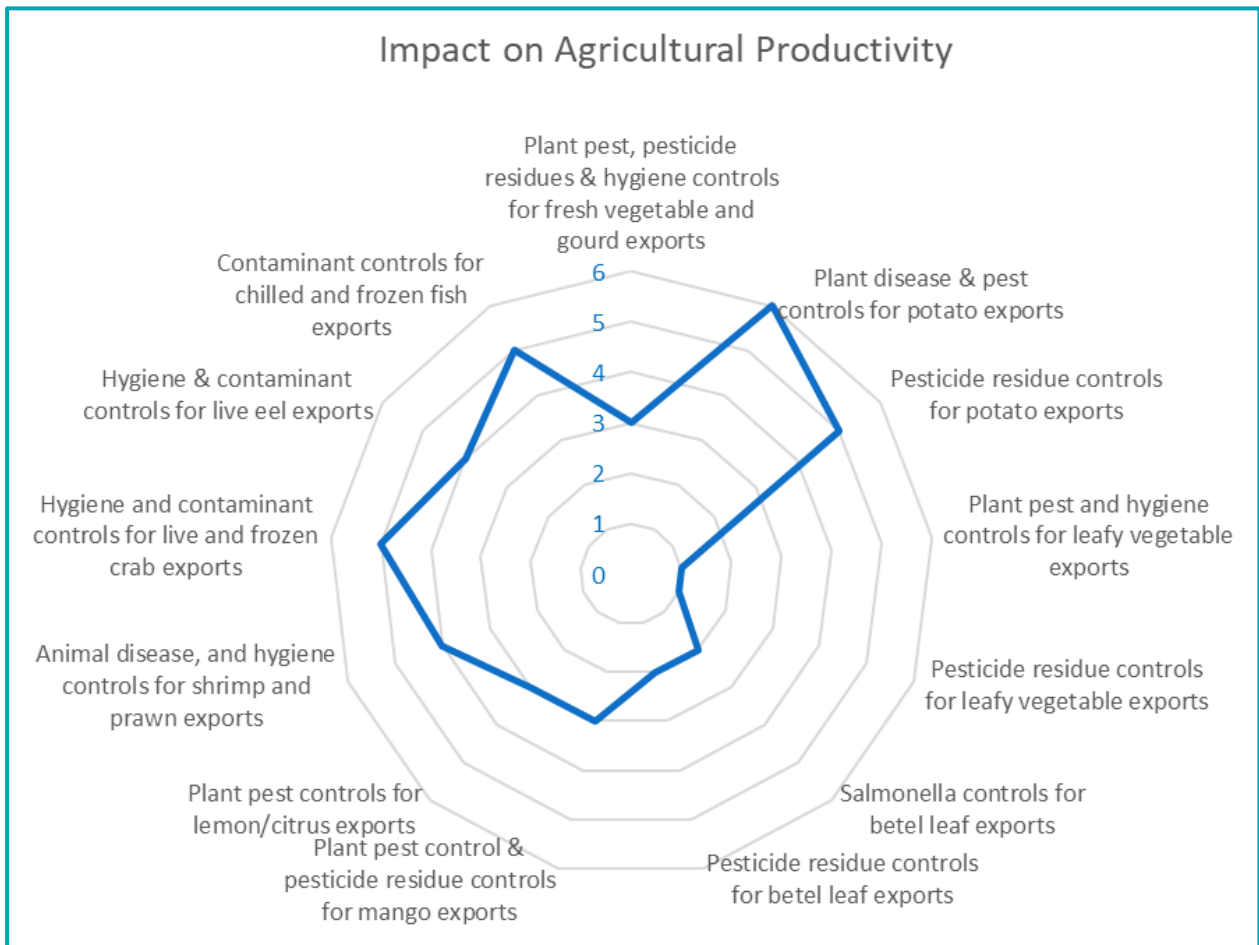
The decision criteria diversification of export has been judged for all the thirteen (13) capacity building options from the scale minimal to major /low to high (1 to 5). The options for high possibilities of export diversification lie on the scale 4 to 6. These options are *Animal disease, and hygiene controls for shrimp and prawn exports*, *hygiene and contaminant controls for live and frozen crab exports*, *Contaminant controls for chilled and frozen fish exports*, *Plant pest, pesticide residues & hygiene controls for fresh vegetable and gourd exports*, *Plant disease & pest controls for potato exports* and *Pesticide residue controls for betel leaf exports*.

**Figure 31: Decision criteria measures scores for CBOs – Diversification of exports**



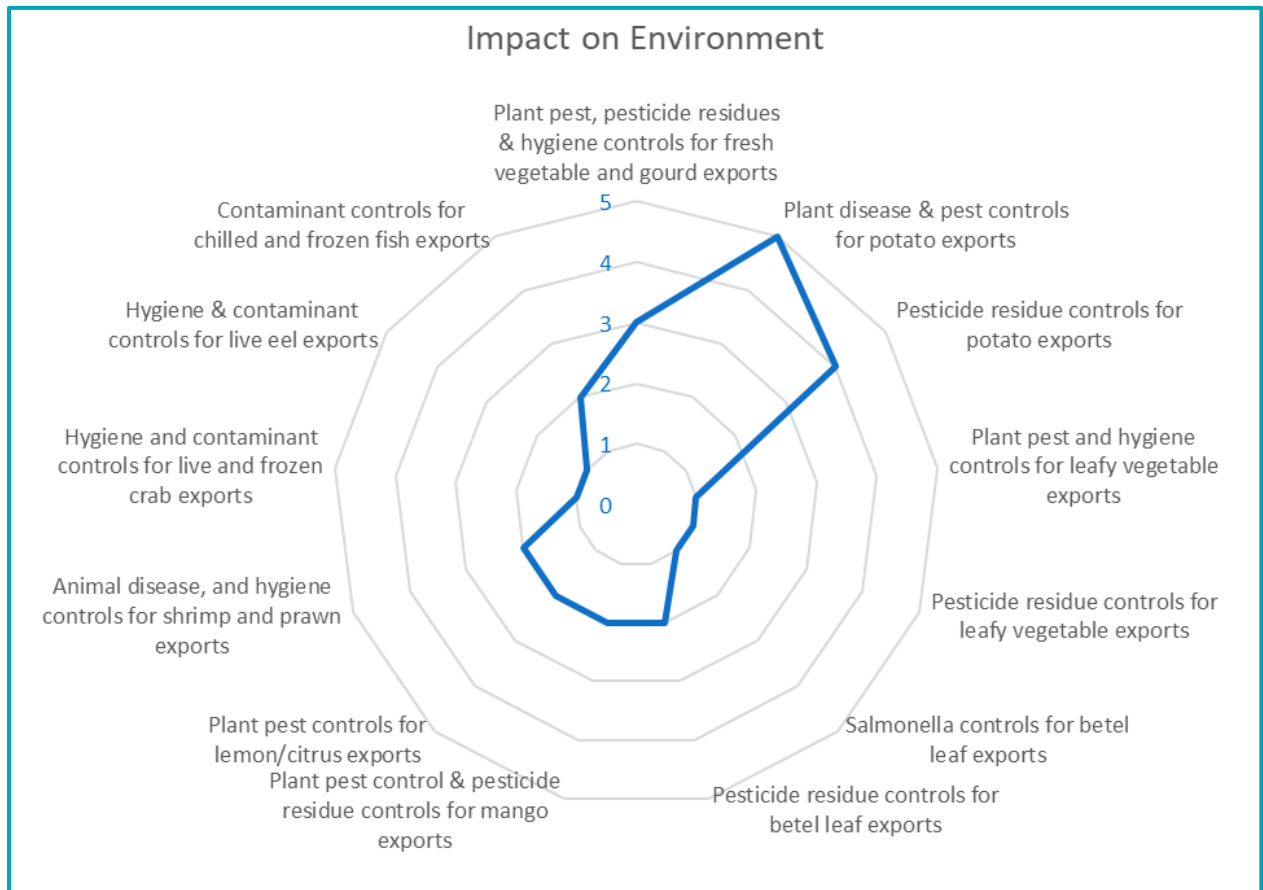
The options are experimented based on Low, medium, and High for the decision criteria of Impact on agricultural productivity. According to the analysis the options *Plant disease & pest controls for potato exports*, *Pesticide residue controls for potato exports*, *hygiene and contaminant controls for live and frozen crab exports* and *Contaminant controls for chilled and frozen fish exports* have high impact on agricultural productivity. On the other hand, the options *Plant pest and hygiene controls for leafy vegetable exports*, *Pesticide residue controls for leafy vegetable exports*, *Salmonella controls for betel leaf exports* and *Pesticide residue controls for betel leaf exports* have low impact on agricultural productivity.

**Figure 32: Decision criteria measures scores for CBOs – Impact on Agricultural Productivity**



The 13 CBOs are evaluated on the decision criteria “Impact on environment” The option *Plant disease & pest controls for potato exports* have the high positive impact on environment. *Plant pest, pesticide residues & hygiene controls for fresh vegetable and gourd exports* & *Pesticide residue controls for potato exports* have medium level impact and for all other options the environmental impact is low.

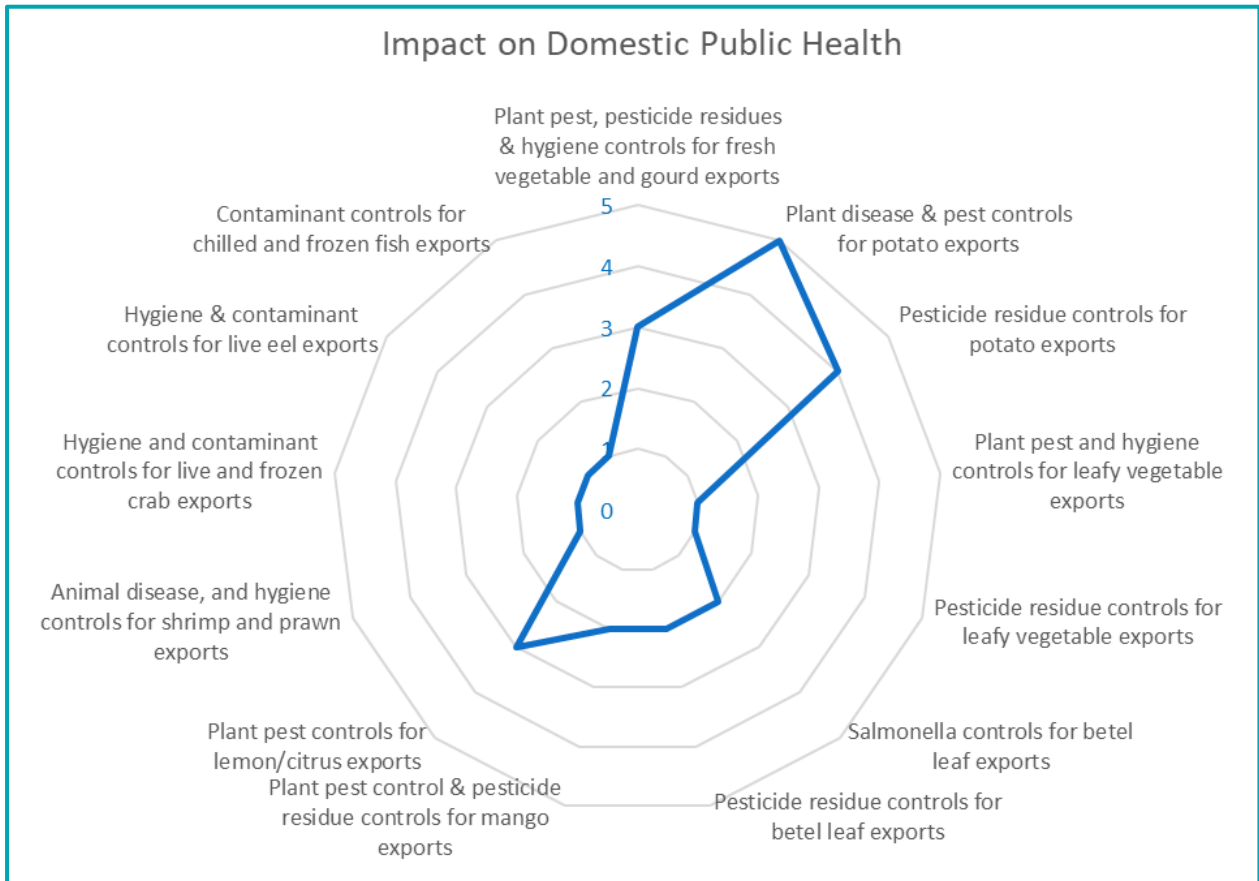
**Figure 33: Decision criteria measures scores for CBOs – Impact on Environment**





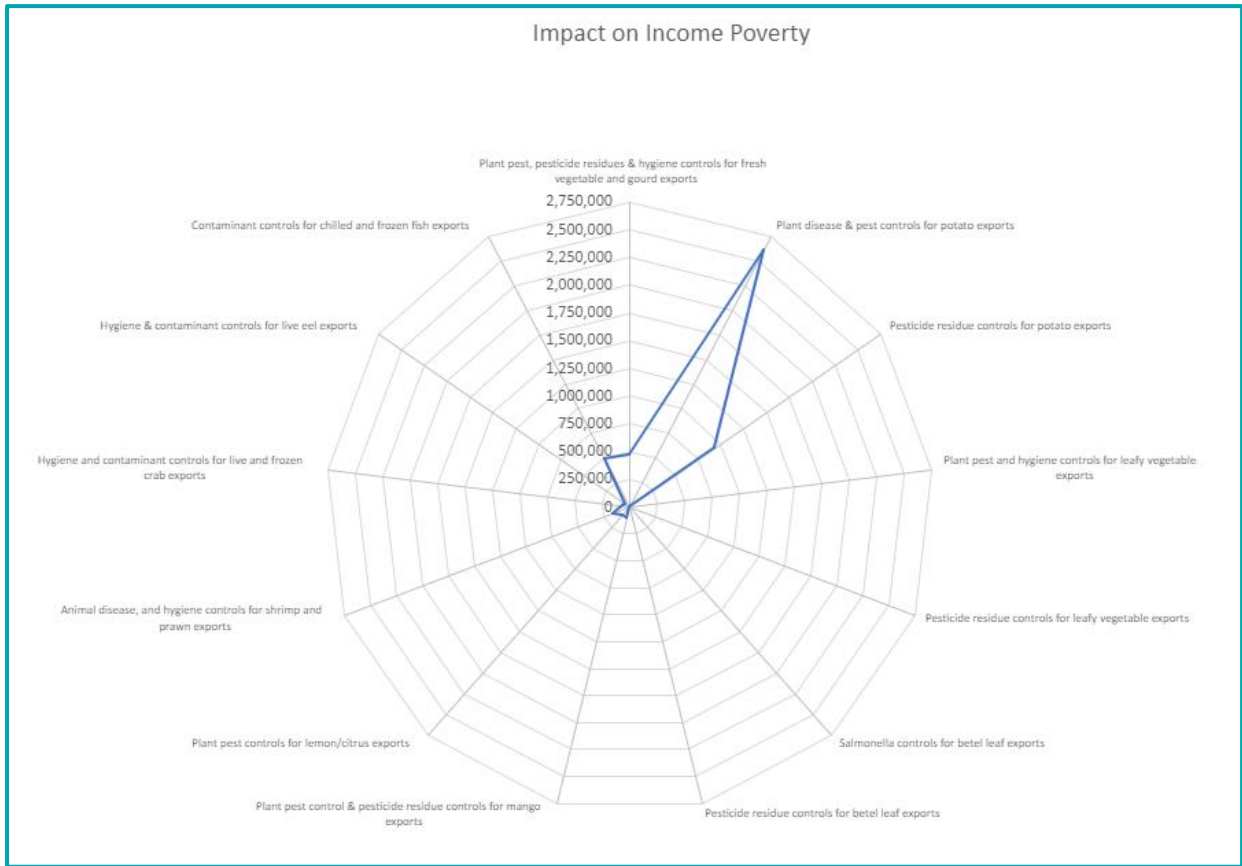
All the capacity building options are assessed based on the decision criteria “Impact on domestic public health” where the measurement indicators are termed as Low, Medium, and High and scaled from 1 to +7. The option *Pesticide residue controls for potato exports* has the high positive impact on domestic public health. The options *Plant pest, pesticide residues & hygiene controls for fresh vegetable and gourd exports*, *Pesticide residue controls for potato exports*, and *Plant pest controls for lemon/citrus exports* are considered to have medium level impact on public health. All other options fall under the categories of low-level impact on public health.

**Figure 34: Decision criteria measures scores for CBOs – Impact on Domestic Public Health**



The decision criteria “Impact on income poverty” is considered of all the capacity building options where the measure of indicators was the number of people impacted. The highest number of people are impacted in the option *Plant disease & pest controls for potato exports*, with more than 26 lakhs people impacted. The options *Contaminant controls for chilled and frozen fish exports* and *Plant pest, pesticide residues & hygiene controls for fresh vegetable and gourd exports* impact the poverty level of more than 4 lakhs people. All other options impact 1 lakh or below the number of people.

**Figure 35: Decision criteria measures scores for CBOs – Impact on Income Poverty**



The decision criteria “Impact on marginalised groups” is also assessed for all the capacity building options. The measurement indicators are termed as Low, Medium, and High and scaled from +1 to +7. The options *Plant disease & pest controls for potato exports* and *Contaminant controls for chilled and frozen fish exports* have high impact on marginalized group and scored 7 and 5 respectively. The maximum options fall under the medium level impact on marginalized group scoring 3 to 4.

Figure 36: Decision criteria measures scores for CBOs – Impact on Marginalised Groups

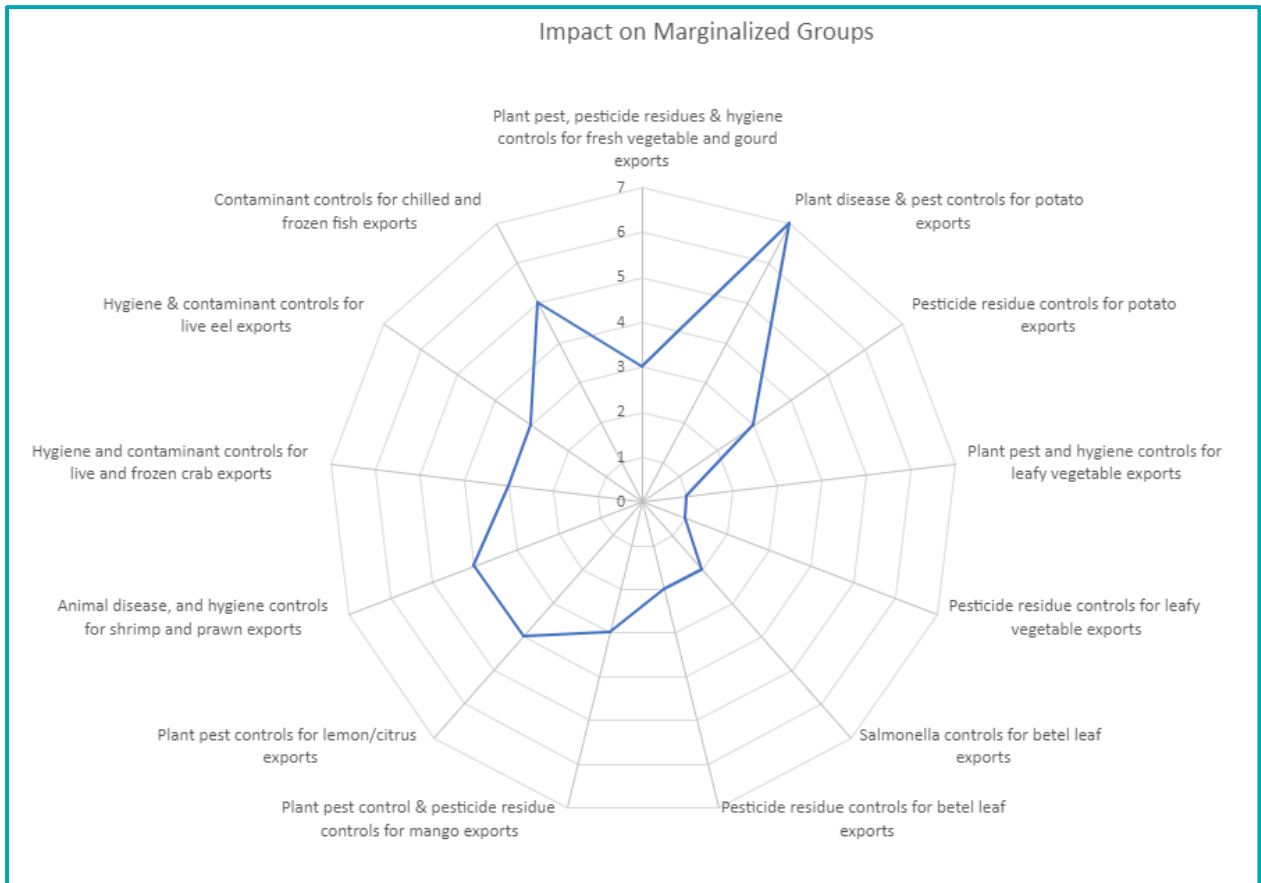
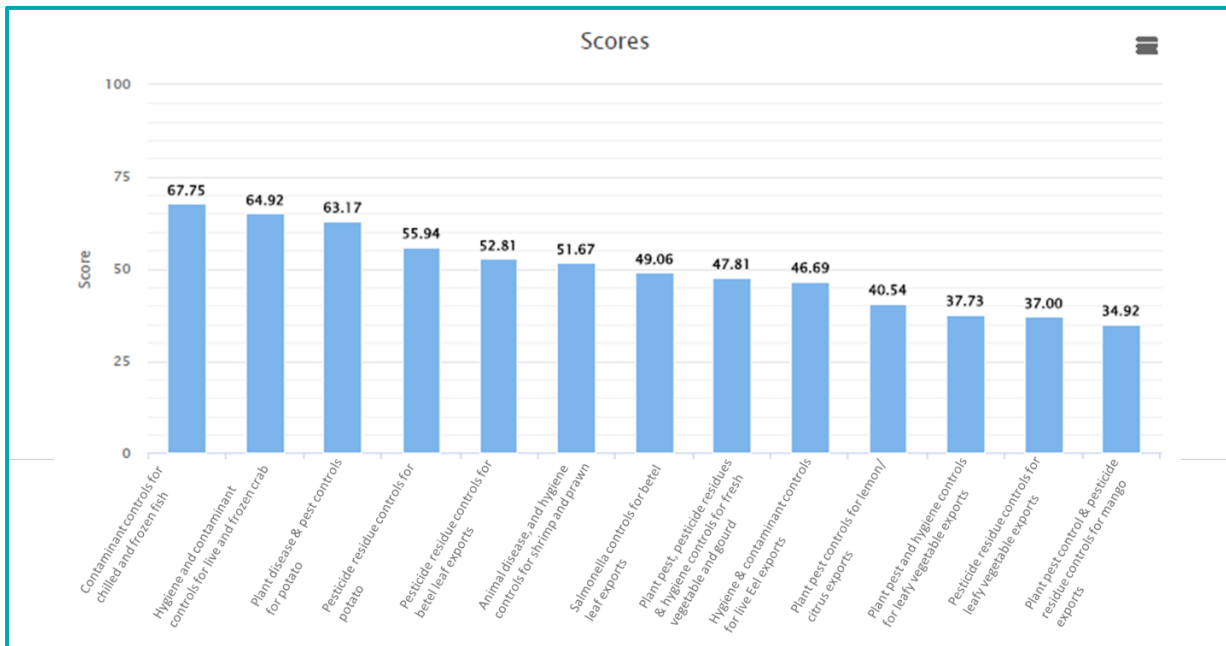


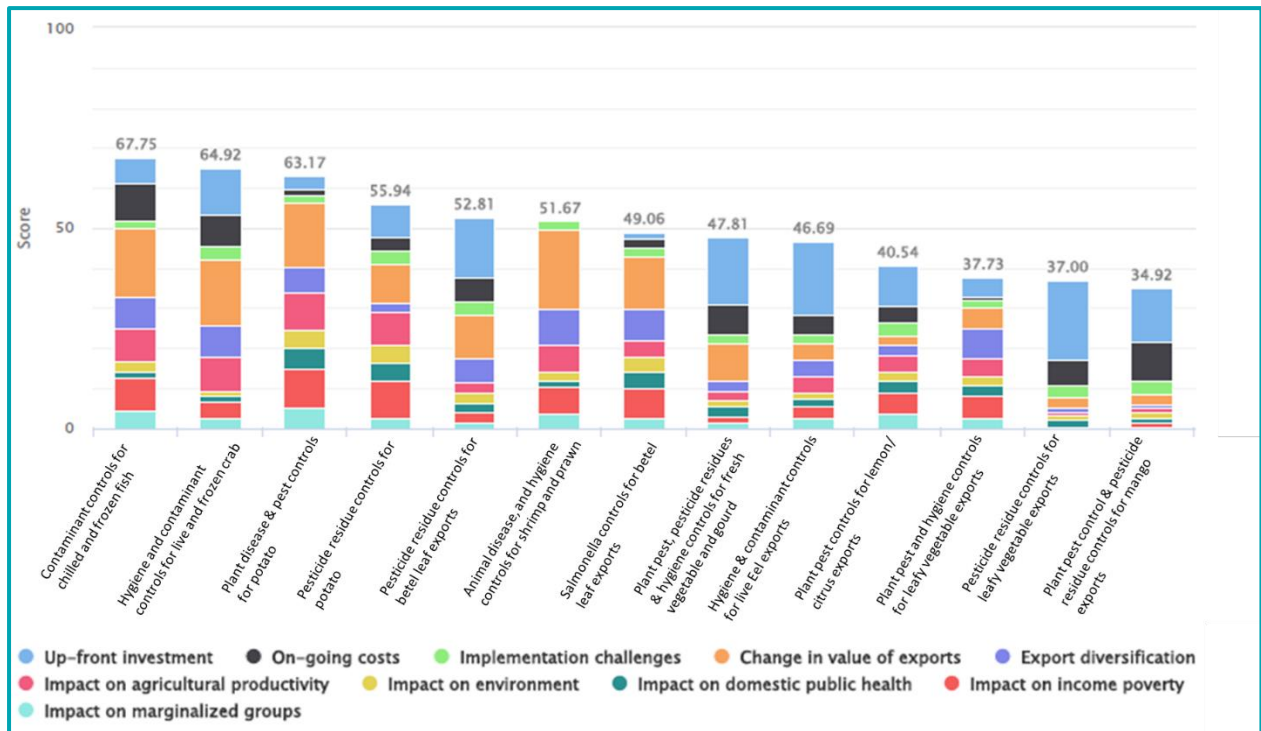
Figure 37 below reports the prioritisation of the 13 CBOs through D-sight software analysis. the prioritisation derived using the decision criteria and weights defined in the stakeholder workshops and consultation. The options are ordered according to decreasing score, and so declining priority. **The option judged to be top priority based on the 10 decision criteria is Contaminant controls for chilled and frozen fish exports.** Other high-ranked top three options are *Hygiene and contaminant controls for live and frozen crab exports*, *Plant disease & pest controls for potato exports*, *Pesticide residue controls for potato exports*.

Figure 37: Prioritization Result



Rank	Alternative	Score
1	<b>Contaminant controls for chilled and frozen fish exports</b>	<b>68</b>
2	Hygiene and contaminant controls for live and frozen crab exports	65
3	Plant disease & pest controls for potato exports	63
4	Pesticide residue controls for potato exports	56
5	Pesticide residue controls for betel leaf exports	53
6	Animal disease, and hygiene controls for shrimp and prawn exports	52
7	Salmonella controls for betel leaf exports	49
8	Plant pest, pesticide residues & hygiene controls for fresh vegetable and gourd exports	48
9	Hygiene & contaminant controls for live Eel exports	47
10	Plant pest controls for lemon/citrus exports	41
11	Plant pest and hygiene controls for leafy vegetable exports	38
12	Pesticide residue controls for leafy vegetable exports	37
13	Plant pest control & Pesticide residue controls for mango exports	35

Figure 38: Criteria contribution



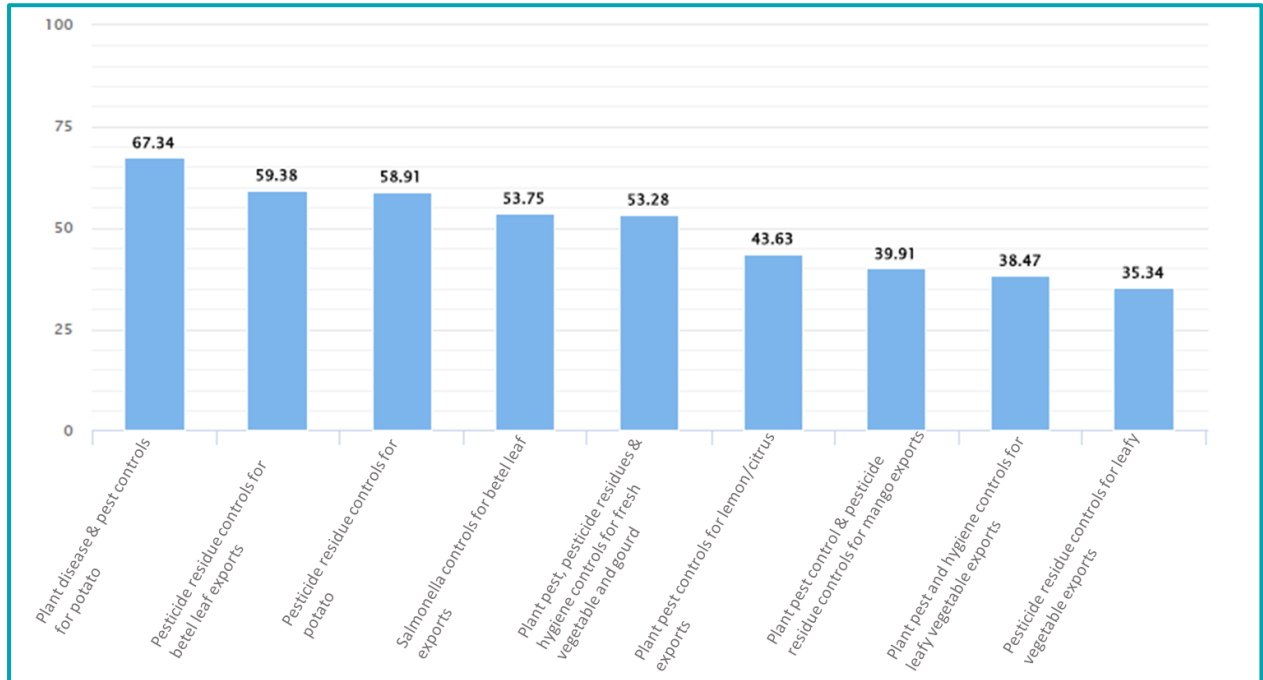
We can see here that the top two options score very highly on the change in exports. The top option also scores high on poverty impact. They do not have the lowest up-front investment or on-going costs but score well on these compared to several of the other options. Overall, they have the highest scores. The third option has some of the lowest up-front investment and on-going costs and has a high export and poverty impact. The fourth option performs well across several of the decision criteria including poverty impact, agricultural productivity, and exports. It has relatively low up-front investment and especially on-going costs. The lowest ranked options either have high upfront-investments and minimal impacts (notably those options ranked 11 and 12) or score relatively low across most of the decision criteria (notably the option ranked 13).

**Sub-sector segregated model:** While the first model presents the combined prioritization results for all the selected horticulture and fisheries products, it might be useful to conduct separate analysis for the two subsectors. Given the huge difference in baseline export value of fisheries products and horticulture products, a combined analysis is expected to heavily favour the fisheries products, compared to the horticulture products. This concern was also raised by participants in the validation workshop, who acknowledged the importance of presenting a combined prioritisation ranking to inform an overall agri-trade decision making. However, given the SPS decisions are often made by stakeholders that are exclusively interested in one of the two subsectors, a separate analysis would also be beneficial for a nuanced understanding of the prioritizations.

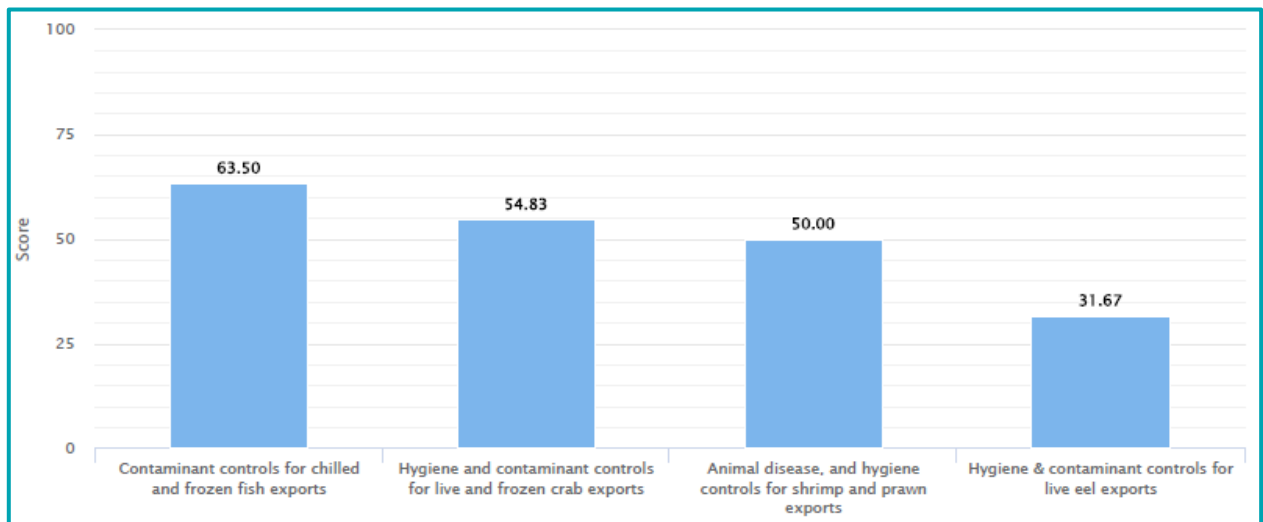
The outcome of the analysis is visualised through figure 38 (Sub-sector segregated prioritization for horticulture) and figure 39 (Sub-sector segregated prioritization for fisheries). The figures show, while the sub-sector segregated prioritization does not differ significantly from the combined model for the fisheries sub-sector, the horticulture sector sees considerable changes in prioritization rankings. For instance, while pesticide residue control for potato was ranked higher than pesticide residue control for betel leaf in the combined model, in this model their relative positions flip. Similarly, while plant pest and pesticide residue controls for mango was found to be the least prioritized CBO in the

combined model, it jumps two steps up for this analysis, placing it at a higher priority than both CBOs related to leafy vegetables, plant pest and hygiene controls, and pesticide residue controls.

**Figure 39: Sub-sector segregated prioritization for horticulture**



**Figure 40: Sub-sector segregated prioritization for fisheries**



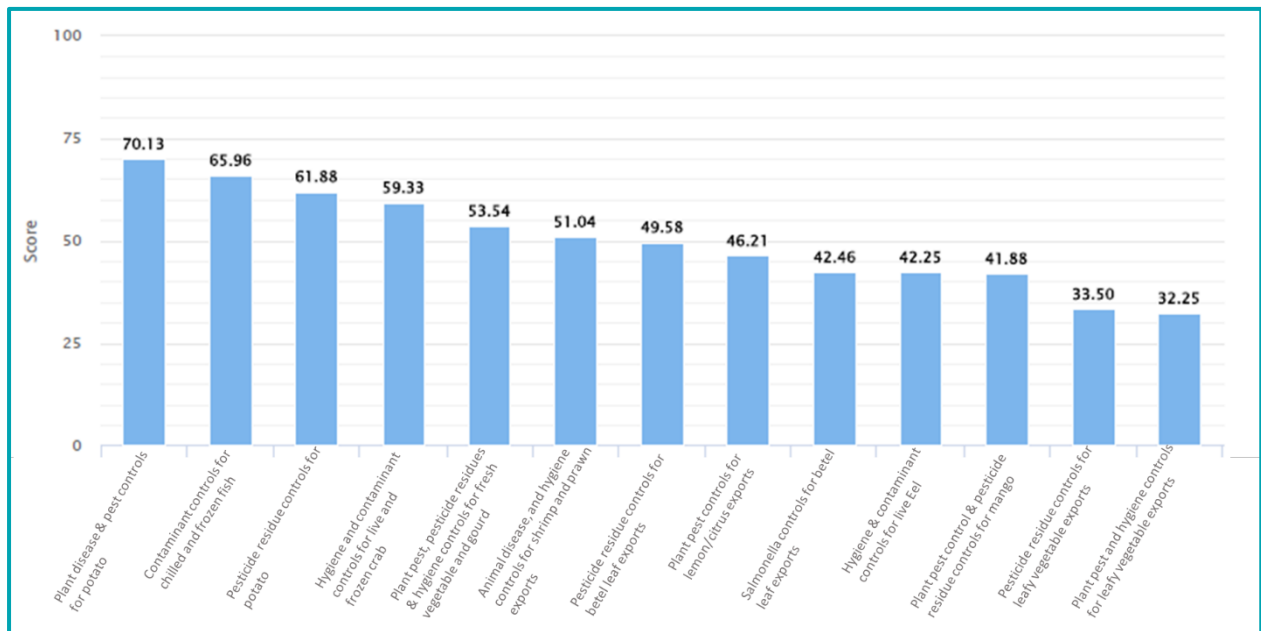
**Equal weights model:** In the Analysis of equal weight model all the decision criteria are weighted equally (10%). After considering the equal weight, the analysis has been run through D sight software for prioritization of the capacity building options. The outcome of the analysis has been shown through figure 41 (Equal weight on Criteria) and figure 42 (Prioritization based on equal weight model). Here the top four options are Plant disease & pest controls for potato exports, Contaminant controls for chilled and frozen fish exports, Pesticide residue controls for potato exports and hygiene and contaminant controls for live and frozen crab exports.

**Figure 41: Equal weight on Criteria**

Criteria Parameters									
Criterion	Type	Maximize / Minimize	Function	Indifference Threshold	Preference Threshold	Weight	Qualitative Scale	Decimals	Unit
Up-front investment	pairwise	minimize	linear	0.0	1.0	10.00%	Numerical	1	
On-going costs	pairwise	minimize	linear	0.0	1.0	10.00%	Numerical	1	
Implementation challenges	pairwise	minimize	level	0.0	1.0	10.00%	Numerical	1	
Change in value of exports	pairwise	maximize	linear	0.0	1.0	10.00%	Numerical	1	
Export diversification	pairwise	maximize	level	0.0	1.0	10.00%	Numerical	1	
Impact on agricultural productivity	pairwise	maximize	level	0.0	1.0	10.00%	Numerical	1	
Impact on environment	pairwise	maximize	level	0.0	1.0	10.00%	Numerical	1	
Impact on domestic public health	pairwise	maximize	level	0.0	1.0	10.00%	Numerical	1	
Impact on income poverty	pairwise	maximize	linear	0.0	1.0	10.00%	Numerical	1	
Impact on marginalized groups	pairwise	maximize	level	0.0	1.0	10.00%	Numerical	1	



**Figure 42: Prioritization based on equal weight model.**



**Table 8: Prioritization based on equal weight model and score.**

Rank	Alternative	Score
1	Plant disease & pest controls for potato exports	70
2	Contaminant controls for chilled and frozen fish exports	66
3	Pesticide residue controls for potato exports	62
4	Hygiene and contaminant controls for live and frozen crab exports	59
5	Plant pest, pesticide residues & hygiene controls for fresh vegetable and gourd exports	54
6	Animal disease, and hygiene controls for shrimp and prawn exports	51
7	Pesticide residue controls for betel leaf exports	50
8	Plant pest controls for lemon/citrus exports	46
9	Salmonella controls for betel leaf exports	42
10	Hygiene & contaminant controls for live Eel exports	42
11	Plant pest control & pesticide residue controls for mango exports	42
12	Pesticide residue controls for leafy vegetable exports	34
13	Plant pest and hygiene controls for leafy vegetable exports	32

Figure 43: Criteria contribution based on equal weight model.

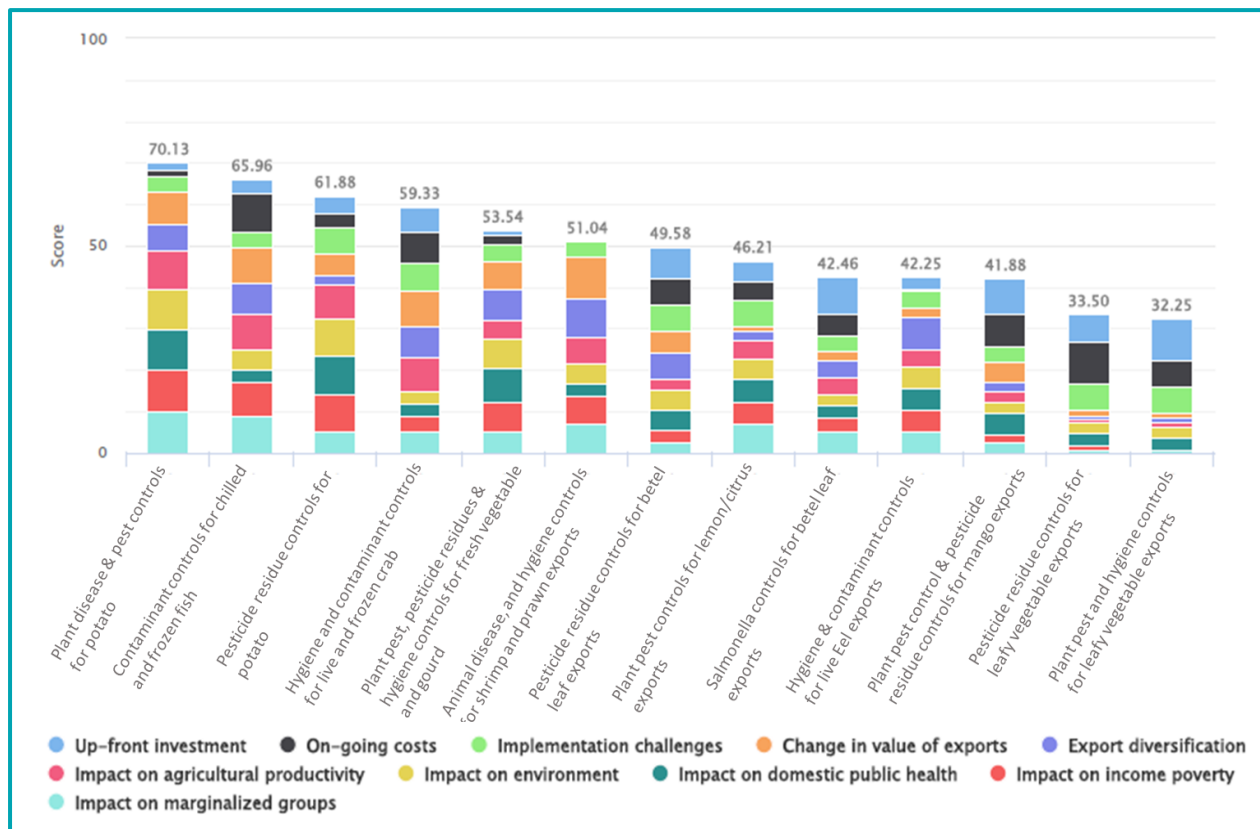


Figure 42 presents the ranking of the 13 capacity-building options with the weight of all the decision criteria equalized. Importantly, although their position relative to one another does change, the same four capacity-building options rank in the top four namely: Contaminant controls for chilled and frozen fish exports (ranked second here and first in the baseline model); hygiene and contaminant controls for live and frozen crab exports (ranked fourth here and second in the baseline model); Plant disease and pest controls for potato exports (ranked first here and third in the baseline model); and Pesticide residue controls for potato exports (ranked third here and fourth in the baseline model). This indicates that the ranking of these four options as the top priority is robust.

So far, the core results of the analysis have been presented. These are based on the decision criteria and weights derived from the stakeholder workshops and working group meetings, and as such they arguably represent the most valid prioritisation. It is important to recognise, however, that different stakeholder groups might have distinct perspectives on the criteria that should drive the prioritisation of the CBOs and/or the weights that should be assigned to criteria. Such differences can lead to conflict in decision-making processes, such that it is important to ascertain where distinct perspectives on the decision criteria have an appreciable impact on the prioritisation and where they do not. In cases where prioritisation is insensitive to changes in the decision criteria, it should be relatively easy to come to collective agreement on which options should be prioritised. Where changes to the decision criteria have appreciable impacts on the prioritisation it may be necessary to enter a more extensive process of consultation or to explore the reasons why different stakeholder groups put weight on criteria.

## 6. Conclusion

## 6. Conclusion

This report has presented the initial results of a priority-setting exercise for SPS capacity-building in Bangladesh. The priorities were defined using a prioritisation framework based on MCDA, which provides a structured and transparent approach to ranking capacity-building options based on predefined and agreed decision criteria. The options to be considered were identified through a process of stakeholder consultation that was informed by a review of prior assessments of SPS capacity. A total of thirteen (13) distinct SPS capacity-building options are identified which are judged to be substantive SPS issues.

These thirteen (13) capacity-building options are prioritised based on a series of ten (10) decision criteria to which weights are applied. These criteria and weights are again derived through the stakeholder workshop and working group meetings established in the framework of the project. These criteria cover the upfront and on-going costs, Challenges faced in implementation, change in value of exports, Diversification of exports, Agricultural productivity, Impact on Environmental protection, Impact on domestic public health, Level of poverty and impacts on other marginalised groups.

The result of the application of the MCDA framework is a clear ranking of the thirteen (13) capacity-building options that are identified, which is apparently robust to changes in the decision criteria that are applied and to the weights attached to these criteria. Thus, of the thirteen (13) options in the analysis the following four (4) are consistently ranked as high priority:

- Contaminant controls for chilled and frozen fish exports
- Hygiene and contaminant controls for live and frozen crab exports
- Plant disease & pest controls for potato exports
- Pesticide residue controls for potato exports

Conversely, Plant pest and hygiene controls for leafy vegetable exports, Pesticide residue controls for leafy vegetable exports and Plant pest control & Pesticide residue controls for mango exports ranked bottom of the thirteen (13) options under consideration.

Given the robustness of the results, the ranking provided by the MCDA framework provides a coherent basis on which to define a national action plan for SPS capacity-building in Bangladesh, and to support efforts to secure the necessary resources, both nationally and internationally. However, importantly, the results presented above should be only the starting point in the use of MCDA to prioritise SPS capacity-building options in the country. Thus, these results should be revisited and revised on an on-going basis in the light of improvements in the availability and/or quality of data, changes in policy priorities that imply shifts in the decision weights and/or the introduction of new decision criteria. If new capacity-building needs arise, these need to be added to the analysis. Conversely, as investments are made in the options included above, these need to be excluded and the priorities re-estimated.

It is possible that some stakeholders will be concerned about the prioritisation of the thirteen (13) capacity-building options; they may feel that a particular option has been treated harshly, or that too much weight has been attached to a particular criterion. They might also be concerned about some of the estimates in the information sheets. The rankings are based on the results of the stakeholder consultation process and the collection and collation of data directed at the compilation of the

information sheets. It is almost always possible to improve on this process, for example by encompassing the perspectives of a larger number and wider range of stakeholders. It is important to recognize that a key function of the MCDA analysis is to facilitate debate over the prioritisation of the capacity-building options; the output of the framework should not be seen as ‘final’ but instead the basis on which differences in opinion can be explored and consensus over which options should be given priority is moved towards. Thus, if a particular group of stakeholders is unhappy about the results of the prioritisation, they should be invited to present new data that can be used to revise the information sheets. Such changes can then be employed, and the model re-estimated accordingly.

Following this trial application, we would love to see Bangladesh employing the MCDA framework on a routine basis for the planning of SPS capacity-building. Towards this end, there is a need to put in place systems for the effective capture of the data needed to populate and update the information sheets, and to enable these data to be validated. These will require that fruitful linkages are established with private sector and other stakeholders, and across those involved in various SPS and trade functions within the government.

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## 8. List of Annexes

**8.1 Annex 1: Rank-wise Capacity Building Options (CBOs)**

**8.2 Annex 2: CBO Information Cards**

**8.3 Annex 3: Field Validation of data and information for P-IMA Bangladesh**



## Annex 1: Ranked Capacity Building Options (CBOs) based on baseline analysis

Rank	CBOs	Upfront Investment (in USD)	Ongoing Cost (in USD)	Total Cost (in USD)
1	Contaminant controls for chilled and frozen fish exports	309,090	79,090	388,180
2	Hygiene and contaminant controls for live and frozen crab exports	189,091	81,818	270,909
3	Plant disease & pest controls for potato exports	378,181	111,818	489,999
4	Pesticide residue controls for potato exports	219,090	100,000	319,090
5	Pesticide residue controls for betel leaf exports	162,727	84,545	247,272
6	Animal disease, and hygiene controls for shrimp and prawn exports	472,727	240,909	713,636
7	Salmonella controls for betel leaf exports	159,090	81,818	240,908
8	Plant pest, pesticide residues & hygiene controls for fresh vegetable and gourd exports	383,818	104,545	488,363
9	Hygiene & contaminant controls for live Eel exports	154,545	95,454.54	250,000
10	Plant pest controls for lemon/citrus exports	200,000	95,454	295,454
11	Plant pest and hygiene controls for leafy vegetable exports	143,636	84,545	228,181
12	Pesticide residue controls for leafy vegetable exports	189,090	76,363	265,453
13	Plant pest control & Pesticide residue controls for mango exports	358,181	112,727	470,908
<b>Total cost (in USD)</b>		<b>3,319,266</b>	<b>1,349,087</b>	<b>4,668,353</b>

## Annex 2: CBO Information Cards

Option 1: Plant pest, pesticide residues & hygiene controls for fresh vegetable and gourd exports				
Decision Criterion	Value	Details	Measurement	Confidence in Estimate
<b>Cost and Challenges in Implementation</b>				
Up-front investment	USD 383,818	The area of cultivation is considered about 18825 Hectares, where production is about 432878 MT and export volume is about 1185 MT required for absolute change in export value. The upfront expenditure is related to the purchase of trap, stick and related accessories, pesticides (Chemical & Bio-pesticides), developing traceability book manual and digital solution, buying of HACCP practices materials for Field level to packaging, procuring laboratory upgradation machinery & accreditation, procuring of the column of HPLC's & GCMS, blixer machine, developing of cool chain management, conducting study on bio efficacy test, , and residue decline.	Monetary cost	High
On-going cost	USD 104,545	Considering one (1) Annual crop year for recurring expenditure of maintenance & service of Pheromone Trap, stick and related accessories, Additional expenses for HACCP practices materials, necessary chemical for testing, sample collection, Carrying and labour charges for setting, capacity building of the manpower for maintaining traceability and records and conducting training to relevant stakeholders.	Monetary cost	High
Challenges faced in implementation	+3	Challenges are related to capacity building of relevant stakeholders for ensuring pest free area or low pest prevalence and cost of materials needed for conducting the activities.	Low (1-2), Medium (3,4), High (5,6,7)	Medium
<b>Trade Impacts</b>				
Change in value of exports	USD 3,748,600	According to the Export promotion Bureau (EPB), Bangladesh exported vegetables to the world on average about USD 127.54 MILLION for the last three fiscal year (2019-2022). On the other hand, according to ITC Trade Map Bangladesh exported Vegetables and gourds on average to the following countries: EU (USD 5.22 MILLION), UK (USD 3.76 MILLION) and Middle east (USD 3.51 MILLION) for the last three years (2020-2022). So, the average total export value of vegetables in the EU, the USA and Middle east is about USD 12.49 MILLION. It's expected that the total export value in the mentioned countries may increase by 30 % after solving the problems. <b>The probable change in value of exports = (USD 12.49 * 30%) = USD 3.747 MILLION</b>	Monetary cost	High
Diversification of exports	+5	After solving this problem, the export will diversify to different markets because building trust is important in international market.	Low (1-2), Medium (3,4), High (5,6,7)	High

### Domestic spillovers

Agricultural productivity	+3	According to the DAE Statistics (2021-2022), The total Production of vegetable and gourd was 14,727,990 MT. According to the change in Value of export, the production needs to be considered about 432879 MT, i.e., roughly 2.93 % increment to the total production.	Low (1-2), Medium (3,4), High (5,6,7)	medium
Impact on Environmental protection	+3	Less use of chemical pesticides in the farming system will impact positively to the environment.	Low (1-2), Medium (3,4), High (5,6,7)	Medium
Impact on domestic public health	+3	Reduction of indiscriminate use of chemical pesticides, increased use of bio-pesticide, using traps in the field level and ensuring training to the relevant stakeholders on hygiene practice will enhance domestic public health.	Low (1-2), Medium (3,4), High (5,6,7)	Medium

#### Social impacts

Level of poverty	476,135	<p>According to the DAE, the total cultivation area of Vegetables and gourd is about 640501 Hectares where roughly 16.2 MILLION people are directly or indirectly involved in producing different kinds of vegetables in Bangladesh.</p> <p>According to the Change in value of exports, the area of cultivation (Hectares) needed to be considered about 18825 hectares, where approximately 476,135 people will be positively impacted.</p>	Number of people impacted	High
Impacts on other marginalised groups.	+3	According to the Change in value of exports, the area of cultivation (Hectares) needed to be considered about 18825 hectares, where approximately 29,391 Women will be positively benefitted.	Low (1-2), Medium (3,4), High (5,6,7)	Medium

**Option 1: Estimated up-front investment (Plant pest, pesticide residues & hygiene controls for fresh vegetable and gourd exports to the EU, UK & Middle)**

Items	Estimated Cost (BDT)
Purchase of pheromone trap	1220000
Buying of culture for male	1200000
Buying culture for female	1000000
Purchase of stick and related accessories	1200000
Paying for carrying and labour charges for setting (lumpsum)	300000
Capacity building of the manpower on trap and culture	6000000
Buying pesticides (chemical & bio-pesticides) for the laboratory	1500000
Developing book manual and digital solution for traceability	3000000
Purchasing HACCP practices materials for field level to packaging	6500000
Procuring laboratory upgradation machinery & accreditation process	8500000
Procuring of the column of HPLC's & GCMS	1300000
Buying blixer machine (4 Liters) (Grinders)	4000000
Developing cool chain management system while transporting from field to packhouse	4000000
Conducting residue decline study & bio efficacy test	2500000
<b>Total Expenditure (BDT)</b>	<b>42,220,000 (BDT)</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>383,818 (USD)</b>

**Option 1: Estimated on-going costs (Plant pest, pesticide residues & hygiene controls for fresh vegetable and gourd exports to the EU, UK & Middle)**

Items	Estimated Cost (BDT)
Maintenance, service and replace of pheromone trap	1300000
Maintenance, service and replace of culture for male	600000
service and replace of culture for female	600000
Expenses of additional stick and related accessories	400000
Additional labour charges for carrying, service and replace for extra trap and culture.	300000
Additional expenses of pesticides (Chemical & Bio-pesticides) for recurring tests	600000
Data collection for traceability	1500000
Additional purchase of HACCP practices materials for Field level to packaging	2500000
Additional expenses of chemicals for lab testing	800000
Sample collection	300000
Equipment calibration	700000
Servicing or replacing of the column of HPLC's & GCMS	400000
Capacity building of the manpower for maintaining traceability, records and analysing the test and sample collection procedure	1500000
<b>Total Expenditure (BDT)</b>	<b>11,500,000 (BDT)</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>104,545 (USD)</b>

### Option 2: Plant disease & pest controls for potato exports

Decision Criterion	Value	Details	Measurement	Confidence in Estimate
<b>Cost and Challenges in Implementation</b>				
Up-front investment	USD 378,181	The area of cultivation is considered about 66,065 Hectares, where production is about 1,615,992 MT and export volume is about 7937 MT required for absolute change in export value. The upfront expenditure is related to the purchase of machinery for Upgradation of laboratory, necessary chemicals & reagents for labs, tarpaulin, pesticides (methomyl, indoxacarb, diazinin, carbaryl), neem oil/extraction, mask/protective materials for spraying, expenses of developing survey team & collecting of sample, carrying and labour charges for spraying & display, conducting necessary studies and capacity building trainings.	Monetary cost	High
On-going cost	USD 111,818	Considering one (1) annual crop year for recurring expenditure of conducting time to time survey, and impact assessment, maintenance and servicing of laboratory machinery, expenses for additional lab accessories, additional expenses for laboratory testing, additional expenses for necessary chemicals, reagents, pesticides, mask/protective materials conducting time to time Inspection activities and further capacity building activities.	Monetary cost	High
Challenges faced in implementation	+3	Challenges are related to capacity building of relevant stakeholders for ensuring pest free area or low pest prevalence and cost of materials needed for conducting the activities.	Low (1-2), Medium (3,4), High (5,6,7)	Medium
<b>Trade Impacts</b>				
Change in value of exports	USD 4,800,000	According to the EPB, Bangladesh exported on average about USD 33.86 MILLION for the last three years (2019-20 to 2021-22). Currently, Bangladesh has no export of potatoes to Russia and Indonesia in current years. According to BPA (Bangladesh potato association) statistics, in 2014 - 2015 the export value was USD 16 MILLION. After that the export was restricted. It's expected that the export may resume to at least 30% of the previous export value to these countries after solving the problems. <b>The probable change in value of exports = (USD 16 * 30%) = USD 4.8 MILLION</b>	Monetary cost	High
Diversification of exports	+4	After solving this problem, the export will diversify to different markets because building trust is important in international market.	Low (1-2), Medium (3,4), High (5,6,7)	Medium
<b>Domestic spillovers</b>				
Agricultural productivity	+6	According to the DAE Statistics (2021-2022), The total Production of Potatoes was 11,401,726 MT. According to the change in value of export the production may increase 1,615,992 MT i.e., roughly 4.99 % of the total production.	Low (1-2), Medium (3,4), High (5,6,7)	High
Impact on Environmental protection	+5	Less use of chemical pesticides in the farming system will impact positively to the environment.	Low (1-2), Medium (3,4), High (5,6,7)	High

Impact on domestic public health	+5	Reduction of indiscriminate use of chemical pesticides, increased use of bio-pesticide, and ensuring training to the relevant stakeholders on hygiene practice will enhance domestic public health.	Low (1-2), Medium (3,4), High (5,6,7)	High
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#### Social impacts

Level of poverty	2,612,116	According to BBS, the total cultivation area of Potato is about 466127 Hectares where roughly 18.43 MILLION people are directly or indirectly involved in producing Potatoes in Bangladesh.  According to the Change in value of exports, the area of cultivation (Hectares) needed to be considered about 66065 hectares, where approximately 2,612,116 people will be positively impacted.	Number of people impacted	High
Impacts on other marginalised groups.	+7	According to BBS, the total cultivation area of Potato is about 466127 Hectares where roughly 18.43 MILLION people are directly or indirectly involved in producing Potatoes in Bangladesh where the women workforce is about 18% i.e., 3317253 women and marginalized group of people are directly or indirectly involved. But in this scenario, the area of cultivation (Hectares) needed to be considered about 66065 hectares, where approximately 470,160 women and marginalized group of people will be positively impacted.	Low (1-2), Medium (3,4), High (5,6,7)	High

### Option 2: Estimated up-front investment (Plant disease & pest controls for potato exports to Russia and Indonesia)

Items	Estimated Cost (BDT)
Procuring machinery for Upgradation of laboratory	6800000
Expenses incurred for the survey Team & collecting of sample	2000000
Enhancing the laboratory testing services	1500000
Buying of necessary chemicals & reagents	1500000
Buying of necessary lab accessories	1000000
Expenses for conducting Inspection related activities	1000000
Buying of tarpaulin (24X18 feet)	15000000
Buying of pesticides (methomyl, indoxacarb, diazinin, carbaryl)	1500000
Buying of neem oil/extraction	1500000
Procuring of mask/protective materials for spraying	1500000
Expenses for carrying and labour charges for spraying & display	800000
Capacity building of the manpower (Farmers, exporters, officials etc.) for maintaining traceability and records	5000000
Conducting necessary studies. (Data collection and research)	2000000
Miscellaneous Cost	500000
<b>Total Expenditure (BDT)</b>	<b>41,600,000 (BDT)</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>378,181 (USD)</b>



## Option 2: Estimated up-front investment (Plant disease & pest controls for potato exports to Russia and Indonesia)

Items	Estimated Cost (BDT)
Conducting time to time survey & sample collection	1800000
Further capacity building activities for laboratory testing and inspection	2000000
Additional expenses for further laboratory testing (soil, seed, irrigation, water, surrounding solaneous crops) etc.	1000000
Buying additional chemicals & reagents	500000
Expenses for equipment calibration	500000
Purchasing additional pesticides	1000000
Buying other required lab accessories	500000
Time to time inspection activities	1000000
Buying additional pesticides (methomyl, indoxacarb, diazinin, carbaryl)	1000000
Buying additional neem oil/extraction	500000
Procuring further mask/protective materials for spraying	500000
Additional expenses for carrying and labour charges for spraying & display	500000
Expenses for time-to-time impact analysis	1000000
Miscellaneous cost	500000
<b>Total Expenditure (BDT)</b>	<b>12,300,000 (BDT)</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>111,818 (USD)</b>

### Option 3: Pesticide residue controls for potato exports

Decision Criterion	Value	Details	Measurement	Confidence in Estimate
<b>Cost and Challenges in Implementation</b>				
Up-front investment	USD 219,090	The area of cultivation is considered about 23,728 Hectares, where production is about 580,410 MT and export volume is about 2850 MT required for absolute change in export value. The upfront expenditure is related to procuring machinery for MRLs (Maximum Residue Level) testing in laboratories. (The expenses are for purchasing of the Column of HPLC's, GCMS, reagents, media, conducting the training to make skilled manpower for analysing the test and sample collection procedure, implementing the process of laboratory accreditation, conducting the studies on pesticide residue decline and bio-efficacy test etc.)	Monetary cost	High
On-going cost	USD 100,000	Considering one (1) annual crop year for recurring expenditure for maintenance and servicing of the column of HPLC's & GCMS, equipment calibration, buying additional chemicals & reagents for conducting test, HACCP, hygiene, and sanitation materials for the laboratory, time to time sample collection and impact assessment and, further training of manpower for laboratory & field.	Monetary cost	High
Challenges faced in implementation	+2	Challenges are related to lack of skilled manpower for sampling procedure and MRL analysis	Low (1-2), Medium (3,4), High (5,6,7)	Low
<b>Trade Impacts</b>				
Change in value of exports	USD 1,724,000	According to the EPB, Bangladesh exported on average about USD 33.86 MILLION for the last three years (2019-20 to 2021-22). According to ITC Trade Map Bangladesh has exported potatoes to Malaysia on average for the last three years (2020-2022) is about USD 8.62 MILLION. It's expected that the export may increase to at least 20% of export value to Malaysia after solving the problems. <b>The probable change in value of exports = (USD 8.62 * 20%) = USD 1.72 MILLION</b>	Monetary cost	High
Diversification of exports	+2	The testing capacities of MRLs will help to maintain the standards of different countries that will diversify the export markets.	Low (1-2), Medium (3,4), High (5,6,7)	Low
<b>Domestic spillovers</b>				
Agricultural productivity	+5	According to the DAE Statistics (2021-2022), The total Production of Potatoes was 11,401,726 MT. According to the change in value of export the production may increase 580,410 MT i.e., roughly 5 % of the total production.	Low (1-2), Medium (3,4), High (5,6,7)	High
Impact on Environmental protection	+4	Less use of chemical pesticides in the farming system will impact positively to the environment.	Low (1-2), Medium (3,4), High (5,6,7)	Medium
Impact on domestic public health	+4	Reduction of indiscriminate use of chemical pesticides, increased use of bio-pesticide, and ensuring training to the relevant	Low (1-2), Medium (3,4), High (5,6,7)	Medium

		stakeholders on Pesticide residue controls will enhance domestic public health.		
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### Social impacts

Level of poverty	938,188	According to BBS, the total cultivation area of Potato is about 466127 Hectares where roughly 18.43 MILLION people are directly or indirectly involved in producing Potatoes in Bangladesh.  According to the Change in value of exports, the area of cultivation (Hectares) needed to be considered about 23728 hectares, where approximately 938,188 people will be positively impacted.	Number of people impacted	Medium
Impacts on other marginalised groups	+3	According to BBS, the total cultivation area of Potato is about 466127 Hectares where roughly 18.43 MILLION people are directly or indirectly involved in producing Potatoes in Bangladesh where the women workforce is about 18% i.e., 3317253 women and marginalized group of people are directly or indirectly involved. According to the Change in value of exports, the area of cultivation (Hectares) needed to be considered about 23728 hectares, where approximately 168,863 women and marginalised group of people will be positively impacted.	Low (1-2), Medium (3,4), High (5,6,7)	Medium

### Option 3: Estimated up-front investment (Pesticide residue controls for potato exports to Malaysia)

Items	Estimated Cost
Procuring machinery for upgradation of laboratory	2500000
Procuring of the column of HPLC's & GCMS	8000000
Buying of necessary chemicals & reagents	2500000
Procuring of HACCP, hygiene, and sanitation materials	500000
Expenses related for sample collection	1000000
Procurement of sample materials	5000000
Conducting the training to make skilled manpower for analysing the test and sample collection procedure	1500000
Expenses on implementing the process of laboratory accreditation & processing report	2500000
Buying of blixer machine (4/1 litters)	600000
Expenses on others lab required Accessories	1000000
Miscellaneous cost	1000000
<b>Total Expenditure (BDT)</b>	<b>24,100,000</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>219,090.90</b>

### Option 3: Estimated ongoing costs (Pesticide residue controls for potato exports to Malaysia)

Items	Estimated Cost
Maintenance and servicing of HPLC's & GCMS	2000000
Additional buying of chemicals & reagents for conducting test	1000000
Further expenses for buying additional HACCP, hygiene, and sanitation materials.	500000
Further expenses on time-to-time sample collection	1000000
Further expenses for training of manpower for laboratory & field level	1500000
Equipment calibration	500000
Time to time conducting studies and impact assessment	2500000
Others required expenses on lab accessories	1000000
Miscellaneous cost	1000000
<b>Total Expenditure (BDT)</b>	<b>11,000,000</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>100,000</b>

### Option 4: Plant pest and hygiene controls for leafy vegetable exports

Decision Criterion	Value	Details	Measurement	Confidence in Estimate
<b>Cost and Challenges in Implementation</b>				
Up-front investment	USD 143,636	The area of cultivation is considered about 13 Hectares, where production is about 281 MT and export volume is about 0.048 MT required for absolute change in export value. The upfront expenditure is related to purchasing necessary HACCP practices materials for packhouse, field level to packaging, conducting capacity building trainings for the farmers, exporters, officials for maintaining traceability and records, buying required chemicals, developing cool chain management system and purchasing necessary laboratory testing accessories for contaminants and others	Monetary cost	High
On-going cost	USD 84,545	Recurring expenditure for one (1) annual crop year for maintaining pest free area for leafy vegetables. The expenses are related to further buying additional HACCP practices materials for Packhouse, field level to packaging, capacity building of the farmers, exporters, officials for maintaining traceability and records, additional purchases of required chemicals for the labs.	Monetary cost	High
Challenges faced in implementation	+2	Challenges are related to lack of competency of the relevant stakeholders in relation to establishing pest free area and HACCP practices.	Low (1-2), Medium (3,4), High (5,6,7)	Low
<b>Trade Impacts</b>				
Change in value of exports	USD 6000	According to ITC Trade Map Bangladesh exported leafy Vegetables on average to the following countries: EU (USD 0.01 MILLION), UK (USD 0.01 MILLION) and USA (No export) for the last three years (2020-2022). So, the average total export value of vegetables in the EU, UK and USA is about USD 0.02 MILLION. It's expected that the total export value in the mentioned countries may increase by 30 % after solving the problems. <b>The probable change in value of exports = (USD 0.02*30%) = USD 0.006 MILLION</b>	Monetary cost	Low
Diversification of exports	+1	It is presumed that the export market for leafy vegetable may diversify after solving this problem.	Low (1-2), Medium (3,4), High (5,6,7)	Low
<b>Domestic spillovers</b>				
Agricultural productivity	+1	According to the change in Value of export, the production needs to be considered about 281 MT more.	Low (1-2), Medium (3,4), High (5,6,7)	Low
Impact on Environmental protection	+1	Less use of chemical pesticides in the farming system will impact positively to the environment.	Low (1-2), Medium (3,4), High (5,6,7))	Low
Impact on domestic public health	+1	Practicing hygiene and HACCP as well as following GAP, there will be no hazards for human health that will positively enhance the domestic public health.	Low (1-2), Medium (3,4), High (5,6,7)	Low

### Social impacts

Level of poverty	309	According to the DAE, the total production of Vegetables and gourd is about 14727990 MT. There is no separate data on how many people are involved for producing leafy vegetables only. But roughly 16.2 MILLION people are directly or indirectly involved in producing different kinds of vegetables in Bangladesh. According to the change of value of export we are considering the production of leafy vegetables is about 281 MT. So, considering this amount of production about 309 people are involved.	Number of people impacted	Low
Impacts on other marginalised groups.	+1	According to the change of value of export we are considering the production of leafy vegetables is about 281 MT. So, considering this amount of production about 154 women and marginalized people are involved.	Low (1-2), Medium (3,4), High (5,6,7)	Low

#### Option 4: Estimated up-front investment (Plant pest and hygiene controls for leafy vegetable exports to the EU, UK & USA)

Items	Estimated Cost (BDT)
HACCP practices materials for Packhouse, Field level to packaging	800000
Capacity building of the farmers, exporters, officials for maintaining traceability and records (considering 500 persons)	4000000
Chemicals	1000000
Cool chain management	8000000
Laboratory test for contaminates and others	1000000
Miscellaneous & other cost	1000000
<b>Total Expenditure (BDT)</b>	<b>15,800,000 (BDT)</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>143,636 (USD)</b>

#### Option 4: Estimated ongoing costs (Plant pest and hygiene controls for leafy vegetable exports to the EU, UK & USA)

Items	Estimated Cost (BDT)
HACCP practices materials for Field level to packaging	2000000
Capacity building of the manpower (Farmers, exporters, officials etc.) for maintaining traceability and records	2000000
Chemicals	800000
Cool chain Management	3000000
Laboratory test for Contaminates and Others	1000000
Miscellaneous & other cost	500000
<b>Total Expenditure (BDT)</b>	<b>9,300,000</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>84,545</b>

### Option 5: Pesticide residue controls for leafy vegetable exports

Decision Criterion	Value	Details	Measurement	Confidence in Estimate
<b>Cost and Challenges in Implementation</b>				
Up-front investment	USD 189,090	The area of cultivation is considered about 37 Hectares, where production is about 788 MT and export volume is about 0.136 MT required for absolute change in export value. The upfront expenditure is related to purchasing of the upgradation of laboratory machinery, procuring of the column of HPLC's & GCMS, chemicals & reagents for conducting test, expenses related to sample collection, procurement of sample materials, conducting the training to make skilled manpower for analysing the test and sample collection procedure, expenses for implementing the process of laboratory accreditation and purchasing blixer machine.	Monetary cost	High
On-going cost	USD 76,363	Recurring expenditure for maintenance and servicing of the Column of HPLC's & GCMS, equipment calibration, additional buying of chemicals & reagents for conducting test, HACCP, hygiene, and sanitation materials. Conducting further capacity building trainings, for one (1) annual crop year.	Monetary cost	High
Challenges faced in implementation	+2	Challenges are related to lack of competency on Pesticide residue controls for different stakeholders.	Low (1-2), Medium (3,4), High (5,6,7)	Low
<b>Trade Impacts</b>				
Change in value of exports	USD 17,400	According to ITC Trade Map Bangladesh exported leafy Vegetables on average to Middle east (USD 0.058 MILLION) for the last three years (2020-2022). It's expected that the total export value in Middle East may increase by 30 % after solving the problems. <b>The probable change in value of exports = (USD 0.058*30%) = USD 0.0174 MILLION</b>	Monetary cost	Low
Diversification of exports	+1	It is presumed that the export market for leafy vegetable may diversify after solving this problem.	Low (1-2), Medium (3,4), High (5,6,7)	Low
<b>Domestic spillovers</b>				
Agricultural productivity	+1	According to the change in Value of export, the production needs to be considered about 788 MT more.	Low (1-2), Medium (3,4), High (5,6,7)	Low
Impact on Environmental protection	+1	Less use of chemical pesticides in the farming system will impact positively to the environment.	Low (1-2), Medium (3,4), High (5,6,7)	Low
Impact on domestic public health	+1	Practicing Pesticide residue controls for leafy vegetable will positively enhance the domestic public health.	Low (1-2), Medium (3,4), High (5,6,7)	Low
<b>Social impacts</b>				
Level of poverty	866	According to the DAE, the total production of Vegetables and gourd is about 14727990 MT. There is no separate data on how many people are involved for producing leafy	Number of people impacted	Low

		vegetables only. But roughly 16.2 MILLION people are directly or indirectly involved in producing different kinds of vegetables in Bangladesh. According to the change of value of export we are considering the production of leafy vegetables is about 788 MT. So, considering this amount of production about 866 people are involved.		
Impacts on other marginalised groups.	+1	According to the change of value of export we are considering the production of leafy vegetables is about 788 MT. So, considering this amount of production about 433 women and marginalized people are involved.	Low (1-2), Medium (3,4), High (5,6,7)	Low

### Option 5: Estimated up-front investment (Pesticide residue controls for leafy vegetable exports to the Middle East)

Items	Estimated Cost (BDT)
Purchase of machinery for the upgradation of laboratory	4000000
Procuring of the column of HPLC's & GCMS	8000000
Buying chemicals & reagents for conducting test	1000000
Expenses related to sample collection	300000
Procurement of sample materials	500000
Conducting the training to make skilled manpower for analysing the test and sample collection procedure	3000000
Expenses related to implementing the process of laboratory accreditation process.	3000000
Buying blixer machine (4 litters)	500000
Miscellaneous cost	500000
<b>Total Expenditure (BDT)</b>	<b>20,800,000 (BDT)</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>189,090 (USD)</b>

### Option 5: Estimated ongoing costs (Pesticide residue controls for leafy vegetable exports to the Middle East)

Items	Estimated Cost (BDT)
Maintenance and servicing of the column of HPLC's & GCMS	4000000
Buying additional chemicals & reagents for conducting test	1000000
Purchasing additional HACCP, hygiene, and sanitation materials	600000
Equipment calibration	800000
Time to time conducting studies and impact assessment	1000000
Miscellaneous cost	1000000
<b>Total Expenditure (BDT)</b>	<b>8,400,000 (BDT)</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>76,363 (USD)</b>



**Option 6: Salmonella controls for betel leaf exports**

Decision Criterion	Value	Details	Measurement	Confidence in Estimate
<b>Cost and Challenges in Implementation</b>				
Up-front investment	USD 159,090	The area of cultivation is considered about 2247 Hectares, where production is about 21465 MT and export volume is about 618 MT required for absolute change in export value. The upfront expenditure is related to the installation of washing plants, purchase of HACCP practices materials for field level to packaging, conducting capacity building of the manpower (farmers, exporters, officials etc.) for maintaining traceability and records, developing cool chain management, purchasing chemicals (Sodium Orthophenyl Phenate like substances) and laboratory testing accessories for contaminates and others	Monetary cost	High
On-going cost	USD 81,818	Recurring Expenditure for repairing & maintenance of washing plants, additional buying of HACCP practices materials for Field level to packaging, further capacity building trainings for the manpower (farmers, exporters, officials etc.) for maintaining traceability and records, enhancing cool chain management services, further buying chemicals and laboratory test accessories for contaminates and others for one (1) annual crop year.	Monetary cost	High
Challenges faced in implementation	+2	Challenges are related to lack of competency of the resources and insufficient technical infrastructure.	Low (1-2), Medium (3,4), High (5,6,7)	Low
<b>Trade Impacts</b>				
Change in value of exports	USD 1,680,000	According to the EPB, Bangladesh Exported betel leaf worth of USD 16.85 MILLION in the world in 2021-2022. Currently there is no export in EU due to compliance issues. It's expected that, the export may resume in EU market and may contribute about 10% of the total current export value in EU market after solving the problem. The probable change in Value of export: (USD 16.85* 10 %) = USD 1.68 MILLION	Monetary cost	Medium
Diversification of exports	+2	There is a chance of diversifying the export markets of salmonella free betel leaf specially in EU Markets.	Low (1-2), Medium (3,4), High (5,6,7)	Low
<b>Domestic spillovers</b>				
Agricultural productivity	+2	According to the change in Value of export, the production needs to be considered about 21,465 MT more.	Low (1-2), Medium (3,4), High (5,6,7)	Low
Impact on Environmental protection	+1	Practicing HAACP will bring indirectly positive impact to the environment.	Low (1-2), Medium (3,4), High (5,6,7)	Low
Impact on domestic public health	+2	As there will be no hazards for human health because of following hygiene and HACCP practice so, there will be a positive impact on domestic public health.	Low (1-2), Medium (3,4), High (5,6,7)	Low

### Social impacts

Level of poverty	5000	According to DAE statistics 2021-2022, the total cultivation area of Betel leaf in Bangladesh is about 22470 Hectar and about 50,000 people are involved directly or indirectly for cultivation of Betel leaf. In this scenario, the area of cultivation is considered about 2247 Hectares for absolute change in export value. Thus about 5000 people will be benefitted.	Number of people impacted	Low
Impacts on other marginalised groups.	+2	According to DAE statistics 2021-2022, the total cultivation area of Betel leaf in Bangladesh is about 22470 Hectar and about 20,000 women are involved directly or indirectly for cultivation of Betel leaf. the area of cultivation is considered about 2247 Hectares for absolute change in export value. Thus about 2000 people will be benefitted.	Low (1-2), Medium (3,4), High (5,6,7)	Low

### Option 6: Estimated up-front investment (Salmonella controls for betel leaf exports to the EU)

Items	Estimated Cost (BDT)
Installation of washing plants	4000000
Purchasing HACCP practices materials for field level to packaging	3000000
Capacity building of the manpower (Farmers, exporters, officials etc.) for maintaining traceability and records	2500000
Developing cool chain management	4000000
Buying chemicals (Sodium Orthophenyl Phenate like substances)	1000000
Buying laboratory test accessories for contaminates and others	2000000
Miscellaneous & others	1000000
<b>Total Expenditure (BDT)</b>	<b>17,500,000 (BDT)</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>159,090 (USD)</b>

### Option 6: Estimated ongoing costs (Salmonella controls for betel leaf exports to the EU)

Items	Estimated Cost (BDT)
Repair & maintenance of washing plants	1000000
Additional purchase of HACCP practices materials for field level to packaging	1500000
Further capacity building of the manpower (farmers, exporters, officials etc.) for maintaining traceability and records	1500000
Enhancing cool chain management services	2000000
Additional buying chemicals for the labs	500000
Additional purchase of laboratory test accessories for contaminates and others	1500000
Others	1000000
<b>Total Expenditure (BDT)</b>	<b>9,000,000</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>81,818</b>

### Option 7: Pesticide residue controls for betel leaf exports

Decision Criterion	Value	Details	Measurement	Confidence in Estimate
<b>Cost and Challenges in Implementation</b>				
Up-front investment	USD 162,727	The area of cultivation is considered about 2919 Hectares, where production is about 27885 MT and export volume is about 802 MT required for absolute change in export value. The upfront expenditure is related to procuring of pesticide & bio-pesticide, column of HPLC's & GCMS, chemicals & reagents, HACCP, hygiene, and sanitation materials for the laboratory, expenses on sample materials and collection, conducting the training to make skilled manpower for analysing the test and sample collection procedure, and implementing the process of laboratory accreditation.	Monetary cost	High
On-going cost	USD 84,545	Recurring expenditure for additional procuring of pesticide & bio-pesticide and demonstrating the judicial use, maintenance and servicing of the column of HPLC's & GCMS, further buying of additional chemicals & reagents for conducting test, additional purchase of HACCP, hygiene, and sanitation materials for the laboratory, equipment calibration and miscellaneous cost for one (1) annual crop year.	Monetary cost	High
Challenges faced in implementation	+2	The challenges are related to the lack of skilled manpower/competencies and insufficient of equipment in the laboratory.	Low (1-2), Medium (3,4), High (5,6,7)	Low
<b>Trade Impacts</b>				
Change in value of exports	USD 2,189,400	According to ITC, Bangladesh Exported Betel leaf on average USD 7.298 MILLION to Middle east for the last three years (2020-2022). It's expected that the export may increase about 30% to Middle east after solving the problem. <b>The probable change in export values: (USD 7.298* 30%) = USD 2.1894 MILLION</b>	Monetary cost	Medium
Diversification of exports	+4	Low MRL products will diversify the market after solving this problem	Low (1-2), Medium (3,4), High (5,6,7)	Medium
<b>Domestic spillovers</b>				
Agricultural productivity	+2	According to the change in Value of export, the production needs to be considered about 27,885 MT more.	Low (1-2), Medium (3,4), High (5,6,7)	Low
Impact on Environmental protection	+2	Ensuring MRLs free products will bring positive impact to environment	Low (1-2), Medium (3,4), High (5,6,7)	Low
Impact on domestic public health	+2	It will help producing below MRLs level products so, the produces will not be harmful for public health. So, there will be positive impact on public health.	Low (1-2), Medium (3,4), High (5,6,7)	Low
<b>Social impacts</b>				
Level of poverty	6495	According to DAE statistics 2021-2022, the total cultivation area of Betel leaf in Bangladesh is about 22470 Hector and about 50,000 people are involved directly or indirectly for cultivation of Betel leaf.	Number of people impacted	Low

		In this scenario, the area of cultivation is considered about 2919 Hectares for absolute change in export value. Thus about 6495 people will be benefitted.		
Impacts on other marginalised groups	+2	According to DAE statistics 2021-2022, the total cultivation area of Betel leaf in Bangladesh is about 22470 Hectares and about 20,000 women are involved directly or indirectly for cultivation of Betel leaf. the area of cultivation is considered about 2919 Hectares for absolute change in export value. Thus about 2598 people will be benefitted.	Low (1-2), Medium (3,4), High (5,6,7)	Low

### Option 7: Estimated up-front investment (Pesticide residue controls for betel leaf exports to the Middle East)

Items	Estimated Cost (BDT)
Procuring of pesticide & bio-pesticides	5500000
Procuring of the column of HPLC's & GCMS	4000000
Buying of chemicals & reagents for conducting test	1500000
Purchase of HACCP, hygiene, and sanitation materials for the Laboratory	200000
Expenses related to sample collection	100000
Procurement of sample materials	100000
Conducting the training to make skilled manpower for analysing the test and sample collection procedure	3000000
Expenses related to Implementing the process of laboratory accreditation	2500000
Miscellaneous cost	1000000
<b>Total Expenditure (BDT)</b>	<b>17,900,000 (BDT)</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>162,727 (USD)</b>

### Option 7: Estimated ongoing costs (Pesticide residue controls for betel leaf exports to the Middle East)

Items	Estimated Cost (BDT)
Additional buying of pesticide & bio-pesticide	2000000
Maintenance and servicing of the column of HPLC's & GCMS	4000000
Additional buying of chemicals & reagents for conducting test in the labs	800000
Further procuring of additional HACCP, hygiene, and sanitation materials for the laboratory	500000
Expenses related to time-to-time impact assessment	500000
Equipment Calibration	500000
Miscellaneous cost with processing report	1000000
<b>Total Expenditure (BDT)</b>	<b>9,300,000</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>84,545</b>

**Option 8: Plant pest control & Pesticide residue controls for mango exports**

Decision Criterion	Value	Details	Measurement	Confidence in Estimate
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**Cost and Challenges in Implementation**

Up-front investment	USD 358,181	According to BFVAPEA, the area of cultivation of mangoes in Bangladesh is about 202968 Hectares, production is about 2,350,499 MT and exported only 1788 MT in 2021-2022. In this scenario, these figures are considered as the basis of analysis for absolute change in export value. The upfront expenditure is related to setting up or installation of vapor Heat Treatment facility with all activities, expenses related to buying of pheromone trap, lure for male, bagging, carrying and labour charges for setting of bagging, lure for female, carrying and labour charges for setting of traps, conducting capacity building of farmers, exporters, officials etc. for maintaining traceability and records, purchase of pesticides, chemicals & reagents, , conducting residue decline study, bio efficacy test study, purchase of machinery for laboratory upgradation, procuring of the column of HPLC's & GCMS, purchase of HACCP, hygiene, and sanitation materials for the laboratory, procurement of sample materials, implementing the process of laboratory accreditation & processing report and buying of Blixer machine etc.	Monetary cost	High
On-going cost	USD 112,727	Recurring expenditure are related to maintenance and servicing of Pheromone Trap, Lure for male, Bagging, carrying and labour charges for additional bagging, lure for female, carrying and labour charges for additional traps, further capacity building of farmers, exporters, officials etc. for maintaining traceability and records, buying additional of Pesticides, chemicals & reagents, maintenance of laboratory upgradation machinery, HPLC's & GCMS, additional purchase of HACCP, Hygiene, and sanitation materials for the laboratory, equipment calibration, for one (1) annual crop year.	Monetary cost	High
Challenges faced in implementation	+3	Challenges are related to lack of expertise of the stakeholders in plant pest control & pesticide residue controls for mangoes and necessary required infrastructural facilities.	Low (1-2), Medium (3,4), High (5,6,7)	Medium

**Trade Impacts**

Change in value of exports	USD 582,600	According to ITC trade map, Bangladesh exported mangoes to EU on average USD 1.942 million for the last three years (2020-2022). The mangoes are not exporting to USA, Korea, and Japan for noncompliance issues. Japan and Korea needed PRA report and required Vapour Heat Treatment (VHT) for importing from Bangladesh. It is expected that export may increase 30% from the current export value after solving the problems. <b>The probable change in export values: (USD 1.942*30%) = USD 0.5826 MILLION</b>	Monetary cost	Medium
Diversification of exports	+2	The export market of mango will increase after solving the presence of fruit fly in mangoes.	Low (1-2), Medium (3,4), High (5,6,7)	Low

### Domestic spillovers

Agricultural productivity	+3	According to the change in Value of export, the production needs to be considered about 2,350,499 MT.	Low (1-2), Medium (3,4), High (5,6,7)	Medium
Impact on Environmental protection	+2	Controlling the use of pesticides will have a significant impact on arable land and the overall environment.	Low (1-2), Medium (3,4), High (5,6,7)	Low
Impact on domestic public health	+2	As it will causes less use of pesticide so, there will be impact on domestic public health.	Low (1-2), Medium (3,4), High (5,6,7)	Low

### Social impacts

Level of poverty	100,000	According to BFVAPEA, the area of cultivation of mangoes in Bangladesh is about 202968 Hectares where about 100,000 people are involved directly or indirectly for cultivation of mangoes.	Number of people impacted	Medium
Impacts on other marginalised groups	+3	According to BFVAPEA, the area of cultivation of mangoes in Bangladesh is about 202968 Hectares where about 100,000 people are involved directly or indirectly where the number of women is about 25000 will be impacted positively.	Low (1-2), Medium (3,4), High (5,6,7)	Medium

**Option 8: Estimated up-front investment (Plant pest control & Pesticide residue controls for mango exports to the EU, USA, Japan & Korea)**

Items	Estimated Cost (BDT)
Setting up/installation of smaller Vapor Heat Treatment facility with all activities	7500000
Buying of pheromone trap	2000000
Expenses related to lure for male	2000000
Procuring bagging accessories	1500000
Expenses of carrying and labour charges for setting of bagging (lumpsum)	500000
Expense related to lure for female	2000000
Expenses of carrying and labour charges for setting of traps (lumpsum)	500000
Capacity building of farmers, exporters, officials etc. for maintaining traceability and records	4000000
Buying pesticides, chemicals & reagents	2000000
Conducting study on residue decline and bio efficacy	1500000
Procuring machinery for laboratory upgradation	6000000
Procuring of the column of HPLC's & GCMS	6000000
Purchase of HACCP, hygiene, and sanitation materials for the laboratory	500000
Procurement of sample materials	500000
Expenses on implementing the process of laboratory accreditation	2000000
Buying of blixer machine	400000
Miscellaneous	500000
<b>Total Expenditure (BDT)</b>	<b>39,400,000 (BDT)</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>358,181 (USD)</b>

**Option 8: Estimated ongoing costs (Plant pest control & Pesticide residue controls for mango exports to the EU, USA, Japan & Korea)**

Items	Estimated Cost
Maintenance and servicing of VHT	2000000
Replacing or servicing of pheromone trap	2500000
Servicing for lure for male and female	1000000
Replacing or servicing of bagging accessories	500000
Additional expenses related carrying and labour charges for f bagging and traps (Lumpsum)	600000
Further capacity building of farmers, exporters, officials etc. for maintaining traceability and records	1000000
Additional buying of pesticides, chemicals & reagents	1000000
Additional buying of HACCP, hygiene and sanitation materials for the laboratory	500000
Expense on time-to-time impact assessment.	800000
Equipment calibration	500000
Miscellaneous cost for time-to-time laboratory accessories	1000000
Manpower for trap observation and safeguard	500000
Others	500000
<b>Total Expenditure (BDT)</b>	<b>12,400,000 (BDT)</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>112,727 (USD)</b>



### Option 9: Plant pest controls for lemon/citrus exports

Decision Criterion	Value	Details	Measurement	Confidence in Estimate
<b>Cost and Challenges in Implementation</b>				
Up-front investment	USD 200,000	According to BFVAPEA, the area of cultivation of lemon/citrus in Bangladesh is about 20127 Hectares, production is about 206,961 MT and exported only 1,982 MT in 2021-2022. In this scenario, these figures are considered as the basis of analysis for absolute change in export value. The upfront investment is related to expenses on rejuvenation of citrus garden, purchase of pesticides (Insecticide & fungicide), Mask/protective materials for spraying, expense to carrying and labour charges for spraying & display, capacity building of Farmers, exporters, officials etc. for maintaining traceability and records , developing of traceability book manual and digital solution, purchase of Protective materials for entering garden and sanitation of equipment with chemicals for work in the field, buying of chemicals for equipment sanitation with Sodium Orthophenylene Phenate substances Conducting necessary studies (data collection and research & report processing).	Monetary cost	High
On-going cost	USD 95,454	Recurring expenditure is related to Additional buying of pesticides, mask/protective materials for spraying, regular expenses on spraying, capacity building of farmers, exporters, officials etc. for maintaining traceability and records, time to time sample collection and impact assessment and conducting further capacity building trainings. for one (1) annual crop year.	Monetary cost	High
Challenges faced in implementation	+2	Challenges are related to building awareness and ensuring regular surveillance to the projected area.	Low (1-2), Medium (3,4), High (5,6,7)	Low
<b>Trade Impacts</b>				
Change in value of exports	USD 54,000	According to ITC trade Map, Bangladesh exported lemon/citrus to EU on average USD 0.18 MILLION for the last three years (2020-2022). It is expected that export may increase 30% from the current export value after solving the problems. <b>The probable change in export values: (USD 0.18*30%) = USD 0. 054 MILLION</b>	Monetary cost	Medium
Diversification of exports	+2	There are potentials of diversifying the export markets of lemon/citrus if the problems related to Bacterial disease are solved.	Low (1-2), Medium (3,4), High (5,6,7)	Low
<b>Domestic spillovers</b>				
Agricultural productivity	+3	According to the change in Value of export, the production needs to be considered about 206,961 MT.	Low (1-2), Medium (3,4), High (5,6,7)	Medium

Impact on Environmental protection	+2	Plant pest control will bring positive environmental impact.	Low (1-2), Medium (3,4), High (5,6,7)	Low
Impact on domestic public health	+2	Ensuring pest free area will bring positive impact on domestic public health.	Low (1-2), Medium (3,4), High (5,6,7)	Low

#### Social impacts

Level of poverty	100,000	According to BFVAPEA, the area of cultivation of lemon/citrus in Bangladesh is about 20127 Hectares where about 100,000 people are involved directly or indirectly for cultivation of lemon/citrus.	Number of people impacted	Medium
Impacts on other marginalised groups	+4	According to BFVAPEA, the area of cultivation of lemon/citrus in Bangladesh is about 20127 Hectares where about 50,000 women and marginalized groups of people are involved directly or indirectly for cultivation of lemon/citrus.	Low (1-2), Medium (3,4), High (5,6,7)	Medium

#### Option 9: Estimated up-front investment (Plant pest controls for lemon/citrus exports to the EU)

Items	Estimated Cost (BDT)
Expenses on Rejuvenation of citrus garden	2500000
Buying of Pesticides (Insecticide & fungicide)	3000000
Purchase of Mask/protective materials for spraying	1500000
Expenses on Carrying and labour charges for spraying & display	1000000
Conducting Capacity building of Farmers, exporters, officials etc. for maintaining traceability and records	4000000
Developing Traceability Book manual and digital solution	500000
Purchase of Protective materials for entering garden and sanitation of equipment with chemicals for work in the field	1500000
Buying of chemicals for equipment sanitation with Sodium Orthophenylene Phenate substances	5000000
Conducting necessary studies. (Data collection and research & report processing)	2000000
Miscellaneous cost.	1000000
<b>Total Expenditure (BDT)</b>	<b>22,000,000 (BDT)</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>200,000 (USD)</b>

**Option 9: Estimated ongoing costs (Plant pest controls for lemon/citrus exports to the EU)**

Items	Estimated Cost (BDT)
Additional buying of pesticides (Insecticide & fungicide)	1500000
Additional purchase of mask/protective materials for spraying	1300000
Time to time expenses on spraying	500000
Capacity building of farmers, exporters, officials etc. for maintaining traceability and records	5000000
Additional purchase of chemicals for equipment sanitation with Sodium Orthophenylene Phenate substances	2000000
Time to time sample collection and impact assessment	1000000
Miscellaneous cost	1000000
<b>Total Expenditure (BDT)</b>	<b>10,500,000</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>95,454</b>

**Option 10: Animal disease, and hygiene controls for shrimp and prawn exports**

Decision Criterion	Value	Details	Measurement	Confidence in Estimate
<b>Cost and Challenges in Implementation</b>				
Up-front investment	USD 472,727	The area of cultivation is considered about 61636.16 Hectares for absolute change in export value. The upfront expenditure is related to purchase of machinery for the DoF laboratory upgradation, expense on upgrading sampling process, and SoP development on sampling of exportable shrimp & prawn, expenses on purchasing HACCP practices materials, developing efficient traceability system, Reviewing and Strengthening GAP in shrimp and Prawn production and maintaining compliances for entering to foreign markets.	Monetary cost	High
On-going cost	USD 240,909	Recurring expenditure for conducting the activities for one (1) annual crop year or more for Conducting capacity building trainings of the officials for testing, inspection, and certification, Maintenance and servicing of laboratory equipment tools and kits, Awareness & Capacity building workshop and trainings on HACCP practices and prohibited antibiotic & chemicals usages in farming system etc. Building capacities of the officials for testing, inspection, certification and HACCP practices, Maintenance of laboratory equipment tools and kits and awareness building on prohibited antibiotic & chemicals usages in farming system.	Monetary cost	High
Challenges faced in implementation	+3	Challenges are related to building awareness among all the value chain actors on the improvement of SPS issues and improvement of the capacities of the competent authorities.	Low (1-2), Medium (3,4), High (5,6,7)	Medium

**Trade Impacts**

Change in value of exports	USD 83,480,000	According to the ITC Trade Map, Bangladesh exported shrimp and prawns to the world on average for about USD 352.75 MILLION for the last three years (2020–2022). On the other hand, Bangladesh exported shrimp and prawn on average to the following countries: Thailand (USD 0.88 MILLION), Korea (USD 0.84 MILLION), Mexico (No export), EU (USD 286.57 MILLION), USA (USD 29.68 MILLION), Japan (USD 15.88 MILLION), and Australia (USD 0.055 MILLION) for the last three years. So, the average export value in Thailand, Korea, Mexico, the EU, the USA, Japan, and Australia is about USD 333.92 MILLION. It's expected that the total export value in the mentioned countries may increase by 25% after solving the problems. <b>The expected change in value of exports is (333.92*25%) =USD 83.48 MILLION.</b>	Monetary cost	High
Diversification of exports	+6	The export market share will increase after solving the problems.	Low (1-2), Medium (3,4), High (5,6,7)	High

### Domestic spillovers

Agricultural productivity	+4	According to the Department of Fisheries (DoF), the total production of shrimp and prawns in 2021–2022 was about 137,021 MT. It's expected that the Production will increase by 32114.41 MT, i.e., a 23% increment to the total production.	Low (1-2), Medium (3,4), High (5,6,7)	Medium
Impact on Environmental protection	+2	These measures may have some positive environmental impacts.	Low (1-2), Medium (3,4), High (5,6,7)	Low
Impact on domestic public health	+1	Shrimp and prawn are exporting oriented industry. So, the impact on domestic public health will be minimal.	Low (1-2), Medium (3,4), High (5,6,7)	Low

### Social impacts

Level of poverty	164,063	<p>According to the Department of Fisheries, the total cultivation area of shrimp and prawns in Bangladesh is about 262980 hectares. Here, about 700,000 people are involved directly and indirectly.</p> <p>According to the Change in value of exports, the area of cultivation (Hectares) needed to be considered at 61636.16 hectares, where approximately 164,063 people will be positively impacted.</p>	Number of people impacted	High
Impacts on other marginalised groups	+4	<p>According to the DoF, about 200,000 women and marginalised groups are involved in the whole shrimp and prawn industry.</p> <p>According to the Change in value of exports, the area of cultivation (Hectares) needed to be considered at 61636.16 hectares, where approximately 46,875 people will be positively impacted.</p>	Low (1-2), Medium (3,4), High (5,6,7)	Medium

### Option 10: Estimated up-front investment (Animal disease, and hygiene controls for shrimp and prawn exports to Thailand, Korea, Mexico, EU, USA, Japan, and Australia)

Items	Estimated Cost (BDT)
Purchase of machinery for the DoF laboratory upgradation for testing, inspection, and certification	10,000,000
Purchase of necessary laboratory equipment, testing tools and kits	9,500,000
Expense on upgrading sampling process	3,500,000
Expenses related to SoP development on sampling of exportable shrimp	3,000,000
Expenses on reviewing and strengthen GAP in shrimp and prawn production and maintaining compliances for entering foreign markets	7,500,000
Expenses on strengthening and developing efficient traceability system	8,000,000
Purchasing HACCP practices materials at hatcheries, farm, transport, and processing stages	10,500,000
<b>Total Expenditure (BDT)</b>	<b>52,000,000</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>472,727</b>

**Option 10: Estimated ongoing costs (Animal disease, and hygiene controls for shrimp and prawn exports to Thailand, Korea, Mexico, EU, USA, Japan, and Australia)**

Items	Estimated Cost (BDT)
Conducting capacity building trainings of the officials for testing, inspection, and certification	6,000,000
Maintenance and servicing of laboratory equipment tools and kits	6,500,000
Awareness building seminars on prohibited antibiotic & chemicals usages in farming system.	7,000,000
Awareness & capacity building workshop and training on HACCP practices	7,000,000
<b>Total Expenditure (BDT)</b>	<b>26,500,000</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>240,909</b>

**Option 11: Hygiene and contaminant controls for live and frozen crab exports**

Decision Criterion	Value	Details	Measurement	Confidence in Estimate
<b>Cost and Challenges in Implementation</b>				
Up-front investment	USD 189,090.90	The area of cultivation is considered about 1741 Hectares for absolute change in export value. The upfront expenditure is related to expenses on purchase of necessary accessories for Skill & capacity development of the supply chain actors on production, transportation, and storage system skill & capacity development of the supply chain actors on production, transportation, and storage system for crabs.	Monetary cost	High
On-going cost	USD 81,818.18	Recurring expenditure for conducting the activities for 1 year or more for the efficiency improvement trainings of the competent authority and awareness building seminars and trainings to maintain compliances to international market access.	Monetary cost	High
Challenges faced in implementation	+2	Challenges are related to lack of awareness of compliance issues among the value chain actors, different varieties of stakeholders and lack of efficiency of the competent authority.	Low (1-2), Medium (3,4), High (5,6,7)	Low
<b>Trade Impacts</b>				
Change in value of exports	USD 5,048,000	According to the ITC Trade Map, Bangladesh exported live and frozen crab to the world on average for about USD 19.02 MILLION for the last three years (2020–2022). On the other hand, Bangladesh exported live and frozen crab on average to the following countries: China (USD 25.57 MILLION), Australia (USD 2.07 MILLION), EU (USD 9.65 MILLION), USA (USD 11.38 MILLION), Japan (USD 1.52 MILLION), and Korea (USD 0.22 MILLION) for the last three years. So, the average export value in China, Australia, EU, USA, Japan, and Korea is about USD 50.48 MILLION. It's expected that the total export value in the mentioned countries may increase by 10% after solving the problems. The expected change in value of exports is $(50.408 \times 10\%) = \text{USD } 5.048 \text{ MILLION}$ .	Monetary cost	High
Diversification of exports	+5	The export markets will increase after solving the problems.	Low (1-2), Medium (3,4), High (5,6,7)	High
<b>Domestic spillovers</b>				
Agricultural productivity	+5	According to the Department of Fisheries (DoF), the total production of live and frozen crab in 2021–2022 was about 7729.99 MT. It's expected that the Production will increase by 1159.49 MT, i.e., a 15 % increment to the total production.	Low (1-2), Medium (3,4), High (5,6,7)	High
Impact on Environmental protection	+1	These measures may have some positive environmental impacts.	Low (1-2), Medium (3,4), High (5,6,7)	Low

Impact on domestic public health	+1	Live and frozen crab are exporting industry. So, the impact on domestic public health will be very minimal.	Low (1-2), Medium (3,4), High (5,6,7)	Low
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#### Social impacts

Level of poverty	65,150	According to the Department of Fisheries, the total cultivation area of live and frozen crab in Bangladesh is about 9353 hectares. Here, about 350,000 people are involved directly and indirectly. According to the Change in value of exports, the area of cultivation (Hectares) needed to be considered at 1741.01 hectares, where approximately 65,150 people will be positively impacted.	Number of people impacted	Medium
Impacts on other marginalised groups	+3	According to the DoF, about 200,000 women and marginalised groups are involved in the whole live and frozen crab industry. According to the Change in value of exports, the area of cultivation (Hectares) needed to be considered at 1741.01 hectares, where approximately 37,228 people will be positively impacted.	Low (1-2), Medium (3,4), High (5,6,7)	Medium

#### Option 11: Estimated up-front investment (hygiene and contaminant controls for live and frozen crab exports to China, Australia, EU, USA, Japan, Korea)

Items	Estimated Cost (BDT)
Expenses on purchase of necessary accessories for skill & capacity development of the supply chain actors on production, transportation, and storage system.	20,800,000
<b>Total Expenditure (BDT)</b>	<b>20,800,000</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>189,090.90</b>

#### Option 11: Estimated ongoing costs (hygiene and contaminant controls for live and frozen crab exports to China, Australia, EU, USA, Japan, Korea)

Items	Estimated Cost (BDT)
Efficiency improvement trainings of the competent authority	5,000,000
Awareness building seminars and trainings to maintain compliances for international market access	4,000,000
<b>Total Expenditure (BDT)</b>	<b>9,000,000</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>81,818.18</b>



**Option 12: Hygiene & Contaminant controls for live Eel exports**

Decision Criterion	Value	Details	Measurement	Confidence in Estimate
<b>Cost and Challenges in Implementation</b>				
Up-front investment	USD 154,545.45	The total Annual catch of live Eels is considered 2158.05 MT for absolute change in export value. The upfront expenditure is related to Purchase of necessary accessories for Improvement of Eel holding and storage centres improvement of Eel holding and storage centres for maintaining hygiene practices and conducting study on presence of Estradiol hormone and preventive measures.	Monetary cost	High
On-going cost	USD 95,454.54	Expenditure related to awareness & Capacity building trainings for all the supply chain stakeholders and Efficiency improvement seminars of the competent authority for 1 year or more.	Monetary cost	High
Challenges faced in implementation.	+3	Challenges are associated with motivating and approaching the large number of farmer and collectors who are scattered in different parts of the country, lack of laboratory analysis and testing facilities.	Low (1-2), Medium (3,4), High (5,6,7)	Medium
<b>Trade Impacts</b>				
Change in value of exports	USD 464,000	According to the ITC Trade Map, Bangladesh exported live Eels to the world on average for about USD 1.30 MILLION for the last three years (2020–2022). On the other hand, Bangladesh exported live Eels on average to the following countries: China (USD 0.2 MILLION), Korea (No export), USA (USD 2.09 MILLION), Canada (USD 0.03 MILLION), Singapore and Japan (No export) for the last three years. So, the average export value in China, Korea, USA, Canada, Singapore & Japan is about USD 2.32 MILLION. It's expected that the total export value in the mentioned countries may increase by 20% after solving the problems. <b>The expected change in value of exports is (2.32*20%) =USD 0.464 MILLION.</b>	Monetary cost	High
Diversification of exports	+3	The export markets will diversify by many folds	Low (1-2), Medium (3,4), High (5,6,7)	Medium
<b>Domestic spillovers</b>				
Agricultural productivity	+3	According to the DoF, in 2020-21, the total Annual catch was about 9488 MT. It's expected that the Annual catch will increase by 1423.20 MT, i.e., a 15 % increment to the total catch.	Low (1-2), Medium (3,4), High (5,6,7)	Medium
Impact on Environmental protection	+1	These measures may have some positive environmental impacts.	Low (1-2), Medium (3,4), High (5,6,7)	Low

Impact on domestic public health	+1	No Impact on domestic public health. All most all the production amount is exported.	Low (1-2), Medium (3,4), High (5,6,7)	Low
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#### Social impacts

Level of poverty	45,490	According to the DoF, about 200,000 people are directly and indirectly involved in live Eel's collections. According to the Change in value of exports, the 2158.05 MT needs to be considered. Thus approximately 45,490 people will be positively impacted.	Number of people impacted	High
Impacts on other marginalised groups	+3	According to the DoF, about 100,000 marginalised people are directly and indirectly involved in live Eel's collections. According to the Change in value of exports, the 2158.05 MT needs to be considered. Thus approximately 22,745 people will be positively impacted.	Low (1-2), Medium (3,4), High (5,6,7)	Medium

#### Option 12: Estimated up-front investment (hygiene & Contaminant controls for live Eel exports to China, Korea, USA, Canada, Singapore & Japan)

Items	Estimated Cost (BDT)
Purchase of necessary accessories for Improvement of Eel holding and storage centres	7,000,000
Conducting study on presence of Estradiol hormone and preventive measures	10,000,000
<b>Total Expenditure (BDT)</b>	<b>17,000,000</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>154,545.45</b>

#### Option 12: Estimated ongoing costs (hygiene & Contaminant controls for live Eel exports to China, Korea, USA, Canada, Singapore & Japan)

Items	Estimated Cost (BDT)
Awareness & Capacity building trainings for all the supply chain stakeholders	4,000,000
Efficiency improvement seminars of the competent authority	6,500,000
<b>Total Expenditure (BDT)</b>	<b>10,500,000</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>95,454.54</b>

**Option 13: Contaminant controls for chilled and frozen fish exports**

Decision Criterion	Value	Details	Measurement	Confidence in Estimate
<b>Cost and Challenges in Implementation</b>				
Up-front investment	USD 309,090	The area of cultivation is considered about 1,168,812 Hectares and 1,006,518 MT Production for absolute change in export value. The upfront expenditure is related to Purchasing necessary accessories for Improving cool chain management system improving cool chain management system i.e., ensuring temperature-controlled supply chain from harvesting to consumer.	Monetary cost	High
On-going cost	USD 79,090	Recurring expenditure for conducting the activities for 1 year or more for Awareness building, developing skills and capacities of the supply chain actors on cool-chain management system.	Monetary cost	High
Challenges faced in implementation	+3	Challenges are related to building awareness among all the value chain actors mainly the producers on the improvement of SPS issues and improvement of the capacities of the competent authorities & Poor transport and packaging process.	Low (1-2), Medium (3,4), High (5,6,7)	Medium
<b>Trade Impacts</b>				
Change in value of exports	USD 5,310,000	According to the ITC Trade Map, Bangladesh exported chilled and frozen fish to the world on average for about USD 29.36 MILLION for the last three years (2020–2022). On the other hand, Bangladesh exported chilled and frozen fish on average to the following countries: EU (USD 11.69 MILLION), USA (USD 4.91 MILLION), Gulf countries (USD 4.83 MILLION) and Middle East (USD 5.15 MILLION) for the last three years. So, the average export value in the EU, the USA, Gulf countries and Middle East is about USD 26.58 MILLION for the last three years. It's expected that the total export value in the mentioned countries may increase by 20% after solving the problems. <b>The expected change in value of exports is (26.58 *20%) =USD 5.31 MILLION.</b>	Monetary cost	High
Diversification of exports	+5	The export markets will diversify after solving the problems.	Low (1-2), Medium (3,4), High (5,6,7)	High
<b>Domestic spillovers</b>				
Agricultural productivity	+5	According to the Department of Fisheries (DoF), the total production of fishes in Bangladesh is about 4,052,701 MT in 2021–2022. It's expected that the Production will increase by 81,054.02 MT Annually, i.e., roughly 2% increment to the total production.	Low (1-2), Medium (3,4), High (5,6,7)	High
Impact on Environmental protection	+2	Contaminants control will have minimum impact on environment.	Low (1-2), Medium (3,4), High (5,6,7)	Low

Impact on domestic public health	+1	The impact on domestic public health will be very minimum because it will not impact the production for the domestic market substantially.	Low (1-2), Medium (3,4), High (5,6,7)	Low
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#### Social impacts

Level of poverty	484,297	According to the Department of Fisheries, the total production of fishes in Bangladesh is about 4,052,701 MT. Here, about 19,50,000 people are involved directly and indirectly. According to the Change in value of exports, the production needed to be considered at 100,6518 MT, where approximately 484,297 people will be positively impacted.	Number of people impacted	High
Impacts on other marginalised groups	+5	According to the Department of Fisheries, the total production of fishes in Bangladesh is about 4,052,701 MT. Here, about 1,40,000 marginalised group of people are involved. According to the Change in value of exports, the production needed to be considered at 100,6518 MT, where approximately 34,770 people will be positively impacted.	Low (1-2), Medium (3,4), High (5,6,7)	High

#### Option 13: Estimated up-front investment (Contaminant controls for chilled and frozen fish exports to EU, USA, Gulf & Middle East countries)

Items	Estimated Cost (BDT)
Purchasing necessary accessories for Improving cool chain management system	34,000,000
<b>Total Expenditure (BDT)</b>	<b>34,000,000</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>309,090</b>

#### Option 13: Estimated ongoing costs (Contaminant controls for chilled and frozen fish exports to EU, USA, Gulf & Middle East countries)

Items	Estimated Cost (BDT)
Awareness building, developing skills and capacities of the supply chain actors on cool-chain management system	8,700,000
<b>Total Expenditure (BDT)</b>	<b>8,700,000</b>
<b>Total Expenditure (USD, considering USD 1 = BDT 110)</b>	<b>79,090</b>

### Annex 3: Field Validation of data and information for P-IMA Bangladesh

A team consisting of six (6) persons from Swiss contact officials and national consultants carried out a field-level data validation from October 15th to October 19th, 2023, in five districts (Jessore, Satkhira, Bagerhat, Barisal, and Patuakhali) and 28<sup>th</sup> to 30<sup>th</sup> November 2023 in Cox's Bazar of the southern part of the country for the PIMA Assessment in Bangladesh. The team met with district officials from the appropriate government agencies, exporters, supply chain actors, farmers, and visited contract farming pilot projects for agricultural and fishery products.

**On the first day of the visit**, the team met with officials from the District Fisheries Department and the District Agriculture Extension Department and visited contract farming for agricultural products, where five farmers were also consulted.

According to the district fisheries officer in Jessore, the exportable fisheries products are Shrimp (Bagda and Golda), Kuchia, Tengra and Pabda. Pabda and Tengra get exported as chilled fish product while Chingri gets exported as a frozen item. There is also a demand for crabs in the export business. The top importing country for Pabda and Shrimp is India, and there is a market for Crabs in China. According to him, there lies an array of problems in the case of importing. **As he stated, biological contaminants, chemical contamination, antibiotics residues, pollutants, Natural Toxins, Hygienic condition/controls are the main barriers for export.** In the fiscal year 2022-2023, 27.21 million USD worth fisheries products were exported from this area through Benapole in the nearby countries. The number of exported fisheries products were USD 6973199.14 kg in total, with Pabda (5327221 kg, 76.40% of total), Hilsha (1306813.14 kg, 18.75% of the total) Bhetki (99630 kg, 1.42% of the total), Tengra and Pangash (92000 kg, 1.33% of the total) being the top items. He pointed out that the exports may increase significantly if the compliance issues are resolved.

According to the deputy director of the DAE, Jessore, the horticulture products that are exported mostly from Jessore and around the region are cabbage, spine gourd, bitter gourd, pointed gourd and papaya. Snake gourd is in high demand but still didn't get export exposure. He stated that Jessore is one of the most fertile lands in the country, which makes it very suitable for growing any sort of vegetables and fruits. He also stated about horticulture products that have huge potential but is still not at the market, one example of such a product is dragon fruit. As this fruit has a good quantity of production but had no export from Bangladesh. This can also be an exportable agricultural product that the agriculture sector should investigate. Another item that shows an immense level of potential is the yard long bean. The crops can be cultivated in 60-65 days, and this item can be grown easily.

Contract farming is also getting popular in the Jessore region, and papaya is the product that is getting cultivated the most under this. Products that are maintained by the set of compliance are getting exported to the European countries and in the middle east. **However, since the farmers are still not being able to meet the standards and compliance given by the importer countries, Bangladesh only sticks to exporting their products in the ethnic market but fails to enter the main European market.** Another export-related problem faced by the farmer is the opposite of what one might assume. It is thought that if the farmers are exporting their products to foreign countries, they will have a huge profit margin. But exporters often promise the contract farmers a good price and then stop showing up. In that case, the farmers must sell the products at the local market at a cheaper price. The other side of the story is also interesting, as farmers often sell their products in the local market when the price is higher, instead of giving it to the exporter. To prevent these from happening, the rules and regulations of contract farming must be introduced by the DAE, Ministry of Agriculture. Written contract and documentation must be a staple step for preventing such scenarios. There are also

several problems to face that are related to production of agricultural products. One big issue often faced is the disease that attacks the plants. For instance, **lemon and citrus plants are often infected by cankers and citrus black spots (CBS). Mangoes on the other hand are infected by scab disease, rotting and fruit flies. Fruit flies also attack a range of other fruits and vegetables such as eggplants, Malta, jack fruit, pointed gourd and so on. As a solution to these diseases, vapor heat treatment (VHT) must be practiced and adapted for fruit fly for mangoes. Leafy vegetables often suffer from leaf miner, which can be solved by using traps and pesticides for insects.** When the new leaves come out, pesticides must be sprayed upon them to prevent the damage. Betel leaf is also a product where the usage of pesticide is much needed to prevent diseases. However, the usage of pesticide is rather tricky as using too much of them causes great harm to the products. The Deputy Director of DEA pointed out that the over usage of pesticides is one of the biggest problems in agricultural production. According to him, post-production margin must be maintained to tackle such issues, and standard operating procedure (SOP) from production till export must be adapted. Maturity index must be followed for grading and sorting starting from the moment the product is to be picked up. Overall change in behaviour and insight is needed firmly to create impactful changes. All stakeholders need to be involved and establish complete relevancy and transparency, and the government cannot do it without the help of the private sector, he added. **Direct packing houses are needed alongside cooling vans so that the transportation is much smoother, more efficient and prevents the goods being damaged.** If these steps are adapted, the horticulture scenario will change rapidly, not only in Jessore, but in all the areas of Bangladesh, as only the adaptation of good practice can truly create a meaningful and sustainable impact.

After finishing the interviews with the officials, a farm visit was arranged where we saw fields of cabbages, pointy gourds, and eggplants. As we discussed with the farmers, they pointed out that eggplants and pointy gourds were the products that have the most potential with the highest amount of profit, but at the same time, these are also the vegetables that get infected the most. **Fruit flies and many other diseases kill the plants very rapidly which has a huge impact in their cultivation and farming.** As these farmers are very vulnerable to climate-related issues, an insurance system must be provided to them to tackle the risks that they go through, as they suffer from huge losses. They also mentioned about the exporters not giving them the right price for the products, as well as exporters being flaky and unable to follow through their words. When this happens, the farmers must sell their premium products at a far cheaper price at the local market. They also mentioned, they need regular trainings on cultivation and irrigation so that they can understand the climatic problems and diseases better and cultivate the crops accordingly.

The next day the team visited, M.U Seafood Ltd., Jessore, one prominent exporter of Fisheries products from Bangladesh. At M.U seafood three (3) officials were interviewed; the managing director Shyamal das, Manager Shubrata Kumar, and commercial manager Satyagith Das. **As they stated, there is a huge potential for frozen soft-shell crab. Before it was thought that China is the only consumer of crabs, but soft-shell crab is an item that has an immense demand in all over the world. Soft shell crab has such a potential since it is very easy to consume unlike hard shell crabs.** Hence, the demand for it is only increasing day by day. It is being imported in Europe often from Bangladesh, having competitors like Myanmar and Vietnam. But there are also various obstacles in exporting soft shell crabs. One such obstacle is the compliance issue that exporters often face. **They mentioned chemical contamination, antibiotics residues, Natural Toxins and Hygienic condition/controls are challenges regarding crab export from Bangladesh.** As different countries have different parameters and compliance systems, it becomes very difficult to maintain for the same product. There is also a lack of awareness and transparency from the exporters. If any consignment returned due to compliance issues, there is always a fear of having a bad reputation of the company that may hamper their

business. There is also a huge gap in communication with the ministry, hence the exporters are unable to ask the cause behind the return of the products. There is also a lack of understanding between the forest and environment ministry as they would not permit to cultivate in the mangrove area, where the baby crabs are found. And if one permits, the another denies, which leads to more delays and cause many exporters to adapt ill ways. As a solution to these, soft shell crab must be conserved. Another exported fisheries item from this area is Shrimp. 85% of the frozen shrimp is exported in the Europe market. The exporters also face significant compliance issues in the EU markets. China is a huge importer of shrimp and yet, there is not enough visibility to accommodate the show casement of Bangladesh to the world in Shrimp fairs, held outside the county. There are huge seafood fairs held in China where participants from all many countries have their stalls, but the stalls of Bangladesh are usually in corners and less spacy areas which decreases their visibility.

The Shrimp and prawn sector is facing compliances like **biological contaminants, chemical contamination, antibiotics residues, Heavy metal residue, pollutants, Natural Toxins, Hygienic condition/controls. Recently Malachite green is affecting the shrimp to a huge extent.** Many consignments had already been returned from different importing countries for this contaminant. Malachite green works as an anti-fungal treatment; however, it is harmful to use this in the shrimp farms that contaminate the shrimps and hence it is very important to stop using this treatment in shrimps farming. Many exporters are not transparent regarding the usage of malachite green in their shrimps and that is why transparency is much needed alongside with third party intervention and roundtables for all parties involved. **International experts and consultants must be called on to get to the root of the problem and solve it accordingly. High quality laboratories are also very much needed to run proper and accurate assessments. There are also several chilled fish that are exported from this region, such as Pabda, Tengra, Ilish and Telapia. However, more quarantine centers need to be developed as there in currently only one quarantine centre in one border.** The development of adequate amount of quarantine centres in all the borders will greatly help the sector as well as the export system. We also visited the M.U seafood processing plant where we witnessed how the products are processed and stored and the cautions that are maintained during processing.

After that we visited Upazila Agriculture office, Monirampur, Jessore and had constructive discussion with the Upazila agricultural officer. The official discussed how Monirampur has a huge potential to produce export quality products on a commercial scale. **In Monirampur, products like bananas, Spine gourds are cultivated in huge quantities.** But the lack of substantial support from the government and private sector hinders the full potential of this Upazila. While the upazila officers are directly working with farmers at a root level, not having proper guidelines and exposure to knowledge, tools and training affect the crop farmers for maintaining the SPS compliances. If transparency and accountability is maintained, quality products can be grown and a sustainable exporting system can be established, he said. We also visited the contract farms of banana and spine gourd there and discussed with the local five farmers. **As we talked to the farmers, they mentioned about the attacks of fruit flies.** They also expressed how proper training and knowledge would help them cultivate the best quality products. They urged for all sorts of help from the government, officers, and the private sector to uphold their livelihood and give them the needed knowledge and exposure.

In the same day the team visited Deputy Director, Fisheries and Quality Assurance office in Khulna. Mohammad Abu Sayed, deputy director of fish inspection and quality control discussed how inspection procedure is done for export consignments. The first step involves collecting samples from the exporters. Although some exporters have their own labs, a lot of them aren't up to standard. There are some ice crashing facilities in some depos but again they are not sufficient and aren't aware of the hygiene standards. To inspect these properly, a quality control inspector goes to assess the quality



after the factories call them. The checking process is always randomized. He emphasized that they need European standard labs and technicians to ensure the best quality of products and services. The team also talked with Quality Assurance manager, Department of Fisheries in Khulna. According to him, they have a lack of human resources that hinders providing quality services to the clients. The amount of work has increased but to tackle those efficiently, there aren't enough people. **They said it's very difficult for them to cope with the importing countries' frequent changing standards and compliances for export. Like manpower, there are lack of necessary Lab instruments in the lab.** As the world is advancing, technology is also getting better. Since every country has their own sets of compliance, latest and upgraded products need to be tested which is sometime difficult for them. And since there are new diseases being identified every day, we must have instruments that are able to keep up and detect those. Alongside with manpower, skill also need to be developed for using those instruments efficiently. **Technical support and capacity building are very important portions to bring systematic and sustainable growth.** He highlighted the importance of having bigger and proper space, and how it is needed to run everything efficiently. And separate rooms are very important in such instances to stop the contamination of diseases and viruses. He also added the need for and importance of proper separate labs for pathology.

On day three of the visit, the team had a meeting with Deputy Director's office, DAE in Khulna. Mr. Kazi Jahangir Hossain, Deputy Director gave us an insight into the products that are cultivated in the Khulna district. **Betel leaf is cultivated in 858 hectares of land, and the amount of produced leaf is 4462 metric tons per year. Similarly, seasonal watermelon is cultivated in 1225 hectares of land, and every year, 511250 metric tons of seasonal watermelon is produced.** On the other hand, off season watermelon is cultivated in 400 hectares of land every year, and the amount of produced goods is 13'280 metric tons. And finally, off season hyacinth bean is cultivated in 345 hectares of land, and every year, 4140 metric tons of hyacinth bean is produced.

The team also visited Lockpur Group of Industries in Bagerhat. This industry is pioneer in exporting fisheries products from Bangladesh. Mr. Khan Habibur Rahman, Managing Director of the industry told us about **the most recurring problems in shrimp industry are mislabels and misgrading, for which a lot of the shipments cancelled from the importing countries. Pushing water and jelly like products inside the fish to increase the size is also another frequent compliance issue, and it changes the size, color, and taste of the product.** During examination, these factors are discovered which sends back the total lot of the shipment as well. According to him, **Bangladesh has a much higher overhead production cost compared to other countries, for which it cannot compete well in the international market. So, there is no alternative to increasing the production volume in any way. A lack of maintenance and proper hygiene tests is also something that must be worked on.** In many cases, products get cancelled despite being processed correctly. But through the assessment, they are sent back due to **not maintaining the hygiene standards.** He also identified the decreased levels of ready to cook items as an issue. In the past, more ready to cook items were exported whereas now, it is only frozen products. Ready to cook shrimp items also must be added alongside frozen shrimp to increase value addition. Proper insurance, full-fledged electric systems and suitable bank policies must be developed, as these are not very available for farming; and developing these will encourage the farmers and exporters to invest in these sectors. The need for a production zone is also very important, as there should be a designated area for cultivating shrimps. In that way, transportation time and cost will lessen, the raw materials will be more accessible, and it will be easy for both the buyers and sellers, as everything will be in one area. **There is also a need for the identification of the chemical sources so that it can be prevented before it enters the area of production.** Moreover, the controlling system must also be advanced and communications with the customs officials and department must be



improved for efficient and successful export. Otherwise, it takes a long time to get customs clearance when the products are sent back.

The next day the team visited Bangladesh Frozen Foods Exporter Association which is based in Bagerhat. SK. MD. Abdul Baki, Vice President of the association discussed about the need for developing the shrimp sector and the crab sector due to its high demand. **He said that Proper training must be provided to the people associated with farming so that they are aware of the viruses and diseases. Awareness also must be raised in terms of what food to feed the shrimp and crab and what chemicals are harmful for them. Taking regular workshops, capacity building and raising awareness must be done frequently.** There is also a need to increase the availability of raw materials such as Shrimp juveniles, food for the shrimp, and proper medications for the shrimps. If these raw materials were available, more people would be interested in investing in the sector and the number of exports would grow. Moreover, farmers must be trained by experts to give them proper knowledge on shrimp farming, which will help them to produce bigger and better shrimps. **He also stressed the importance of quality packaging, quality labs and trainers for the betterment of the sector.**

The team also visited a shrimp market in Bagerhat, where we talked to the owners of the market, retail buyers and wholesale buyers as well as the sellers. Locally, fish in big quantities are sold through a bidding system. Many of the sellers also export their shrimp in various country. They supply chilled shrimp to the exporters. The chilled shrimp export consignments mainly go by air, so that it can reach the destinations fast. The frozen shrimp products are mainly exported from processing plants. If the products are not up to the mark for exporting, the food processing companies buy those products at a cheaper price.

The team visited DAE Office, Uzirpur Upazila in Barisal. The DAE officers facilitated us to visit a Betel leaf field in this area. The betel leaf is cultivated on 320 acres of land in this area. Other than betel leaf, Gourd, Pumpkins are also vegetables that are also cultivated. These products, however, are cultivated in the Gher Borders, which makes them chemical free and fresher. And it also reduces the effect of diseases in the vegetables. **However, there are still several diseases that attack the betel leaf such as fungus infection, the rotting of the root and the leaf, white fly attacks. After the production, the betel leaf is impacted by Salmonella due to lack of awareness in hygiene procedures.** According to the officers, gourds are also affected by the Fruit flies frequently. Betel leaf from Uzirpur now is sold in the local markets in the country but has a high potential to become an export quality product in near future. But for the export the farmers need to become familiar with the international compliances' issues and practice disease free production procedures. The team also visited a field level fisheries farm in Barisal and discussed about their current production system. This region has huge potential for exporting fisheries products, but the farmers are unaware about the **GAP and international compliance issues.**

The Swiss contact officials and fisheries national consultant carried out a field-level data validation for exclusively Fisheries sectors from 28<sup>th</sup> to 30<sup>th</sup> November 2023 in Cox Bazar of the southern part of the country for the PIMA Assessment in Bangladesh. The team met with district officials from the appropriate government agencies, exporters, supply chain actors, and farmers for fishery products.

The creation of cutting-edge fish landing stations in Cox's Bazar and other important districts was underlined by Mr. Md. Boduruzaman, District Fisheries Officer, as a means of addressing the SPS-related issues in the Fisheries sector that arise at the local level. Additionally, he anticipates that the business sector and development partners would step forward and collaborate with the government to ensure the successful operation and installation of the landing stations.

The team visited to Global Seafood Limited, one of the biggest exporters of fisheries of the country, located in Cox's Bazar. Mr. Syed Ziaul Hoque, the managing director, also stressed the significance of maintaining cleanliness at the fisheries landing area. According to him, the shrimp and prawn sector has to deal with issues associated to SPS, such as the existence of heavy metals and chemical and biological contaminants. In most situations, the government laboratories lack the personnel, equipment, and chemicals necessary to give the sample's test certificate. In order to compete in the international market, he also highlighted the need to expand Vannamei prawn farming in Bangladesh.

Additionally, he underlined the significance of SPS-related capacity building training for stakeholders in the public and private sectors as well as those involved in the fisheries supply chain. The SPS criteria imposed by the importing countries are always changing, making it occasionally challenging to comprehend and handle effectively. For this reason, improving SPS abilities is crucial for all parties involved in the Fisheries supply chain.

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