Master's Thesis of Economics

The Impact of Sanitary and Phytosanitary Measures on Myanmar's Dried Legumes Exports

미얀마 건조 콩류 수출에 동식물위생검역(SPS) 조치가 미치는 영향

August 2023

Graduate School of Agricultural Economics and Rural Development
Seoul National University
Agricultural and Resource Economics Major
Van Tha Ceu

The Impact of Sanitary and Phytosanitary Measures on Myanmar's Dried Legumes Exports

Professor Hanho Kim

Submitting a master's thesis of Economics

August 2023

Graduate School of Agricultural Economics and Rural Development
Seoul National University
Agricultural and Resource Economics Major

Van Tha Ceu

Confirming the master's thesis written by
Van Tha Ceu
August 2023

Chair ____________________(Seal)
Vice Chair ____________________(Seal)
Examiner ____________________(Seal)

Abstract[1]

Dried legumes play a crucial role in Myanmar's economy as it presents the highest export earnings among agricultural commodities and ranks second among the country's most valuable exports. Moreover, Myanmar plays a significant role in the global dried legumes[2] production and export market. It has an average of more than 10% of the global export market share between 2011-2021. Nevertheless, Myanmar's dried legumes export in the same period has not been stabilized, and its world export market share in recent years has been lower than in 2011 and 2012. On the other hand, the major importing countries' non-tariff measures, including SPS measures, have been increasing in recent years. Thus, this research is intended to examine the impact of importing countries' SPS measures on Myanmar's dried legumes exports by applying Poisson Pseudo Maximum Likelihood (PPML) estimation with 20 importing countries, which covered more than 99% of Myanmar's dried legumes exports from 2010-2021. In this research, SPS measures were quantified in four different ways, such as SPS measures in the total number of measures, by coverage ratio and frequency index, and as a simple dummy variable. The estimation revealed that importing countries' GDP, the geographical distance

[1] The author is sponsored by Korean Government through Global Korea Scholarship (GKS) program

[2] "Dried legumes" covers all pulses that are reported under HS 0713 in UN Comtrade data

between Myanmar and its export destinations, the quality of dried legumes, measured by price ratios, and SPS measures have a significant role in Myanmar's exports. However, the role of importing countries' tariffs, Myanmar's productions, and importing countries' populations are less important. The findings of this research indicate that importing countries' SPS measures had trade−impeding effects on Myanmar dried legumes exports.

Keywords: Agricultural trade; Dried Legumes; Myanmar; SPS; PPML

Student Number: 2021−26871

Table of Contents

List of Tables

List of Figures

List of Appendix

Abbrevations

ASEAN	Asociation of Southeast Asian Nations
CSO	Central Statistical Organization
FAO	Food and Agriculture Oganization of the United Nations
MOALI	Ministry of Agriculture Livestock and Irrigation
NTM	Non Tariff Measures
SPS	Sanitary and Phytosanitary Measures
TBT	Technical Barriers to Trade
UNCTAD	United Nations Conference on Trade and Development
WTO	World Trade Organization

Chapter 1. Introduction

1.1. Study Background

After the political transition in 2010, many countries have lifted their sanction on Myanmar, which favor the country's active re-engagement in the global economy. Myanmar has pursued an export-led growth strategy for its effective economic development strategy. With that strategy and various efforts, the country has been lifted from a low-income country to a lower-middle-income country in recent years (Diao & Li, 2020). The GDP per capita reached 1477.45 USD in 2020 and only 765.24 USD in 2010.

Under the export lead development strategy, natural resources such as mineral products, the agricultural sector, and textile industries are the primary driving force of Myanmar's economic growth. The average export share of the agricultural[3] sector between 2010-2020 was 17.65%, contributing an average of 27.51%[4] share to the country's GDP (CSO, 2021) and employed 45% of the labor force (FAO, 2021).

Dried legumes, fish, and rice are the primary agricultural export commodities for the country, with which dried legumes are the second most exported earnings after petroleum at HS 4 level. Myanmar is also one of the world's significant dried legume-

[3] Agriculture; HS:06-15 (Trade map.org)
[4] Agriculture including fishery and forestry

producing counties and exporting countries. According to trade map.org, it had an average of 10% world's export share between 2010–2021. Given its essential role in Myanmar's economy, Myanmar's dried legumes export in the same period has not been stabilized, and its world export market share in recent years has been lower than in 2011 and 2012. On the other hand, there is an increasing number of non–tariff measures on Myanmar's dried legumes by importing countries.

The national export strategy (2018–2025) highlighted the significance of crops, including dried legumes, for the country's economic development. Additionally, the Ministry of Agriculture, Livestock, and Irrigation (MOALI) prepared Myanmar's agricultural development and strategy and investment plan (2018/19–2022/23) in 2016, emphasizing the importance of SPS measures. A study by de Brauw et al. (2020) underscored the importance of Myanmar's agricultural sector transformation through efficiency, quality assurance, traceability, and differentiation to fulfill the demand for high–quality products from domestic and international markets. Furthermore, Mao et al. (2021) emphasized the need for Myanmar to produce quality products for the markets by standardizing crop quality and product quality in order to secure its international markets.

Despite the crucial role of Myanmar's major export–earning crop and priority crops for policymakers, there needs to be empirical research on the impact of non-tariff measures such as SPS on the legumes(pules) trade. According to Hoekman and Nicita (2011), tariff and non-tariff measures remained substantial barriers to trade for low-income countries, even with preferential access programs. This research investigates whether non-tariff has been a trade impeding Myanmar's dried legume exports by analyzing its dried legume exports between 2010-2021 with its 20 importing countries.

1.2. Purpose of Research

There are two main objectives in this study,

1. To investigate the restrictiveness of major partner countries' SPS measures on Myanmar's vegetables exports.
2. To examine the economic impact of SPS measures on Myanmar dried legume exports.

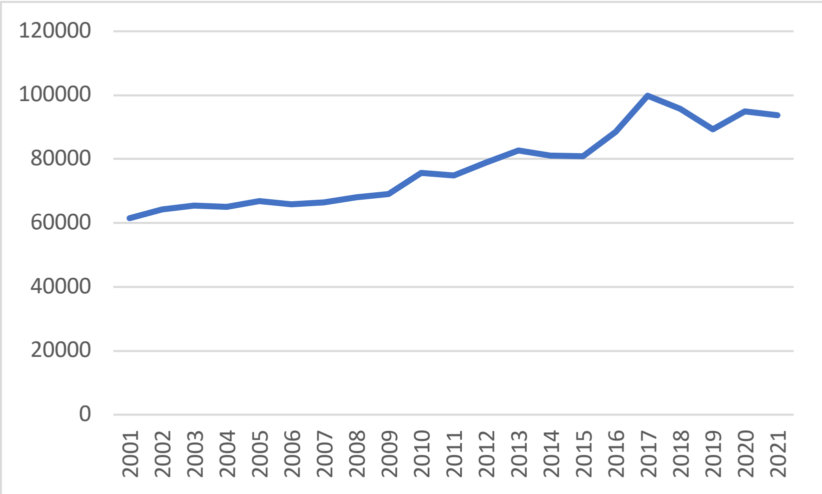
This thesis comprises 8 Chapters. Chapter One provides the research background and an overview of the world and Myanmar's legumes (pulses) production and trade. Chapter Two focuses on the literature review of NTMs on agricultural trade. Then Chapter Three describes non-tariff measures in agriculture, SPS agreements, and non-tariff measures applied to Myanmar legume (pulses) exports. Chapter Four discusses the data and research methodology, and Chapter Five focuses on the results and discussions. Chapter Six explores a conclusion, while Chapter

Seven describes the policy implication. Furthermore, the last chapter, Chapter Eight, addresses the limitations of the research.

1.3. Overviews on the World's Legumes Production and Trade

1.3.1. World legumes (Pulses[5]) production

Figure 1 World pulses production (1000 tons)



Source: FAOSTAT

Figure (1) illustrates the global legumes production trend from 2001 to 2021. During this period, global legumes (pulses) production exhibited an overall increasing trend, reaching its peak in 2017. Subsequently, there was a slight decrease to 88.97 million tons in 2021. During this year, dried bean production was the highest, with 27.7 million tons, followed by chickpea and dry pea,

[5] FAO report as pulses

with 15.87 million tons and 12.4 million tons, respectively. In 2015, dry beans production showed the highest volumes, with 26.29 million tons, followed by dry peas, with 11.9 million tons. The total area harvest of the pulses (legumes) decreased slightly after 2017. In 2017, the area harvest was 97.21 million ha, which was reduced to 95.43 million ha (hectare) in 2021. The highest production volumes among pulses, the dried bean was also the largest harvest area in 2021 with 36 million ha, covering 37.63% of the total harvest area. The harvest area of dry beans was more than twice than either of chickpeas or cowpeas; as their harvest areas were 15 millions ha respectively. The minor pulse, such as Vetches, had only 0.33 million ha harvest area, 0.34% of the total harvest area in 2021.

Based on the pulses (legumes) yield by hectogram (hg[6]) per hectare, the broad bean was the highest yield, with 21906 hg/ha in 2021. The largest production and harvest variety, dry beans yield was only 7716 hg/ha, the fourth lowest yield among 11[7] pulses in the same year. In one of the minor pulses, vetches were the second highest yield by 18775 hg/ha, chickpea was the fifth high-yielding variety, and pigeon pea was the seventh with 10578 hg/ha and 8616.00 hg/ha.

1.3.2. Major Legumes (Pulses) Producing Countries

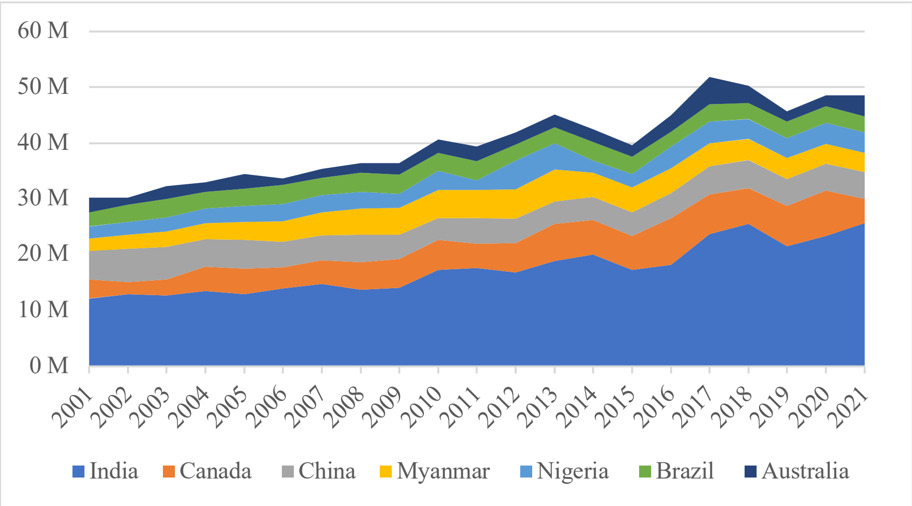
Regionally, the largest volume of global pulses production

[6] hg is equal to 100 grams, and hectare (ha) is a unit of area equal to 10,000 square meters or 2.47 acres

[7] Broad beans, vetches, dry peas, lupins, chickpeas, lentils, pigeon pea, dry beans, cow peas, bambara bean and other pulses (based on FAOSTAT)

comes from ASIA as Figure (2) illustrates the major legumes (pulses) producing countries from 2001-2021. India is the major pulses-producing country leading the world production volumes with 26 million tons in 2021, which was 3 million tons increased from 2020 production season. On average production between 2001-2021, Canada stands as the second highest pulses supplying country, with 5.28 million tons on average, followed by China with 5 million tons. Myanmar was the fourth major producing country, contributed a total of 48 million tons to world pulses production over the last decade. Other countries such as Nigeria, Brazil, and Australia have a significant role in the global pulses production industry.

Figure 2 Major legumes producing countries' productions



Source: FAOSTAT

The world's major pulse-producing country, India, contributed the global pulses production share of 19.8% in 2001 and

23.59% in 2011, and 27.38 % in 2021 (Table 1). The India production on global share increased to 7.58% between 2001 and 2021. Contrarily, China, including the mainland, despite increasing production quantities in recent years, its production share decreased from 8.133% in 2001 to 5.12% in 2021. The World's leading pulses exporting countries; Canada and Australia, have the same trend of decreasing global share compared to the two periods, 2011 and 2021. Like India, Myanmar's global production share increased over the same period, a slight rising from 3.495% in 2011 to 3.94% in 2021.

Table 1 Global legume production share

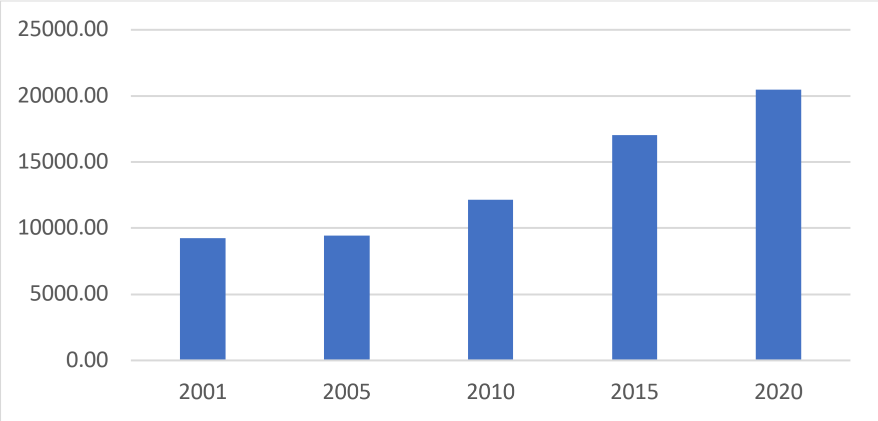
Country	2001	2011	2021
India	19.8	23.59	27.38
China	8.34	6.7	5.12
Canada	5.47	6.15	4.61
Australia	4.33	5.78	4.09
Brazil	4.01	4.62	4.02
Myanmar	3.63	3.49	3.94
Nigeria	3.6	3.28	3.63
Russia	2.89	3.17	3.34
Ethiopia	1.89	2.27	3.11
Others	37.72	34.78	35.65

Source: FAOSTAT

1.3.3. Global Pulses (Legumes) Trade

The global pulses trade in terms of tons (Figure 3) has shown an increase over a five-year interval measure between 2001-2020.

Figure 3 Global export quantity (1000 tons)

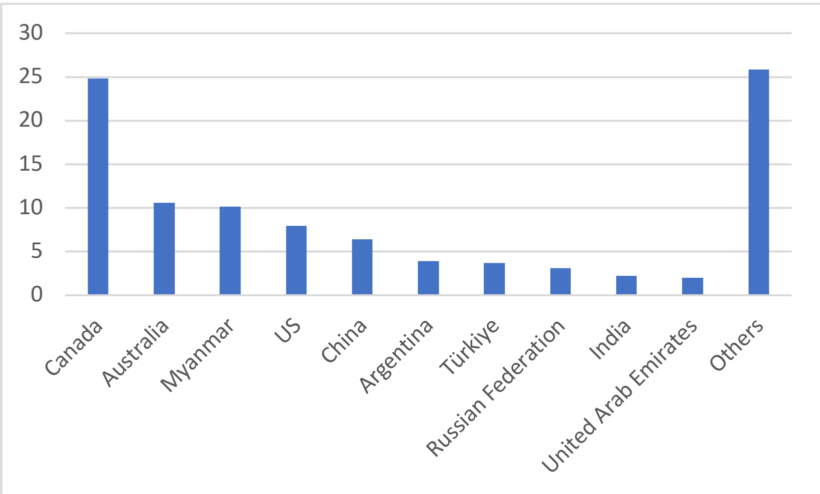


Source: FAOSTAT

According to trade map.org, from 2011-2021, Canada led the world's legumes (pulses) export market, followed by Australia and Myanmar (Figure 4). Over 12 years average (2010-2021), Canada has acquired 25% of the global export market, which is a 5% more than the combination of Australia and Myanmar, as these two countries have a slightly more than 10%, respectively. The World's top-producing country, such as India, has less than 5% of the global exports market share, and China has more than 8% of the global market in the same period.

India is the world's top legumes (pulses) producing and importing countries due to its largest vegan populations in the world (Diao et al., 2020). Recent year, China become the world major importing countries which surpassed Pakistan and the United States. World legumes consumption shows a different intake across the globe. Overall, the consumption in Asia and Africa is much higher than those of developed nations (Alamprese et al., 2022). The legumes (pulses), rich in proteins are major nutritional source for the developing countries and its usually refer as poor man's meat. Globally, the consumption of legume is under the recommended rate.

Figure 4 Average pulses(legumes) export share in the world (2011-2021)

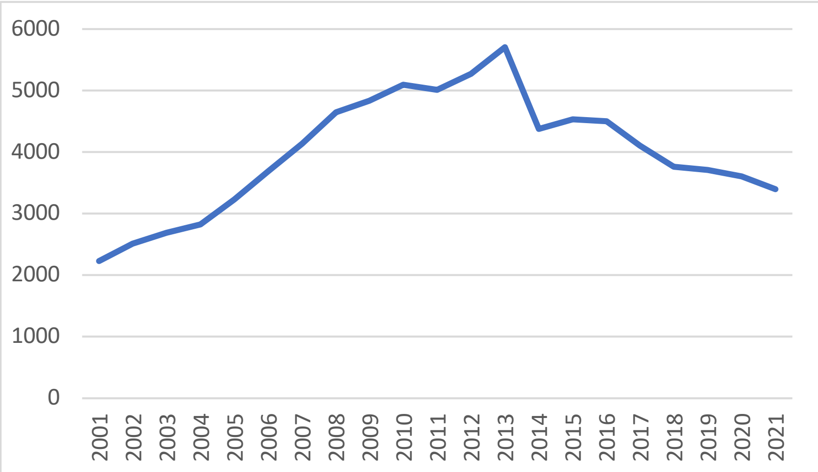


Source: Trade map.org

1.3.4. Myanmar Legumes (Pulses) Production

The Myanmar classification of pulses and beans differs from the UN and many other countries. For instance, Myanmar reported soybean and ground nuts under pulses and legumes, which were excluded from FOASTAT[8]. Under this section, the FAOSTAT data will be used as the primary source of discussion. According to MOALI, Myanmar cultivates about 20 types of pulses(legumes). Based on FAOSTAT, the total harvest area in 2021 as 3.6 million ha, in which dry beans was 2.6 million ha, almost a three-quarter (74.16%) of the total harvest area. The other two significant exporting varieties, such as pigeon pea and chickpea harvest areas were 0.4 and 0.3 million ha.

Figure 5 Myanmar pulses production



Source: FAOSTAT

Figure (5) describes the trend of Myanmar legume production from 2001 to 2021, which shows a decreasing trend after 2013. The highest production volumes can be seen in the 2013 production season, with 5.71 million tons. After a continuous decrease, the pulse production was only 3.4 million tons, slightly over 0.17 million tons higher than the 2005 production season.

[8] MOALI 2017, Myanmar Pulses Sector Development Strategy

The average yield of pulses in Myanmar in 2021 was 9442 hg/ha; among cultivated legumes in Myanmar, pigeon pea was the highest yielding variety in 2021 with 13571 hg/ha, 4955 hg/ha higher than the world average yield (8616.00 hg/ha). The other two major exporting varieties, such as dry beans and cowpeas, are the second and third yielding varieties, 9442 hg/ha and 9291 hg/ha, respectively, in the same year. Despite the fact that Myanmar harvests a higher yield than the world average yield in each variety of cultivated varieties, the overall yield revealed a decrease compared to 2010, where the overall average yield was 13027 hg/ha, and the highest yielding variety chickpea was 13861 hg/ha. The major factors that Myanmar harvest a higher average yield than the World are due to the favorable climatic condition and the country's successful adoption of high-yielding hybrid varieties (Rawal and Navarro 2019).

1.4. Overview of Myanmar’s Agricultural Trade

1.4.1. Agricultural Exports

According to the Central Statistical Organization of Myanmar (CSO), the agricultural industry contributed 21.0% of the country's GDP in the 2019-2020 fiscal year and employed 45% of the country’s labor force. Moreover, this sector plays the country's second most crucial export-earning industry after the natural resources sector. During the same fiscal year, Myanmar's agricultural export value accumulated a total of 1878 million USD.

Among major exported crops, pulses (legumes) held the highest export value reaching 770 million USD. Rice and rice products are the second most major agricultural export, generating 653 million USD in export earnings followed by maize with the export value of 126 million USD. Additionally, oil seed crops and fruits also contributed a significant amount to Myanmar's export earnings.

Table 2 Major Myanmar's agricultural crops export destinations in 2022

	Fruits	Rice	Maize	Legumes
China	59.70%	29.60%	7.90%	31.40%
India	31.80%			42.60%
Thailand			54.40%	
Philippines		9.80%		
Singapore				8.40%
Belgium		17.80%		
Vietnam			20%	

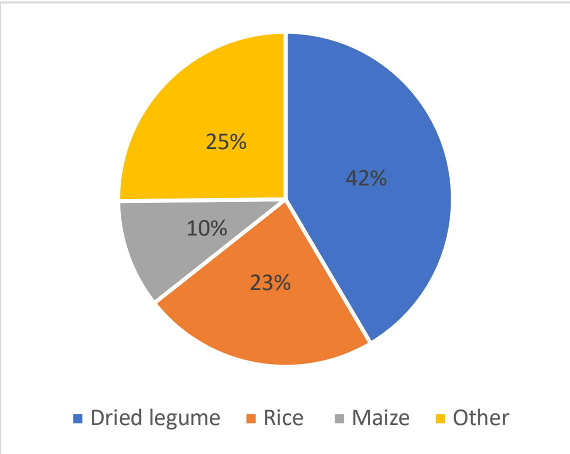
Source: Trade map.org

The primary destination of exported crops is concentrated in neighboring countries, with specific destinations varying depending on the crop type (Table 2). In the case of dried legumes, major export destinations include India, China, Singapore, and Pakistan. In 2022, India accounted for the largest share, occupying 42.6 % of Myanmar's dried legumes export market, followed by China with 31.4% and Singapore with 8.4%. China and Belgium have been major export destinations for rice exports for over a decade. After

2017, the Philippines became Myanmar's prominent rice export market alongside Bangladesh and became the third major Myanmar rice-importing country in 2019. In 2022, more than half (57.2%) of the rice exports were directed to China, Belgium, and the Philippines.

Regarding maize exports, Thailand, China, and Vietnam served as the primary export destinations. Vietnam surpassed China as the second-largest export market for Myanmar’s maize from 2019 onwards. In 2022, 54.4% of maize was exported to Thailand, 20% to Vietnam, and only 7.9% to China. China and India have been the primary destinations for the Myanmar fruit export market. In 2022, Myanmar exported 59.7% of its fruits to China and 31.8% to India.

Figure 6 Average share of Myanmar's agricultural export (2010-2021)



Source: Trade map.org

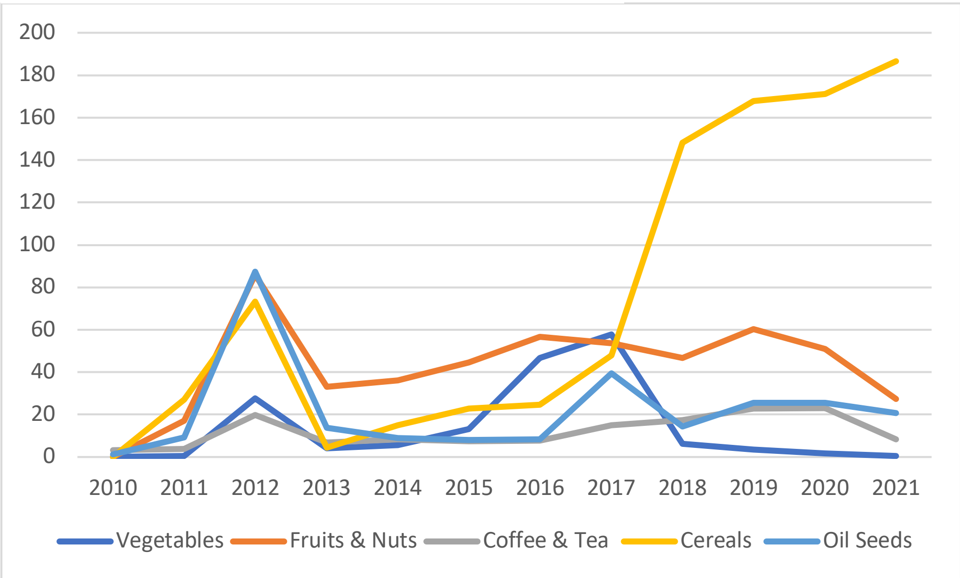
Figure (6) presents the average export shares of Myanmar’s major crops between 2010 and 2021. At HS 4 level, dried legumes were the second most exported commodities for the country between 2010−2021 after petroleum. This highlights the critical role of dried legumes in Myanmar's export market, as they constitute the primary exported crop, accounting for 42% of the total average export share. Following dried legumes, rice, the most cultivated crop in the country, holds the second largest average export share at 23%, and maize with 10%.

1.4.2. Agricultural Imports

The imports of major agricultural crops at HS 2 digit from 2010 – 2021 are shown in Figure (7). Over 12 years, there has been a consistent increase in the import value of cereals, particularly noticeable after 2013, with a significant surge occurring on 2017 onwards, with the import value of 47.78 million USD from 148.12 million USD in 2018 and reached 186.57 million USD in 2021. Similar increasing trends were observed for oil seed crops and fruits and nuts after 2013. However, the imports of vegetables, which peaked in 2017 at 57.79 million USD, had a noticeable declined to 6.22 million USD in 2020 and further to 0.63 million USD in 2021. The imports of coffee and tea exhibited a general increasing trend throughout the period.

Dried vegetables (HS 0712) emerged as the most imported vegetable crop, covering 60% of the total vegetables' imports. Among fruits and nuts, citrus, including oranges, held the majority share of imports, followed by apples and grapes. In 2021, citrus including orange accounted for 38.35% of whole fruits and nuts imports, while apples and pears represented 37.22%. Among coffee and tea, Myanmar's people's preference for tea over coffee is evident as the tea imports was higher. Regarding cereals, wheat and maize were the primary imported crops, with wheat occupying 77.75% and maize comprising 21.5% of total cereal imports. Soya beans dominated the importation of oilseed crops, accounting for nearly half of the imports (47.61%).

Figure 7 Myanmar's agricultural crops imports

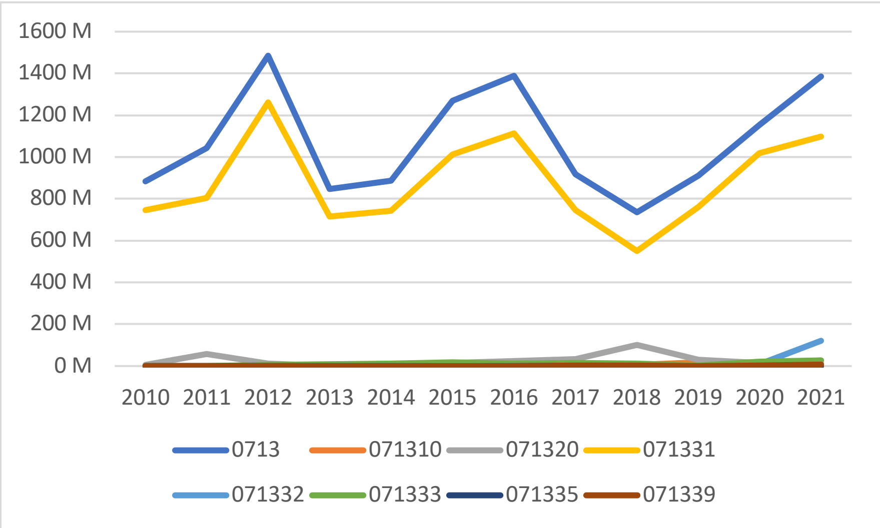


Source: UN Comtrade

By Country, China emerged as the major supplier of most imported crops in Myanmar. In 2022, China occupied a 77.9% share in Myanmar's imports of dried vegetables, 54% for citrus and orange, and 63.5% for apples and pears. Thailand, Myanmar's neighboring country, also plays a significant role in Myanmar's fruit import markets, supplying 31.5% of citrus and 31.9 % of apples in 2022. For major cereals imports such as wheat, Australia held a 70% share in 2022, followed by Singapore with 10.6%. India was a major supplier of maize with 50.7%, while Thailand accounted for 49.1% in 2022. In the same year, more than 85% of tea imports originated from India. Malaysia was a primary coffee supplier with a 70.1% share in Myanmar imports in 2022, followed by Vietnam, which accounted for a 28.2% share in the same period.

1.4.3. Dried Legumes[9] Exports

Figure 8 Myanmar's dried legumes export trend



Source: UN Comtrade

The export trend of Myanmar dried legumes is shown in

[9] HS 0713 dried legumes, HS 0713310 (peas), HS 0713320 (chickpeas), HS 071331(vigna mungo (l.) hepper or vigna radiata (l.) hepper, HS 071332 (small red (adzuki) beans), HS 071333 (kidney beans), HS 071335 (cow peas), HS 071339 (legumes n.e.c. in item no. 0713.3)

Figure (8). At HS 4 level (0713), the Myanmar export of dried legumes trend showed a fluctuation trend. Roughly, it had a sharp dropped and a sharp increase in a certain period. For instance, there was a sharp increase in export from 2011, with an export value of slightly more than 1000 million USD from more than 1400 million USD in 2012. However, that value dropped sharply and was only about 700 million USD in the following year. Nevertheless, a steady increase in export trends could be seen from 2018 onwards.

At HS 6 level, it becomes evident that Myanmar's primary dried legumes export is HS 071331, *Vigna mungo*[10] and (or) *Vigna radiata*[11]. This legume is the major exported commodity and significantly influences the overall export trend. Figure (8) illustrates how its export trend closely mirrors the dried legumes category. The highest export value for HS 071331 was recorded in 2012, reaching 1261 million USD, whereas the lowest was observed in 2018, with a value of 550 million USD. However, after 2018, a steady increase in export value was witnessed and reached 1097 million USD in 2021. Among other legumes, HS 071320 (chickpea) emerged as the second-highest export-earning variety, accumulating 308 million USD between 2010-2021, followed by 071332 (small red (adzuki) beans) and 071333 (kidney beans) with 132 million USD, respectively. The remaining exported legumes, such as HS 071310 and HS 071335 (cow pea), contributed to the

[10] Black gram
[11] Green gram (Mung bean)

country's export earnings with the total of 59 million USD and 4 million USD during the same 12 years periods.

1.5. Myanmar and Regional Trade Integration

Myanmar become a member of WTO in 1995. As a least developed country (LDC), Myanmar is offered a tariff-free exports to certain countries by the European Union under the program of "Everything but Arms" and Generalized System of Preference (GSP) by many developed countries, including the United States and Australia. However, many countries have sanctioned or suspended the preferential tariff treatment over Myanmar due to military human rights violations.

1.5.1. ASEAN Trade In Goods Agreement (ATIGA)[12]

The ASEAN Trade in Goods Agreement (ATIGA) was signed and ratified by ASEAN member nations on February 26, 2009, with the aim of promoting free movement of goods among member states and creating a unified market and production base. The agreement was seen as a step towards achieving greater economic integration in the region, leading to the establishment of the ASEAN financial community by 2015. As per UNCTAD (2021), tariff lines for ASEAN 6 countries have been reduced to 99.65% under ATIGA, while CLMV countries (Cambodia, Laos, Myanmar, and Vietnam) have seen reductions ranging from zero to 5% on

[12] https://asean.org/asean-trade-in-goods-agreement-atiga/

98.86% of tariff lines.

In 2015, ASEAN introduced the ASEAN Economic Community Blueprint 2025, aimed at promoting regional economic cooperation. It strives to implement an ASEAN-wide self-certification scheme and enhance facilitation measures under ATIGA. The agreement also addresses non-tariff measures in Chapter 4 (Article 40-44) and Sanitary and Phytosanitary measures in Chapter 8 (Article 79-85).

1.5.2. ASEAN-China Free Trade Agreement (ACFTA)[13]

ACFTA became effective on January 1, 2010. Under the agreement, the commitment to reduce and eliminate the tariff lines are different as ASEAN 6 and China to remove their tariff on January 1, 2010, for normal tract. However, the group of CLMVs is different as Myanmar to implement a zero-tariff rate by 2016. The ASEAN-China framework also established the Early Harvest Program to allow the members to protect their domestic agricultural products. Crops under this program could delay their tariff reduction for certain periods. According to the ACFTA tariff reduction schedule, China eliminated its MFN tariff rates in 2010. From that year, Myanmar could access the China market with zero tariff rates. In 2012, the members of the agreement also decided to include measures relating to technical barriers to trade and sanitary and phytosanitary concerns as part of the agreement.

[13] Please visit ASEAN website for detail information

1.5.3. ASEAN–Korea Free Trade Agreement (AKFTA)

On January 1, 2010 the AKFTA was activated. Through AKFTA, Korea eliminated tariffs for all tariff lines under the normal tract since the agreement came into force on January 1, 2010; however, unlike ACFTA, the agreement set sensitive and highly sensitive lists for specific products. Korea put many crops, including dried legumes/pulses, on the highly sensitive list to delay its tariff elimination schedule. The ASEAN 6 and Korea agreed to reduce their tariffs on those highly sensitive products by 50% of tariff rates not later than January 1, 2016.

1.5.4. ASEAN–India Free Trade Agreement (AIFTA)

The AIFTA which came into force on January 1, 2010. Like ACFTA, AIFTA also divides ASEAN members' tariff schedule dates for ASEAN 6, India, and CLMV. Under AIFTA, tariff lines are divided into normal tract, sensitive, special products, highly sensitive lists, and exclusion list. Products under the exclusion list are not committed to reducing tariff rates. Of which India put 10.7% of tariff lines into exclusion lists (Harilal, 2010). Interestingly India put Pea (HS 0713.10) on the exclusion list. However, Myanmar's major exporting legumes are under normal track 1, in which India agreed to remove the tariff by December 31, 2013, from which Myanmar enjoys zero tariff rates for exports.

1.5.5. ASEAN– Australia–New Zealand Economic Relations (AANZFTA)

In 2009, members signed an agreement to establish FTA, which came into force on January 1, 2010. The agreement covers commitment and obligation beyond goods, services, and investment trade. Moreover, the agreement covers provisions concerning electronic commerce, intellectual property, competition policy, standards, SPS measures, and the mobility of businesspersons.

1.5.6. ASEAN– Hongkong, China Free Trade Agreement (AHKFTA)

AHKFTA is one of the latest FTAs to be established between ASEAN and Hongkong, China. It came into force on June 11, 2019, for Hongkong, China, and half of ASEAN member States, such as Thailand, Vietnam, Singapore, Myanmar and Laos People's Democratic Republic. The members agree not only to remove tariffs but also to improve access for intraregional service providers and eliminate non–tariff barriers to trade.

1.5.7. The regional comprehensive economic partnership (RCEP)

Myanmar as one of the members of ASEAN signed RCEP in 2020, November 15 along with other nine ASEAN members, Australia, China, Japan, New Zealand, and South Korea, to activate the world's largest regional free trade agreement. Which became effective on January 1, 2022.

1.5.8. The Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)

Aside from being a member of ASEAN, Myanmar also participates in BIMSTEC, an organization with the objective of fostering collaboration and integration among nations situated in the Bay of Bengal region. BIMSTEC's focus areas include trade and investment, energy, transport, and tourism.

1.5.9. Greater Mekong Subregion (GMS) Economic Cooperation Program

Myanmar is also a member of GMS Economic Cooperation Program, established in 1992 to promote economic cooperation and integration among countries in the Mekong River basin. The GMS program focuses on infrastructure development, trade and investment, and environmental sustainability.

1.5.10. Bilateral Trade Agreement

Myanmar also engage a bilateral trade agreement with China, India, Bangladesh, Thailand, Laos, Sri Lanka, Malaysia, Philippines, Vietnam, Pakistan, and South Korea. In addition, Myanmar and the United States signed Trade and Investment Framework Agreements in May 2003; however, it has been suspended in response to the Military Coup in February 2021. It also engaged a border trade agreement with China, India, Bangladesh, Thailand, and Laos. Myanmar also has an investment agreement with Israel and Vietnam; however, both deals have not yet implemented.

Chapter 2. Literature Review

The United Nations Conference on Trade and Development (UNCTAD) defines non-tariff measures as "non-tariff measures (NTMs) are policy measures other than tariffs that can potentially have an economic effect on international trade in goods."

The world trade organization (WTO) establishment prompted several countries to liberalize their tariff policies on international trade. This subsequent liberalization has been accompanied by a discernible proliferation of nontariff measures (NTMs), capturing researchers' attention and scholarly scrutiny. Consequently, there is much literature on the effects of nontariff measures application on international trade. However, their findings are inconclusive over nontariff measures such as "standard as a catalyst" versus "standard as barriers." However, many studies have proved that nontariff measures especially SPS and TBT measures can act as barriers to trade, particularly for developing countries exporting to high-income (Disdier et al., 2008; Jongwanich, 2009; Hoekman & Nicita, 2011; Winchester et al., 2012; Ferro et al., 2015; Khaliqi et al., 2018).

To begin with the positive effects of NTMs on agricultural trade, Dong et al. (2022) studied the SPS measures role in the quality upgrading of imported agricultural products based on China's imports from 156 countries from 2002-2017 by using the

Proximity-to-the-Frontier Model. Their findings claimed that implementing SPS measures yield a long-term beneficial effect on quality upgrading. Similarly, Wood et al. (2017) concluded that China's SPS measures positively affected Korean agricultural exports and increased New Zealand agricultural exports before China made a free trade agreement with New Zealand.

Hien et al. (2022) evaluated EU's NTMs, such as SPS and TBT, impacts on Vietnam's Agricultural exports, such as HS08, HS09, and HS10, using the panel data from 2001-2020. They found that EU's SPS and TBT measures had positively and significantly impacted Vietnam's agricultural exports. Specifically, SPS has a more noticeable impact than TBT as the EU's additional SPS measures enhanced 1.24% increased in Vietnam's exports of agricultural products. These findings are similar to the earlier studies by Gibson and Wang (2018). Their study also proved that a favorable correlation between SPS measures and the exports.

Wongmonta (2021) evaluated China's SPS measures impact on Thai fruit exports as by dividing fruits into fresh, frozen, and dried and others. The study used the panel data which covers 17 items of Thai fruit that are exported to China from 2000-2018. The study revealed that SPS measures applied by China had positively and substantially affected Thai fruit exports.

There are also specific SPS studies, such as agricultural trade food safety measures by Maximum Residue Limits (MRLs).

Sharma et al. (2022) estimated MRLs impacts on the world's top five peanut imports. The study showed a propellant effect of MRLs standards on peanuts import value and quantity of for those importers. A similar study was conducted by Traoré and Tamini (2022) on the impact of MRLs for pesticides focusing on the mango productions and its trade of African countries with OECD members. The findings suggest that strict MRLs imposed by developed countries can hinder production in African nations while promoting trade.

Table 3 Positive effects of NTMs on agricultural trade

Author, Year	NTMs type	Findings
Yinguo Dong, Yihao Shen, Jiayu Chen (2022)	SPS	SPS measures in China positively affect the quality upgrading of imported agricultural products
Jacob Wood, Jie Wu, Yilin Li, and Haejin Jang (2017)	SPS	Positive effects on Korean exports and New Zealand before FTA with China
NguyenThi Thu Hien, VuThi Thanh Huyen, PhanThe Cong,Pham Minh Da (2022)	SPS, TBT	EU's additional SPS and TBT increase Vietnam's exports by 1.24% and 2.34%
Mark J. Gibson and Qianqian Wang (2018)	SPS	Positive relationship between SPS measures and exports

Sasiwooth Wongmonta (2021)	SPS	Positive and substantial effects
Drishti Sharma, Murali Kallummal, Seema Sangita (2022)	SPS (MRLs)	SPS (MRLs) positively impacts peanut imports
Ousmane Z Traoré and Lota D Tamini (2022)	MRLs	promote Mango trade

On the other hand, other literature has shown that NTMs have a trade impeding effects on global trade. Nga et al. (2023) investigated the impacts of non-tariff measures on agricultural products and seafood products export of Vietnam's major export destination includings the US, EU, China, and Japan. The empirical analysis claimed that SPS measures and countervailing measures (CM) had negatively effected. A similar trade impeding finding was found by Mustafa et al. (2022), who examined China's adoption of SPS measures and TBT impact on its import activities between 1995 and 2018. The study found that China's initiation and enforcement of SPS and TBT measures have declined imports from other World Trade Organization member countries.

A study conducted by Nabeshima in 2021 investigated how additional compliance requirements affect trade margins. The outcome indicate that regulatory burdens have a detrimental effect on the trade especially on extensive margin, leading to more limited variety of goods being exported. In terms of the intensive margin, the study reveals those regulatory obligations result in a reduction in the quantity margin but an increase in the price margin. Consequently, intensive margin of trade has effected negatively.

Galloway (2022) applied the PPML estimator along with monthly trade data from the eight main beef exporting countries to Japan between 2010 and 2019. The findings indicate that the trade values of USA beef export declined by 2.8%. It was observed that the SPS measures implemented had a trade-restrictive effect. However, the study also indicates that the restrictiveness of these measures decreased gradually over time.

Fiankor, Curzi, & Olper (2020) examining diverse categories of standards for agri-food effects on trade of Peru exports based on the firm level. According to the results, it was found that the agri-food exports of Peruvian firms were negatively affected only by the NTMs that were most restrictive in nature. On the other hand, regular SPS measures positively affect trade. Peterson et al. (2013) also indicated that implementing phytosanitary treatments tends to decrease trade. However, the level of trade restrictions imposed by these measures significantly decreases when exporters acquire experience, and it completely disappears as they surpass a specific threshold.

Thoung (2018) quantified the economic impacts of major

Vietnam’s rice importing countries’ SPS measures on its exports between 2000−2015 by applying gravity model of international trade. The result showed imported−countries’ SPS measures had hindered Vietnam’s rice exports. Similar findings were claimed by Wood et al. (2017) in which China’s SPS measures lowered the agricultural exports from Japan and Korea between 2002−2014.

Nguyen and Jolly's (2020) research concentrated on how meeting VietGAP and international standards affected the Pangasius value chain. By engaging with processing firms, exporting firms, and farmers, the study discovered substantial modifications in the industry's structure and the manners of the actors along the marketing channel. Due to the strict quality requirements of US and EU standards, Vietnamese exporters sought out markets with fewer restrictions, resulting in improved marketing strategies and a change in exports. Nevertheless, farmers considered the adoption of VietGAP a costly undertaking with limited advantages.

Hejazi, Grant & Peterson (2022) examined MRLs impact on fresh fruits and vegetables trade. Their findings revealed that stricter MRLs imposed by importers lead to an 8.8% reduction in bilateral trade. When specifically analyzing MRLs between the US and EU partners, the impact of stricter MRLs is highly significant, resulting in a 13.8% decrease in US exports of fruits and vegetables to EU members. This finding is similar to Wei, Huang, and Yang (2012), who found that increasing coverage of tea safety standards related to regulatory pesticides also restricted China's tea exports.

Table 4 Negative effects of NTMs on agricultural trade

Author, Year	NTM type	Findings
Le Thi Viet Nga, Doan Nguyen Minh, Phan The Cong (2023)	SPS, CM	impeding agricultural exports
Amir Mustafa, Zahid Mehmood Akhtar, Muhammad Sohail (2022)	SPS, TBT	reduced imports
Nabeshima in 2021	regulatory burden	narrower range of exported goods
Jeffrey Galloway (2022)	SPS	US beef imports to Japan decreased trade values by 2.8%
Daniele Curzi, Monica Schuster, Miet Maertens, Alessandro Olper (2020)	NTM	reduce agri-food exports
Everett Peterson, Jason Grant, Donna Roberts, Vuko Karov (2013)	PS	reduce trade.
Nguyen Thi Thu Thoung (2018)	SPS	reduce rice exports
Jacob Wood, Jie Wu, Yilin Li, and Haejin	SPS	reduce Japan and US exports to China

Jang (2017)		
Nguyen and Jolly (2020)	VietGAP	shift in exports and costly
Mina Hejazi, Jason H. Grant and Everett Peterson (2022)	MRLs	decrease bilateral trade by 8.8%
Guoxue Wei, Jikun Huang, Jun Yang (2012)	Safety standards	restricted China's teat exports

The magnitude of NTMs show the varying impact depending on sectorial and the country involved. However, one important outcome of NTMs studied is that it becomes a barrier on trade, especially for developing countries (Hoekman and Nicita, 2011). The existing body of literature has not documented any empirical study examining SPS measures effects on the dried legumes trade, with a specific focus on Myanmar's legumes export. Consequently, this research intends to address this significant research gap by providing an in-depth analysis.

Chapter 3. Non−Tariff Measures on Agriculture

3.1. Non−Tariff Measures Classification by Chapter

Non−tariff Measures (NMTs) that are used in international trade, have a classification system developed MAST group (Multi−Agency Support Team) established by UNCTAD in 2006. Its goal is to develop a standardized system for classifying and understanding the various NTMs used to restrict or regulate trade. Technical and non−technical measures are the two main categories included in the UNCTAD classification scheme. Technical measurements include standards for products, criteria for certification and testing, and other standards for product quality or safety. Measures relating to services trade, investment, intellectual property, public procurement, and competition policy are included in non−technical measures. UNCTAD further divides NTMs into subgroups within each category based on the specific function or impact.

Table 5 Classification of non−tariff measures by chapter

Imports	Technical measures	A	Sanitary and Phytosanitary measures
		B	Technical barriers to trade
		C	Pre−shipment inspection and other formalities
	Non−technical measures	D	Contingent trade−protective measures

		E	Non-automatic import licensing, quotas, prohibitions, quantity-control measures, and other restrictions, not including sanitary and phytosanitary measures or measures relating to technical barriers to trade
		F	Price-control measures, including additional taxes and charges
		G	Finance measures
		H	Measures affecting competition
		I	Trade-related investment measures
		J	Distribution Restrictions
		K	Restrictions on post-sales services
		L	Subsidies and other forms of support
		M	Government procurement restrictions
		N	Intellectual property
		O	Rules of origin
Exports		P	Export-related measures

Source: UNCTAD (2021)

As described in Table (5), the Chapter A is dealing with the sanitary and phytosanitary measures. This chapter covers various measures designed to restrict substances, enhance food safety, and prevent the spread of pest and diseases. This Chapter also encompasses conformity-assesment measures associated with ensuring food safety, including testing, inspection, and quarantine (Table 6).

A thorough list of technical measures, also referred to as technical trade barriers, is provided in Chapter B. Measures about product characteristics like technical requirements and quality standards, as well as the concurrent processes and production techniques, are covered in this chapter. Additionally, Chapter B includes labeling and packaging policies related to national security, consumer safety, and environmental protection. All conformity-assessment measures for sanitary and phytosanitary requirements are included in Chapter A for technical requirements. This covers tasks on testing, certification, and inspection.

Chapter covers pre-shipment inspection procedures and other trade-related formalities. The subject of Chapter D is temporary trade protectionist measures in order to protect the domestic industry from unfair competition. Chapter E deals with non-automatic import licensing, quotas, prohibitions, and other restrictions. Chapter F describe price-control measures, such as increased taxes and fees, while Chapter G deals with financial-related measures.

The topic of competition-affecting measures, such as anticompetitive practices, is covered in Chapter H. In Chapter I, trade-related investment measures are covered, and in Chapter J, distribution limits are outlined. Chapter K discusses limitations on post-sales services, while Chapter L focuses on subsidies and other types of support. Chapter M describes constraints on government procurement, while Chapter N discusses policies related to intellectual property. Rule of origin and export related regulations are covered in Chapter O and Chapter P.

Chapter A of SPS measures are categorized as in Table 6.

Table 6 Sanitary and Phytosanitary Measures Classification

A1 Prohibitions/restrictions of imports for sanitary and phytosanitary reasons A11 Prohibitions for sanitary and phytosanitary reasons A12 Geographical restrictions on eligibility A13 Systems approach A14 Authorization requirement for sanitary and phytosanitary reasons for importing certain products A15 Authorization requirement for importers for sanitary and phytosanitary reasons A19 Prohibitions or restrictions of imports for sanitary and phytosanitary reasons, not elsewhere specified
A2 Tolerance limits for residues and restricted use of substances A21 Tolerance limits for residues of or contamination by certain (non-microbiological) substances A22 Restricted use of certain substances in foods and feeds and their

contact materials
A3 Labelling, marking and packaging requirements A31 Labelling requirements A32 Marking requirements A33 Packaging requirements
A4 Hygienic requirements related to sanitary and phytosanitary conditions A41 Microbiological criteria of the final product A42 Hygienic practices during production related to sanitary and phytosanitary conditions A49 Hygienic requirements not elsewhere specified
A5 Treatment for elimination of plant and animal pests and disease-causing organisms in the final product or prohibition of treatment A51 Cold or heat treatment A52 Irradiation A52 Irradiation A59 Treatments to eliminate plants and animal pests or disease-causing organisms in the final product not elsewhere specified or prohibition of treatment
A6 Other requirements relating to production or post production processes A61 Plant-growth processes A62 Animal-raising or -catching processes A63 Food and feed processing A64 Storage and transport conditions A69 Other requirements relating to production or post production

processes not elsewhere specified
A8 Conformity assessment related to sanitary and phytosanitary conditions A81 Product registration and approval requirement A82 Testing requirements A83 Certification requirements A84 Inspection requirements A85 Traceability requirements A851 Origin of materials and parts A852 Processing history A853 Distribution and location of products after delivery A859 Traceability requirements not elsewhere specified A86 Quarantine requirements A89 Conformity assessment related to sanitary and phytosanitary conditions not elsewhere specified
A9 Sanitary and phytosanitary measures not elsewhere specified

Source: UNCTAD (2021)

3.2. Overview of SPS Agreements[14]

Following the goals and objectives stated in Article 1 of the SPS Agreement; food safety, plant and animal life, and health are all covered. The fundamental rights and obligations of WTO members to apply SPS measures are laid out in Article 2, this provision also specifies that these measures ought to be implemented only to the extent required, grounded in scientific principles, supported by

[14] Visit WTO website for detail agreements https://www.wto.org/english/tratop_e/sps_e/spsagr_e.htm

sufficient scientific evidence, and not employed in a discriminatory or unjustifiable manner. Some other important agreements are as follows;

3.2.1. Harmonization

The SPS Agreement's Article 3 enables parties to coordinate their policies, which should be based on international norms, prescriptions, and guidelines. The standards established by the Codex Alimentarius Commission (CAC), the International Office of Epizootics (OIE), and the International Plant Protection Convention (IPPC) in the domains of food safety, plant life and health, and animal life and health are acknowledged by the Agreement as the standard measures. A greater degree of measures can only be used when there is a scientific basis. Countries' measures that adhere to international standards are considered necessary and consistent with the Agreement.

3.2.2. Equivalence

The idea of equivalency concerning SPS measures is described in Article 4. This paragraph states that if an exporting member can prove objectively that their measures offer the same protection as an importing member, other members should recognize those measures as equivalent. However, the importing member must be permitted access for inspection and testing. The member must also consult in order to reach bilateral and multilateral agreements regarding the recognition of particular sanitary or phytosanitary measures.

3.2.3. Risk Assessment

A framework for ensuring that the implemented controls are consistent in protecting human, animal, and plant life or health while limiting trade consequences is laid forth in the SPS agreement of Article 5. It also emphasizes the significance of risk evaluations that consider productions, inspection techniques, and scientific data. When there is insufficient scientific evidence, provisional actions should be taken; however, they must be reassessed within a fair amount of time. The Agreement urges members to avoid unfair or random discrimination while deciding on the required level of protection and to ensure that their actions do not lead to excessive trade restrictions beyond what is necessary to achieve the desired level of protection. Additionally, this Agreement gives each member the authority to request measure from another if they consider such measures would restrict trade or violate international norms.

3.2.4. Adaptation to Regional Conditions

The SPS Agreement's Article 6 highlights the significance of members' measures tailored to the distinctive features of the region from which the product originated and is being sent. This article urges members to locate and recognize pest- and disease-free regions as well as areas with low pest and disease prevalence. The Agreement also mandates that the exporting nations disclose details on areas free of pests and diseases.

3.2.5. Transparency

Transparency is emphasized as a critical component of the SPS Agreement's proper operation in Article 7. The notification procedures that must be followed when introducing regulations, the publication of regulations, the provision of enough time from interested parties and creating an inquiry point, following the notification procedures, and general reservation are all outlined in the Agreements' Annex B. Information sharing between delegations and the SPS Committee should occur during the meeting to encourage transparency.

3.2.6. Technical Assistance

Article 9 of the SPS Agreement encourages WTO members to provide technical assistance to each other through bilateral or international organizations. This assistance can come in the form of advice, credits, donations, and grants, and it should focus on helping developing countries meet the requirements of their trading partners and expand their market access opportunities. Infrastructure and research support can also be provided to establish a national regulatory body.

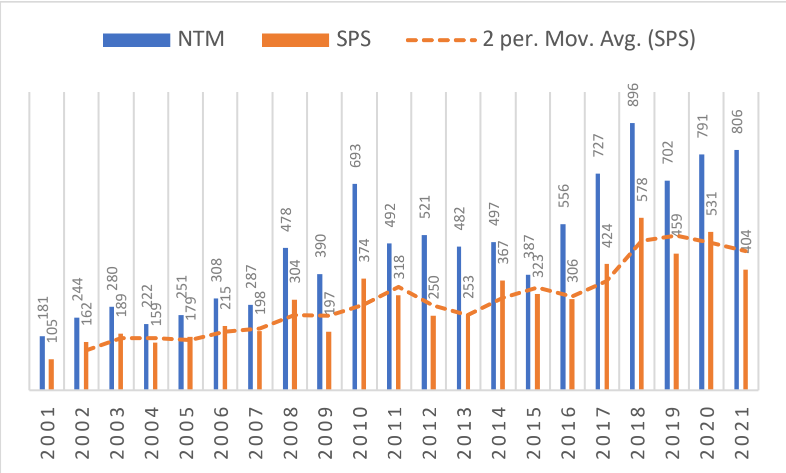
3.2.7. Special and Differential Treatment

The WTO members are urged by Article 9 of the SPS Agreement to make it easier to provide technical support, whether bilaterally or through international organizations. The support might come in the form of infrastructure, research, and technical support for establishing a national regulatory organization. To fulfill the measure needs of the importing countries and to increase the developing countries' prospects for market access, the help should take the form of recommendations, credits, contributions, and grants.

3.3. Trend of Non-Tariff Measures on Agriculture[15]

Overall, there was an increasing trend of both NTMs and SPS measures in agricultural crops (Figure 9). During the period of 2001 to 2010, there was a notable rise in the implementation of non-tariff measures (NTMs), with NTMs total number enforced escalating from 181 in 2001 to 693 in 2010. SPS measures also showed an increasing trend as it was only 105 in 2001 and reached a total of 374 in 2010. During this period, the number of total NTMs increased in 283% and SPS in 256%.

Figure 9 Non-tariff Measures on agriculture

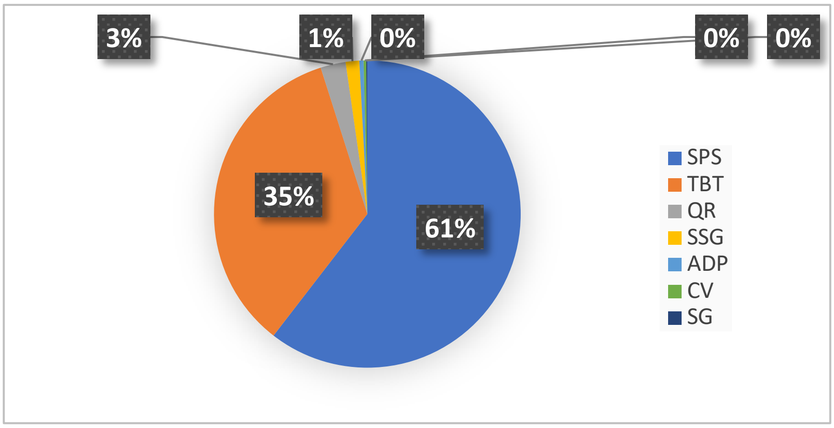


Source: WTO (I-TIP)

---
[15] HS: 06-15

In latter period (2010–2021), non–tariff measures applied in agriculture showed an overall fluctuation trend. In 2010, the total NTMs applied in the agricultural sector reached 693, in which SPS occupied more than half of the total measures (53.96 %). After 2010, the measure experienced a decreasing trend and reached its lowest in 2015 at 387 total NTMs and 323 SPS measures. However, in terms of SPS percent share in total NTMs, 2015 was the highest, with 83.46%. After 2016, the increasing trend was again accelerated and reached its peak in 2018 with 896 total NTMs and 578 SPS measures. There was a slight increase in total NTMs from 2019–2021; however, the SPS measures decreased after 2020.

Figure 10 Total NTMs applied on agriculture by type (2001-2021)



Source: WTO (I–TIP)

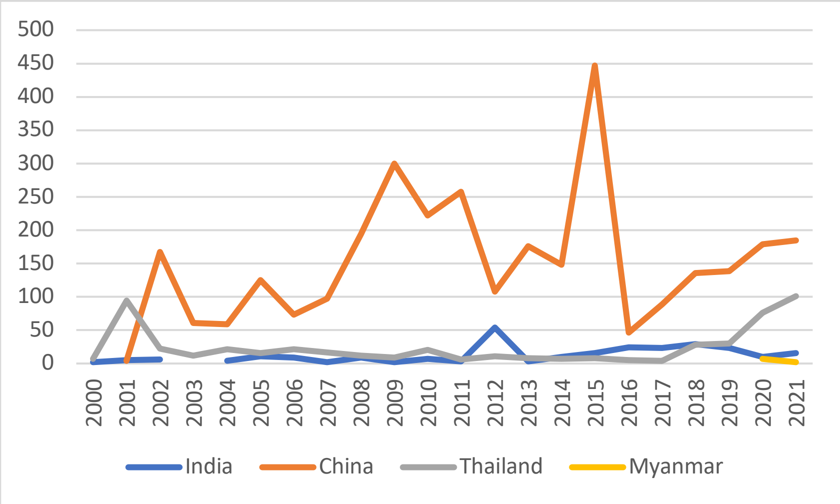
The composition of Non–Tariff Measures (NTMs) applied in agricultural sector (HS; 06–15) can be seen in Figure (10). Even though TBT (technical barrier to trade) is the highest number of NTMs applied in the overall sector, the SPS is the highest in the agricultural sector. SPS measures occupied 61% of total NTMs, the highest in all measures, followed by the TBT with 35%. In other words, SPS and TBT measures are the primary non-tariff measures applied in Agriculture, accounting for 96% of the total measures. The quarantine requirements (QR) accounted for only 3%, and other measures such as special Safeguards (SSG), anti-dumping (ADP), countervailing (CV), and safeguards (SG) are negligible.

3.4. Overview of Myanmar and Selected Trading Partners' NTMs on Agriculture[16]

The non-tariff measures on agriculture by Myanmar and selected trading partners such as China, India, and Thailand showed diverse frequencies between 200 to 2021. Figure (11) depicts that China has the highest amount number of NTMs, followed by Thailand. India' highest application of NTMs on agriculture can be seen in 2012, with over 50 in total, while Myanmar reportedly had 9 measures in total.

[16] Agriculture (HS 01-24)

Figure 11 Myanmar and partners' NTMs on agriculture



Source: WTO (I-TP)

3.4.1. Myanmar's NTMs on Agriculture

According to WTO-ITPs data Myanmar have only nine total NTMs, 7 in 2020 and 2 in 2021 from 2000-2021. However, based on UNCTAD (2016, 2019) report, Myanmar did not notify its applied NTMs to WTO. The notified NTMs is composed of 8 SPS and 1 TBT measure. In Myanmar, the Ministry of Agriculture, Livestock, and Irrigation (MOALI) is the primary institution to develop the NTMs regulations and the Ministry of Commerce is leading notifying institution (Doan, 2019).

3.4.2 China's NTMs Measures on Agriculture

After becoming a member of WTO in 2001, China has imposed a dramatic amount of NTMs for specific products. In China, 29 different authorities issued NTM-related regulations, of which more than 80% of NTMs are issued by five major institutions including Standardization Administration of the People's Republic of

China, General Administration of Quality Supervision, and Inspection and Quarantine (UNCTAD, 2020). Table (7) shows the detailed NTMs China applied on agriculture covering 2000 to 2021. Overall, the highest volumes of NTMs can be seen in 2015, with 447 measures followed by 300 in 2009. After 2015, there was a sharp drop, with 46 total measures in 2016, again increasing from 2017 onwards and reaching 185 in 2021. By type of NTMs, TBT and SPS measures were the main regulations that used on agriculture, with 51.41%, and 43.07%. In other words, China applied a higher number of TBT measures than SPS measures in agriculture; overall, the world's NTM measures show a higher number of SPS in that sector. Other measures such as antidumping (ADP), countervailing (CV), quantitative restriction (QR), and safeguard (SG) have only 5.52%.

Table 7 China's non-tariff measures

	NTM type						
Year[17]	ADP	CV	QR	SG	SPS	TBT	Total
2001	0	0	4	0	0	0	4
2002	0	0	0	0	155	12	167
2003	5	0	0	0	28	28	61
2004	0	0	0	0	37	22	59
2005	2	0	2	0	15	106	125
2006	6	0	0	0	4	63	73
2007	4	0	0	0	4	89	97
2008	2	0	0	0	7	185	194

[17] Implementation year

2009	6	0	4	0	90	200	300
2010	7	1	0	0	153	61	222
2011	2	0	2	0	166	88	258
2012	5	1	2	0	25	75	108
2013	6	0	0	0	90	80	176
2014	5	0	28	0	68	47	148
2015	11	0	0	0	339	97	447
2016	5	1	0	1	12	27	46
2017	24	1	0	0	8	56	89
2018	15	2	0	0	54	65	136
2019	14	1	0	0	33	91	139
2020	4	4	0	0	45	126	179
2021	0	0	0	0	51	134	185
Total	123	11	42	1	1,384	1,652	3,213

Source: WTO(I-TP)

3.4.3. India's NTMs on Agriculture

According to UNCTAD (2020), more than 50% of NTMs were issued by the Ministry of Health and Family Welfare and Ministry of Agriculture and Farmers Welfare among the 17 institutions responsible for NTM-related regulations. Moreover, it stated that the Ministry of Agriculture and Farmers Welfare is the central institution that issues SPS measures. Comparing the two periods between 2000-2010 and 2011- 2021, the applied NTMs in agriculture by India had shown a significant increase. In the former period, NTM measures are only one-digit numbers throughout the year and the combination of 57 total measures. On the other hand, the former period 2010−2021 mostly had 2−digit number measures and accumulated 221 measures in total. Unlike China, India has applied a higher number of SPS measures (164) than TBT measures (37) on agriculture. Moreover, India has more quantitative restriction (QR) measures than TBT, the second most applied NTMs after SPS.

Table 8 India's non−tariff measures

	NTM type						
Yea[18]	ADP	CV	QR	SG	SPS	TBT	Total
2000	0	0	0	0	2	0	2
2001	5	0	0	0	0	0	5
2002	2	0	0	1	3	0	6
2004	0	0	0	1	3	0	4
2005	0	0	0	0	10	1	11
2006	0	0	0	0	9	0	9
2007	0	0	0	0	2	0	2
2008	5	0	0	0	3	1	9
2009	0	0	0	0	2	0	2
2010	0	0	0	0	7	0	7
2011	0	0	0	0	3	0	3
2012	0	0	49	0	5	0	54
2013	0	0	1	1	1	0	3
2014	0	0	0	0	10	0	10

[18] Implementation year

2015	0	0	0	0	16	0	16
2016	0	0	0	0	34	0	34
2017	0	0	0	0	19	4	23
2018	0	6	0	0	19	4	29
2019	6	0	0	0	9	8	23
2020	0	0	0	0	4	6	10
2021	0	0	0	0	3	13	16
Total	18	6	50	3	164	37	278

Source: WTO(I-TP)

3.4.4. Thailand's NTMs on Agriculture

Laksanapnyakul et al. (2019) stated that the NTMs in Thailand are the highest among ASEAN members. The prominent institutions which issued NTM-related regulations are the Ministry of Agriculture and Cooperatives, Ministry of Public Health, Ministry of Industry, and Ministry of Commerce. The total measures of those ministries in 2018 accounted for 91.66% of total NTMs (Laksanapnyakul et al., 2019). The overall trend of Thailand NTMs measures indicates a rise in recent years; however, total measures between 2000-2010 and 2011-2021 do not have much difference, with the latter having 32 numbers higher count. Between 2000-2021, almost three-quarters (73.88%) of NTMs applied by Thailand on agriculture were SPS measures. Notably, Thailand only used three types of NTMs, quantitative restriction (QR), sanitary and phytosanitary (SPS), and technical barrier to trade (TBT) in the same period.

Table 9 Thailand's non−tariff measures

	NTM type			
Year[19]	QR	SPS	TBT	Total
2000	0	7	0	7
2001	0	47	47	94
2002	2	10	11	23
2003	0	9	3	12
2004	0	11	10	21
2005	0	15	1	16
2006	0	18	3	21
2007	0	8	9	17
2008	0	9	3	12
2009	0	6	3	9
2010	0	13	7	20
2011	0	5	1	6
2012	4	6	1	11
2013	0	8	0	8
2014	1	4	2	7
2015	0	6	2	8
2016	0	4	1	5
2017	0	2	2	4
2018	0	15	13	28
2019	0	23	7	30
2020	0	71	5	76
2021	0	99	2	101

[19] Implementation year

Total	7	396	133	536

Source: WTO (I-TP)

3.5. Selected Countries' SPS and TBT Measures on Myanmar Agricultural Exports[20]

Table 10 Selected countries' SPS and TBT measure on Myanmar's agricultural product

	China		Japan		Thailand		EU	
	2010 ~ 2015	2016~ 2021	2010~ 2015	2016~ 2021	2010~ 2015	2016~ 2021	2010~ 2015	2016~ 2021
SPS	21	19	9	0	21	38	0	7
TBT	64	7	33	3	4	6	4	4

Source: UNCTAD (TRAINS)

The table (10) depicts the major agricultural sector export destination countries' SPS and TBT measures on Myanmar agricultural products (HS 2017). It can be seen that the different frequency of measures among importing countries. To begin with Myanmar's largest agricultural export market, China, the combined measures of both SPS and TBT in that period is the highest among selected countries. As mentioned above, China's TBT measures are more extensive than SPS. Among SPS measures, A14 (authorization requirement for sanitary and phytosanitary reasons for importing certain products), A31(labelling, marking, and packaging

[20] Agricultural product HS 2017 (UNCTAD(TRAINS))

requirements), and A84 (inspection requirements) are the commonly applied measures, while B31 (labelling requirements) is the highest among TBT measures, followed by B83 (certification requirements).

Thailand, one of Myanmar's import neighbors, also applied SPS and TBT measures on Myanmar's agricultural exports. Comparing the two periods between 2010–2015 and 2016–2021, the latter period have a higher number of both SPS and TBT measures. Among SPS measures, A22 (restricted use of certain substances in foods and feeds and their contact materials) is the most frequently applied SPS measure with a combination of 10 times in the whole period, while A84(inspection requirements) and A85 (traceability requirements) only account for one each. B31 (labelling requirements) is the most significant TBT measure, which is half of the total TBT measures.

Japan, similar to China, has a higher number of TBT than SPS measures. Based on the Trains (UNCTAD) (2023), Japan did not apply any additional SPS measure on Myanmar's agricultural products between 2016–2021. Among SPS, A64(storage and transport conditions) was applied only once between the two periods, while the others, such as A31(labelling requirements), A41(microbiological criteria of the final product), A83(certification requirements), and A86(quarantine requirements) were two times each. Among TBT measures, B49 (production or postproduction requirements not elsewhere specified) is the highest applied measure with a total of 8.

EU is also Myanmar's primary export market, especially for rice, legumes, and recently a target for certain fruit exports. The EU's SPS and TBT, based on UNCTAD data, were only 7 for SPS and 8 for TBT. A83 (Certification requirements) and B31 (labelling requirements) are the primary SPS and TBT measures applied to Myanmar's agricultural products.

Chapter 4. Data and Research Methodology

4.1. The Incidence of NTM

Many different incidence indicators have been used to measure the product shares and trade affected by non-tariff measures (NTMs), such as frequency index (FI), coverage ratio (CR), prevalence ratio and regulatory distance. However, they suffer from some weakness and their strengths are often complement each other (UNCTAD). In many of analysis, frequency ratio, coverage ratio and prevalence ratio are used as their computation is easier and simpler than others.

In this analysis, FI and CR will be applied to examine major importing countries' NTMs restrictiveness on Myanmar Exports, focusing on vegetable crops HS:07. The values of both FI and CR ranges from 0 to 100 however their interpretion method is different. Coverage ratio (CR) measures the trade restrictiveness in terms of depth whilst the frequency index (FI) reflects in terms of range. For instance, the dried legumes are under HS:07 vegetables crop groups, in which there are 14 types of vegetables such as potato (HS:0701), tomato (HS:0702), onions (HS:0703), cabbage (HS:0704), lettuce (HS:0705), carrot (HS:0706), cucumber (HS:0707) and dried legumes (HS:0713) and so forth. Among them if the SPS applied on dried legumes but still importing tomato, onions, and potato, then the frequency index for HS:07 is 25%. At the same year if the total HS:07 exports was 110 USD in that year and dried legumes exports was 64 USD then the coverage ratio in that year is 58% (64/110*100).

4.1.1. Frequency Index

The frequency index which measure restrictiveness in terms of range, only consider whether a specific product is subject to a SPS measures. It provides the share of products affected by one or more NTMs. It can be calculated by

$$\boldsymbol{FI_{kt}} = \left[\frac{\sum D_{xt}M_{xt}}{\sum M_{xt}}\right] \times 100 \cdots\cdots\cdots\cdots\cdots\cdots (1)$$

k is HS 2 digit product category, *x* is the product item at HS 4 digit level, *t* as the time usually as year, D_{xt} is the dummy variable (1 or 0) and M_{xt} is also a dummy variable and (1) if the import of product *x* at time t or 0 otherwise.

4.1.2. Coverage Ratio

The coverage ratio quantifies the trade value percentage that is subjected to SPS measures for the target country's agricultural product (HS 07). The coverage ratio is calculated as the following formula,

$$\boldsymbol{CR_{kt}} = \left[\frac{\sum D_{xt}V_{xt}}{\sum V_{xt}}\right] \times 100 \cdots\cdots\cdots\cdots\cdots\cdots (2)$$

k is HS 2 digit the product category, *x* is the product item at HS 4 digit level, *t* as the time usually as year, D_{xt} is the dummy variable (1 or 0) and V_{xt} is the target country's exports value.

From the equation (1) and (2) the incidence of SPS measures on Myanmar's HS 07 (vegetables) export could be calculated by;

$$FI_t = \left[\frac{\sum D_{xt}M_{xt}}{\sum M_{xt}}\right] \times 100 \cdots\cdots\cdots\cdots\cdots\cdots (3)$$

$$CR_t = \left[\frac{\sum D_{xt}V_{xt}}{\sum V_{xt}}\right] \times 100 \cdots\cdots\cdots\cdots\cdots\cdots (4)$$

4.2. Model Specification and Estimation

4.2.1. Variables

The dependent variable X_{ij}, the export value measured in USD, is the export value of Myanmar dried legumes to the target country from 2010-2021. The explanatory variable GDPj is the importing countries' gross domestic products in terms of current value USD at time t, and this variable is to capture the market size and economy of the importing countries. Shepherd and Wilson (2012) and Nugroho (2014) mentioned that deflated GDP by CPI or GDP deflator could cause misleading due to unobserved multilateral resistance terms, so the nominal value is used.

$DIST_{ij}$ is the geographical distance between Myanmar and importing countries in kilometers (km) based on the distance between most populated cities, which is usually used to capture the trade cost between trading countries in the existing literature. The POP_{jt} is the importing countries' population, indicating the market demand for dry legumes.

Tariff is one of the major trade impeding barriers in international trade and, in this analysis, is measured by the applied

MFN duty rate. Disdier & Fugazza (2020) claimed that NTM studies on trade without the tariff variable could lead to biased estimation. Since there are many zero tariffs from importing countries, one is added to the original tariff rate (Peterson et al., 2013; Ferro et al., 2015; Wilson & Otsuki, 2001; Thoung, 2018).

The Myanmar pulses (legumes) production is used to capture the supply side effects. To avoid endogenous problems between current-year production and ongoing exports, the production variable is used with time lag-1 as Thoung (2018), Dou et al. (2015), and Wei et al.(2012).

The price ratio is used as the proxy of quality effects. The export of Myanmar dried legumes could be influenced by the quality of the commodity. For instance, the increase in deteriorated seeds may reduce exports in terms of volume and value. However, those quality effects cannot be measured directly. For that reason, the price ratio is used to proxy the quality effects (Thoung, 2018; Baldwin & Harrigan, 2011; Crozet et al., 2011). The price ratio is calculated by dividing country j's import value from Myanmar at time t by the average world import price.

SPS_{jt} is importing countries' sanitary and phytosanitary measures. Literature has shown various uses of SPS indicators to capture their effect on trade. For instance, (Assoua et al., 2022; Thuong, 2018; Nugroho, 2014) used SPS as a dummy variable, equal to 1 if the importer applied at least one SPS regulation and 0 otherwise. Wood et al. (2017) used incidence indicators such as frequency index and coverage ratio to quantify the economic impact of SPS measures. On the other hand, for instance, Wongmonta (2021) used the total number of SPS measures (notifications). In this regard, it is assumed that previous time (year) measures impact the current (year) since SPS measures are regulations and do not need to apply repeatedly. And thus, it is calculated by;

$$Y_t = Y_{t-1} + p_t - w_t$$

Where Y_t and Y_{t-1} are the current and previous SPS measures, p_t is the additional measures at year t and w_t the number of withdrawn at year t. Based on previous studies, this research investigates the effect of SPS in 3 different methods as it in cumulative, simple dummy variable and the use of incidence indicator such as frequency index and coverage ratio.

Table 11 Dependent variable and explanatory variable

Variable	Expected sign	Source	Previous studies (selected)
Dependent variable			
Export value		UN Comtrade	
Explanatory variable			
GDP_j	+	World Bank (World development Indicator)	Thuong, (2018), (Otsuki et al. (2001), Nugroho (2014) etc.
$Distance_{ij}$	−	BACI	Thuong, (2018)

$Population_i$	+	World Bank (World development Indicator)	Thuong, (2018), Gebrehiwet et al. (2007)
$Tariff_j$	−	WTO's Tariff Analysis Online, Country's Tariff Profile	Wood et al., (2017), Choi et al. (2015)
$Production_i$	+	FAOSTAT	Wongmonta (2021)
Price Ratio	+		Thuong (2018)
SPS_j (total number of measures)	−	UNCTAD−TRAINS	Wongmonta (2021)
SPS_j (Frequency Index)	−	UNCTAD−TRAINS	Wood et al., (2017), Wei et al. (2012)
SPS_j(Coverage Ratio)	−	UNCTAD−TRAINS	Wood et al., (2017), Wei et al. (2012),
SPS_j (Dummy)	−	UNCTAD−TRAINS	Thuong, (2018), Nugroho (2014), Curzi et al., (2020) etc.

4.2.2. Gravity Model

The gravity model, usually refer to as the workhorse for the analysis of policy impacts on trade. It implies that "the volume of trade between two countries is directly proportional to their masses (GDP) but inversely proportional to the distance between them". Thus, the basic gravity model can be expressed as followed:

$$X_{ij} = \alpha \frac{\gamma_i^{\beta_1} \gamma_j^{\beta_2}}{D_{ij}^{\beta_3}} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (5)$$

X_{ij} is the bilateral trade value between country i and j, α is the constant factor, $\gamma_i\gamma_j$ represents countries i and j economy in terms of GDP, D_{ij} is the geographical distance between the two countries and β_1, β_2, β_3 are the parameters to be estimated.

The gravity model in economics has a rich history[21], and has been developed by many prominent scholars over the years. The first theoretical foundation for the model was offered by Anderson in 1979, while Bergstrand made a later contribution to its development. Eaton and Kortum derived some of the most influential structural gravity theories in the early 2000s, while Anderson and van Wincoop popularized the Arminton-CES model of Anderson (1979). Other notable contributions have been made by Arkolakis et al. (2012), Allen et al. (2014), and Anderson and Yotov (2016), ensuring that the gravity model remains an important

[21] Please read more historical information on Yotov, Y. V., Piermartini, R., & Larch, M. (2016). *An advanced guide to trade policy analysis: The structural gravity model*. WTO iLibrary.

tool in economic analysis.

Based on the economics theory and empirical literature (Assoua et al.,2022; Wongmonta, 2021; Thuong, 2018; Ferro et al., 2015; Murina and Nicita, 2015;), the logarithmic specification of the gravity model equation;

$$\text{Ln}\ (X_{ijt}) = \boldsymbol{\beta_0} + \boldsymbol{\beta_1}\ln(GDP_{jt}) + \boldsymbol{\beta_2}\ln(Dist_{ij}) + \boldsymbol{\beta_3}\ln(Pop_{jt}) + \boldsymbol{\beta_4}\ln(Tariff_{jt} + 1) + \boldsymbol{\beta_5}\ln(Production_{i,\ t-1}) + \boldsymbol{\beta_6}\ln(PriceRatio_t) + \boldsymbol{\beta_7}SPS_{jt} + \boldsymbol{\varepsilon_{ijt}} \cdots\cdots(6)$$

The notation i represents the exporting country, Myanmar, and j as the importing countries, where t as time in year. X is the Myanmar export value to the country j at time t. The βs are the coefficient of explanatory variables that are to be estimated. ε_{ijt} is the error term assume that normal distribution with mean 0.

However, since some countries did not import dried legumes in the study period (2010-2021), the trade value is zero for that year. Since the logarithmic form of zero is meaningless and excluded in the gravity model estimation, it leads biased in the analysis[22]. For that reason, Santos Silva and Tenreyro in 2006 proposed Poisson Pseudo Maximum Likelihood (PPML) to get the correct estimation in even in the present of zero trade value, which have been widely used in the international trade literature. Thus, the Poisson Pseudo Maximum Likelihood (PPML) model becomes;

$$X_{ijt} = \exp\ [\boldsymbol{\alpha_j} + \boldsymbol{\alpha_t} + \boldsymbol{\beta_1}\ln(GDP_{jt}) + \boldsymbol{\beta_2}\ln(Dist_{ij}) + \boldsymbol{\beta_3}\ln(Pop_{jt}) + \boldsymbol{\beta_4}\ln(Tariff_{jt} + 1) + \boldsymbol{\beta_5}\ln(Production_{i,\ t-1}) + \boldsymbol{\beta_6}\ln(PriceRatio_t) + \boldsymbol{\beta_7}SPS_{jt}]\ \boldsymbol{\varepsilon_{ijt}} \cdots\cdots(7)$$

[22] See appendix; OLS regressions

Where α_j and α_t are the country and year fixed effects.

Table 12 Descriptive statistics of variables

	Observat-ions	Description	Mean	Standard Deviation	Minimum	Maxi-mum
Export Value	240	USD	5.24e+07	1.34e+08	0	1.02e+09
Distance (Log)	240	km	4386.276	314.341	575.904	13292.35
GDP (log)	240	current USD	27.32	1.19	24.46	30.31
Population (log)	240	number	17.91	1.49	15.44	21.07
Tariff (log)	240	applied MFN rate	0.64	1.2	0	3.43
Price ratio (log)	237	dried legumes price ratio	−2.08	1.99	−8.11	2.68
SPS	240	total number	7.15	13.35	0	86
Production (log)	240	tons	15.32	0.1419	15.09844	15.55701
Frequency Index	240	percent	25.12	42.2	0	100
Coverage Ratio	240	percent	27.07	44.49	0	100

4.2.3. Data and Data Source

This research used various sources of quantitative data for Myanmar and its importing countries (Table 13) which represent more than 99% of Myanmar dried legumes export market in the study period. The dependent variable, export value in USD for HS:0713 (dried legumes)[23] was collected from UN Comtrade from 2010–2021. The macroeconomic indicators such as GDP and population data were gathered from World Bank's World Development Indicator (WDI) database. By using the World Trade Organization (WTO) 's Tariff Analysis Online portal, applied MFN tariff data was retrieved. However, some countries did not report their tariff measures in certain years and for that period, world tariff profile[24] published by WTO data was used. The parameters of interests SPS variable data was obtained from the UNCTAD Trains database on Non–Tariff Measures. The other explanatory variables, such as distance data was extracted from the BACI.

Table 13 Selected 20 dried legumes importing countries

Asia	**Europe**	**North America**	**Oceania**
India	Belgium	Canada	Australia
China	Poland		
Indonesia	Russia Federation		
Hongkong	United Kingdom		
Japan			
Korea			

[23] Dried legumes represent all pulses and beans reported in UN Comtrade under HS:0713
[24] It does not report exact data for HS 0713 instead reported as vegetable on maximum and minimum value. If the previous value is still in those ranges then it is assume that the tariff rates are the same

Malaysia
Philippines
Pakistan
Singapore
Sri Lanka
Thailand
United Arab Emirates
Vietnam

Chapter 5. Result and Discussion

5.1. Incidence of NTM

The result from equations (3) and (4) are shown in the table (14) and (15), which are the incidence of non-tariff measures such as SPS measures on Myanmar's vegetable (HS07) exports between 2010-2021 if the major importing countries are divided into a group of three such as Myanmar's neighboring countries such as India and China which Myanmar had a free trade agreement, ASEAN members; Indonesia, Malaysia, Singapore and Thailand, EU member Belgium, and others such as Pakistan, and UAE.

Regarding the frequency index, the average of measures index is 91.85%, implies that most of Myanmar's vegetables exports are subjected to SPS measures. Myanmar's neighboring and major importer, India, had a 0% of frequency index, whilst the index of China is reasonably high as it covers more than 92.33% in the given periods. Within ASEAN members, Indonesia and Thailand had a higher incidence rate than Malaysia and Singapore. Thailand measures' incidence had the highest frequency index and applied more frequent, as almost all the periods. One of the EU members, Belgium measures covered 100% in terms of frequency index, and United Arab Emirates (UAE) had only 50% in 2016.

Table 14 Frequency Index (%)

Year	India	China	UAE	Pakistan	Belgium	Indonesia	Malaysia	Singapore	Thailand
2010	0	0	0	0	100	100	100	0	100
2011	0	100	0	0	0	100	100	100	100
2012	0	0	0	0	0	100	0	0	100
2013	0	81.82	0	100	100	0	0	0	100
2014	0	0	0	0	0	100	0	0	0
2015	0	100	0	0	0	100	0	0	100
2016	0	87.5	50	0	0	100	0	0	100
2017	0	0	0	0	0	33.33	83.33	55.56	100
2018	0	0	0	0	0	33.33	0	0	100
2019	0	0	0	0	0	100	0	0	90
2020	0	0	0	0	0	100	0	0	100
2021	0	0	0	0	0	100	0	0	100

Table 15 Coverage Ratio (%)

Year	India	China	UAE	Pakistan	Belgium	Indonesia	Malaysia	Singapore	Thailand
2010	0	0	0	0	100	100	100	0	100
2011	0	100	0	0	0	100	100	100	100
2012	0	0	0	0	0	100	0	0	100
2013	0	99.99	0	100	100	0	0	0	100
2014	0	0	0	0	0	100	0	0	0
2015	0	100	0	0	0	100	0	0	100
2016	0	99.99	0.05	0	0	100	0	0	100
2017	0	0	0	0	0	99.49	99.99	2.36	100
2018	0	0	0	0	0	99.06	0	0	100
2019	0	0	0	0	0	100	0	0	99.88
2020	0	0	0	0	0	100	0	0	100
2021	0	0	0	0	0	100	0	0	100

Table (15) reflects the coverage ratio of NTMs by selected major trading partners, which the average of index is 94.15%. Similar to the frequency index, India had a 0% of coverage ratio for Myanmar vegetable exports, and China had an almost 100% coverage ratio. Thailand and Indonesia had the highest and more frequent than Malaysia and Singapore within ASEAN. EU, such as Belgium and other Asian countries, Pakistan had 100% coverage when they applied SPS measures, while the coverage ratio of the United Arab Emirates in 2016 was only 0.05%.

5.2. The PPML estimation

The estimation from equation (7) is presented in table (16).

Table 16 Regression result

	Export Value (1)[25]	Export Value (2)[26]	Export Value (3)[27]	Export Value (4)[28]
LnGDP	0.4587***	0.4568***	0.4395***	0.4501***
	(0.1364)	(0.1346)	(0.1343)	(0.1374)
LnDistance	−0.7543***	−0.8665***	−0.8469***	−0.7888***
	(0.1471)	(0.1712)	(0.1629)	(0.1577)
LnPop	0.0951	0.0911	0.1023	0.0882
	(0.1646)	(0.1683)	(0.1655)	(0.1704)

[25] SPS by cumulative measures
[26] SPS by frequency index
[27] SPS by coverage ratio
[28] SPS by dummy variable

LnTariff	−0.0236	−0.0264	−0.0296	−0.0346
	(0.069)	(0.0679)	(0.0681)	(0.0703)
LnProduction	−0.1567	0.2695	0.2053	0.2623
	(0.5065)	(0.4799)	(0.4849)	(0.483)
LnPriceRatio	0.5365***	0.5205***	0.5166***	0.5395***
	(0.0989)	(0.1016)	(0.0997)	(0.1018)
SPS	−0.0128***	−0.0063**	−0.0059**	−0.4788*
	(0.0045)	(0.0029)	(0.0026)	(0.2463)
Constant	12.15	6.6281	7.733	6.3497
	(8.054)	(7.759)	(7.979)	(7.773)
R−squared	0.7730	0.7749	0.7753	0.7717

Standard errors in parenthesis, *p<0.1, **p<0.05, ***p<0.01

The statistical analysis in Table (16) shows the empirical investigation using PPML fixed effects by quantifying the trade effects of SPS measures in four different estimations. Overall, the outcome of all the analyses in terms of significant levels is similar except for the SPS, as it is significant at 0.01 significant level in the first estimation (Table 16, column 1), 0.05 significant level in the second and third estimations (Table 16, column 2 and 3) and 0.1 significant level in the fourth estimation, where SPS measures are used as a dummy variable (Table 16, Column 4).

To begin, the GDP is positive and highly significant in all four analyses. It is consistent with the gravity model theory and assumptions, reflecting buyers' wealth effect (Otsuki et al., 2001). The positive coefficient is similar to the previous studies by Assoua et al. (2022), Wongmonta (2021), Jagdambe and Kannan (2020), Krishnan (2016), and Nugroho (2014). Despite a lower consumption of dried legumes in developed nations, the result reveals that a one-unit increase in importing countries' GDP would increase Myanmar's dried legumes exports by more than 45% in the first, second, and fourth estimations and 43.95% in the third estimation. Based on this result, Myanmar dried legumes have an export opportunity to more developed or higher GDP countries.

As expected, distance is negative and statistically significant in all the analyses. Similar to the GPD variable, this finding is consistent with the gravity model theoretical foundation. The outcome can be interpreted as a one-kilometer distance between Myanmar and importing countries will reduce Myanmar's dried legumes exports by 75.43% and 78.88% in the first and the fourth estimations and 86.65% and 84.69% in the second and third estimations. A plausible explanation could be the increased trade costs, especially transportation costs.

There are also positive coefficients for the population, which accounts for the demand effect of dried legumes exports; however, it is insignificant in all four estimations. A reasonable explanation is that the higher populated nations have a higher demand for dried legumes imports. However, the role of importing countries' populations is less significant in Myanmar's dried legumes exports. Previous studies by Assoua et al. (2022), Wilson and Otsuki (2004), and Gebrehiwet et al. (2007) also found that importing countries' populations had a less significant role in exports.

The coefficient of tariff is negative but insignificant across all analyses. This could be due to the fact that Myanmar is one of the least developed members of WTO; thus, it can export dried legumes tariff-free to many developed countries, including the US, Australia, Canada, and EU members. Moreover, major trading partners such as ASEAN members China and India have regional trade agreements, which Myanmar can access tariff-free export markets. Thus, other minor importing countries' tariffs do not significantly impact legume export.

The production variable applied with time lag-1 has a negative coefficient in the first estimation and positive coefficients in the other three estimations. Despite its different signs, the production variable is insignificant in all the analyses. The difference in coefficient could be attributed to the varying integrations of SPS measures within the estimation. Additionally, the insignificant of its coefficient is a result of an unchanged production value across cross-sectional panel data.

The price ratio is also positive and statistically significant at 0.01. As the price ratio is used as a proxy of quality effects, the result of the estimation indicates that a 1% increase in price ratio would have an increase in dried legumes export value by 53.65% and 53.95% in the first and fourth estimations and 52.05% and

51.66% in estimation where SPS measures are quantified in their restrictiveness. It can be concluded that improving the quality of exported dried legumes would increase Myanmar's export earnings by more than 50% in all four estimations. This finding is in line with Thuong (2018). This result is crucial for the Myanmar government because it highlights the need to help and support the farmers. To produce high-quality dried legumes, the government should supply high-quality seeds and provide good infrastructure for storage and other logistic activities.

The explanatory variable of interest, SPS, showed negative coefficients in all four estimations but with different significance levels. The first estimations as the SPS measures applied by the cumulative, the impact of SPS is highly significant at 0.01 significant level. It means that the additional SPS measures applied by the importing countries would result in a 1.28% reduction in the export values of Myanmar dried legumes. Similarly, the SPS measures analyzed by the incidence indicators, such as frequency index and coverage ratio, were found to be statistically significant at a 0.05 significance level. It implies that if importing countries increase their coverage of SPS measures on Myanmar's dried legumes, it would reduce exports by 0.63% and 0.59%, respectively. The last analysis, in which a simple dummy variable estimates SPS measures, was statistically significant at a 0.1 significance level. In which a reduction of export value by 61.41% due to importing countries' implication of SPS regulations. Considering these findings, it is evident that non-tariff measures substantially influence Myanmar's dried legumes exports more substantially than tariffs. Furthermore, these results suggest to policymakers the importance of implementing effective policy measures to mitigate the trade-impeding effects of SPS measures on Myanmar's dried legumes. Research findings also support the SPS measure as a standard as barriers by Crivelli & Gröschl (2016), Zhang, Maeda, & Wang (2021), and Li & Beghin (2012). Otsuki et al. (2001), Disdier et al. (2008), Jongwanich (2009), and Ferro et al. (2015).

Chapter 6. Conclusion

Dried legumes play a crucial role in Myanmar's economy, contribute the highest export earnings among agricultural commodities, and rank as the country's second most valued exported commodity at HS 4 level, following petroleum. In addition, Myanmar is one of the world's major dried legumes producing and exporting countries. It has an average of more than 10% of the global export market share between 2011-2021. Moreover, its average yield in primary exported pulses (legumes) varieties is higher than the world's average. This is due to the favorable climatic condition for production and the adoption of high-yielding varieties. However, the export of dried legumes in the study period has not been stabilized.

The primary export market had concentrated on two neighboring countries such as India and China. In other words, the production and exports of dried legumes heavily depend on the trade policy of India and China, more specifically on India. For example, the implication of the import quota applied by India in 2017 and 2018 caused a market disruption for dried legume exports, which caused a decrease in production in the following seasons. Thus, the need to diversify the export market has been one of the major essential factors for Myanmar's pulses (legumes) sector. However, to boost its export market in developed countries, especially EU markets, the need to comply with import rules and regulations remains challenging for developing countries, despite the fact that Myanmar can access the EU market with free tariff rates.

Moreover, major importing countries have dramatically increased the number of non-tariff measures (NTMs) applied to Myanmar's dried legumes. Myanmar's dried legumes are subject to several SPS measures, with the most commonly applied measures being certification requirements (A 83) and inspection requirements (A 84). Additionally, labeling requirements (B 31) are these products' most frequently encountered TBT measures. In addition, their incidence rate by coverage ratio and frequency index is also high, more than 92%, meaning that most of Myanmar's vegetables exports including dried legumes are subjected to one of SPS measures. Thus, this empirical study applied the Poisson Pseudo Maximum Likelihood (PPML) estimation of international trade to investigate the economic impacts of SPS measures on Myanmar dried legumes exports with its 20 importing countries from 2010-2021. SPS measures were integrated in four different ways, such as SPS measures in the total number of measures, by coverage ratio and frequency index, and as a simple dummy variable.

Based on empirical analysis, importing countries' GDP, the geographical distance between Myanmar and its export destinations, and the quality of dried legumes, measured by price ratios and SPS measures, play a significant and vital role in Myanmar's exports. However, the role of importing countries' tariffs, Myanmar's productions, and importing countries' populations are less significant for the export of dried legumes. The outcomes of this research revealed that importing countries' SPS measures had trade-impeding effects on Myanmar dried legumes exports.

Chapter 7. Policy Implication

First and foremost, the government of Myanmar, primarily through the Ministry of Commerce and Ministry of Agriculture Livestock and Irrigation (MOALI) with the collaboration of the Union of Myanmar Federation of Chambers of Commerce and Industry (UMFCCI), should promote the awareness training on non-tariff measures, the importance of compliance with international regulations and their potential effects on trade. Remarkably, the MOALI should accelerate farmers' training on good agricultural practices, as the farming activities, including the application of fertilizers, pesticides, harvesting, and storage management, directly impact the residue level and the quality of the seeds.

The quality seed distribution should be accelerated significantly in major pulses (legumes) producing areas, as it has a paramount role in exports. According to Myanmar CSO's Myanmar Agricultural Statistics 2022, the distribution of quality seed for dried legumes such as black gram, green gram, chickpeas, and pigeon peas were 2771, 1688, 1727, and 2306 baskets, respectively, in the 2020-2021 season. Compared with paddy, 116 thousand (116000) basket-quality seeds were distributed in the same year, despite the dried legumes making higher contributions to the country's export earnings. Therefore, the government should invest more in the pulses (legumes) sector, especially in developing quality seeds, which in turn enhance the availability of quality seeds.

In addition, governmental organizations should simplify the testing and certification process and reduce unnecessary bureaucratic steps (Nyein & Naing, 2017) for the import-export process. A longer, unnecessary bureaucratic process could make a more extended storage period in poor storage facilities, which might deteriorate the seed's quality. Furthermore, Myanmar should also accelerate regulatory convergence and harmonization based on the guidelines and regulations according to ASEAN NTM, especially in Agriculture. Many previous studies have found that harmonizing NTMs has a trade-enhancing effect.

Bilateral engagement on the protocol and acceptance of NTMs should be extended beyond China and India to other countries, including EU members, on the recognition of certificate and testing results which would facilitate the legumes exports. Lastly, for the export process to run smoothly, it is crucial to meet the highest standards and ensure that all necessary inspections and certifications are carried out efficiently and effectively. To achieve this, the government must give attention to improving the infrastructure for testing, inspection certification, and logistics activities.

Chapter 8. Limitations

There are several limitations to this study. The primary limitation is the availability of data. Myanmar only reports its trade information after 2010, meaning that this study's data only covers 12-year periods. Additionally, the data for legumes are challenging to categorize, with 75% of exported legumes being dried and the export value of fresh legumes being low during the study period. The commodity codes used between UN Comtrade and FAOSTAT are also different, making it difficult to collect specific production and export information. Furthermore, the data on non-tariff measures are complicated, with primary sources differing between WTO and UNCTAD. This means that estimations may vary depending on the data source, as countries need to comply with the rules and regulations of either WTO, UNCTAD, or both.

The gravity model used in this study is limited in measuring all the time-varying policy impacts on trade. Domestic policy changes in one country can affect another country's imports, which the gravity model cannot always capture. Other studies have used time intervals to deal with these issues. For instance, Anderson and Yotov (2016) and Baier and Bergstrand (2007) had used 4-year and 5-year intervals. However, in this case, the available data for Myanmar is only 12 years, making it challenging to apply longer intervals.

Bibliography

Alamprese, C., Barros, L., Shelef, O., Basheer, L., Rivera, A., & Abadias, M. Valorization of Local Legumes and Nuts as Key Components of the Mediterranean Diet. Foods, 11(23), 3858.

Anderson, J. E., & Yotov, Y. V. (2016). Terms of trade and global efficiency effects of free trade agreements, 1990–2002. *Journal of International Economics*, *99*, 279-298.

Association of Southeast Asia Nations (ASEAN), https://asean.org

Baier, S. L., & Bergstrand, J. H. (2007). Do free trade agreements increase members' international trade? *Journal of international Economics*, *71*(1), 72-95.

Baldwin, Richard, and James Harrigan. 2011. "Zeros, Quality, and Space: Trade Theory and Trade Evidence." *American Economic Journal: Microeconomics*, 3 (2): 60-88.

Central Statistical Organization (CSO) 2022, Myanmar Agricultural Statistics

Central Statistical Organization (CSO) 2022, Statistical Yearbook 2022

Crozet, M., Hatte, S., & Zignago, S. (2011). Quality versus price competition across countries and industries Preliminary version. *Available from internet: http://soledad. zignago. pagesperso-orange. fr/quality_vs_price. pdf.*

de Brauw, Alan; Sayaka, Bambang; Pasaribu, Sahat; Ambler, Kate;

Herskowitz, Sylvan; Suryani, Erma; et al. 2020. Agricultural value chain finance in Indonesia: Executive summary. Washington, DC: International Food Policy Research Institute (IFPRI).

Disdier, A. C., & Fugazza, M. (2020). A practical guide to the economic analysis of non-tariff measures.

Disdier, A. C., Fontagné, L., & Mimouni, M. (2008). The impact of regulations on agricultural trade: evidence from the SPS and TBT agreements. *American Journal of Agricultural Economics*, *90*(2), 336-350.

Dong, Y., Shen, Y., & Chen, J. (2022). Impact of SPS Measures on the Import Quality of China's Agricultural Products. *Journal of Management and Economic Studies*, *4*(4), 436-447.

Dou, L., Yanagishima, K., Li, X., Li, P., & Nakagawa, M. (2015). Food safety regulation and its implication on Chinese vegetable exports. *Food Policy*, *57*, 128-134.

Economic Research Institute for ASEAN and East Asia (2019). Non-tariff measures in ASEAN-An Update.

Ferro, E., Otsuki, T., & Wilson, J. S. (2015). The effect of product standards on agricultural exports. *Food Policy*, *50*, 68-79.

Fiankor, D. D. D., Curzi, D., & Olper, A. (2021). Trade, price and quality upgrading effects of agri-food standards. *European Review of Agricultural Economics*, *48*(4), 835-877.

Galloway, J. (2022). Non-Tariff Barrier on Japan Imports: Impact on US Beef Export Market. *Available at SSRN 4099775*.

Gebrehiwet, Y., Ngqangweni, S., & Kirsten, J. F. (2007). Quantifying the trade effect of sanitary and phytosanitary regulations of OECD countries on South African food exports. *Agrekon*, *46*(1), 23–39.

Gibson, M. J., & Wang, Q. (2018). Sanitary and phytosanitary measures in Chinese agricultural exports: the role of trade intermediaries. *Applied Economics*, *50*(27), 3007–3015.

Ha Thi Thanh Doan (2019), 'Non–Tariff Measures in Myanmar', in Ha Thi Thanh Doan and S. Rosenow (eds.), Non–Tariff Measures in ASEAN–An Update. Jakarta: ERIA, pp.120—136.

Harilal, K. N. (2010). ASEAN–India free trade area: Noises of dissent from deep south. *Occasional paper*, *1*.

Hejazi, M., Grant, J. H., & Peterson, E. (2022). Trade impact of maximum residue limits in fresh fruits and vegetables. *Food Policy*, *106*, 102203.

Hien, N. T. T., & Huyen, V. T. T. (2022). Evaluating The Effect Of Non–Tariff Measures On Agriculture Export–A Case Study Of Vietnam's Exports To The European Union. *Journal of Positive School Psychology*, *6*(11), 2446–2460.

Hoekman, B., & Nicita, A. (2011). Trade policy, trade costs, and developing country trade. *World development*, *39*(12), 2069–2079.

Jagdambe, S., & Kannan, E. (2020). Effects of ASEAN–India Free

Trade Agreement on agricultural trade: The gravity model approach. World Development Perspectives, 19, 100212.

Jongwanich, J. (2009). The impact of food safety standards on processed food exports from developing countries. *Food Policy, 34*(5), 447-457.

Kazuaki Miyagishima, 2005, "Sanitary and Phytosanitary (SPS) Agreement: Overview and Recent Developmet", Asian Productivity Organization

Khaliqi, Rifin, Adhi (2018). Trade Effect of Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT) on Indonesia's Shrimp Export. InJAR, 2(1), 134-141.

Krishnan, K. V. (2017). Impact of non-tariff barriers on Indian exports: An econometric analysis. Journal of Tropical Agriculture, 54(2), 144.

Krisztin, T., & Fischer, M. M. (2015). The gravity model for international trade: Specification and estimation issues. Spatial Economic Analysis, 10(4), 451-470

Laksanapnyakul, N., P. Rattanasimanon, S. Tunmuntong, P. Yutthasaknukun and C. Intaravitak (2019), 'Non-Tariff Measures in Thailand', in Ha Thi Thanh Doan and S. Rosenow (eds.), Non-Tariff Measures in ASEAN-An Update. Jakarta: ERIA, pp.185–206.

Li, Y., & Beghin, J. C. (2012). A meta-analysis of estimates of the impact of technical barriers to trade. Journal of policy modeling, 34(3), 497-511.

Mao (2022). Coalitions in international relations and coordination of agricultural trade policies. CAER, 2(15), 433-449.

Mao, P., Zhang, Y., Feng, L., & Kam, P. (2021). China-Myanmar Cross-border Agricultural Economic Cooperation — Views from Myanmar. Proceedings of the 1st International Symposium on Innovative Management and Economics (ISIME 2021).

Merga, B., & Haji, J., (2019) Economic importance of chickpea: Production, value, and world trade, Cogent Food & Agriculture, 5:1.

Ministry of Agriculture and Irrigation, The Republic of the Union of Myanmar, 2018, Myanmar Agriculture Development Strategy and and Investment Plan (2018-19~2022-23)

Ministry of Commerce, The Republic of the Union of Myanmar, 2023: https://www.commerce.gov.mm/en

Murina, Nicita (2015). Trading with Conditions: The Effect of Sanitary and Phytosanitary Measures on the Agricultural Exports from Low-income Countries. World Econ, 1(40), 168-181.

Mustafa, A., Akhtar, Z. M., & Sohail, M. (2022). The Impact of Sanitary and Phytosanitary Measures and Technical Barriers to Trade on Imports of China with Partner Countries. *Journal of Development and Social Sciences*, *3*(2), 819-831.

Nabeshima, K., Obashi, A., & Kim, K. (2021). Impacts of additional compliance requirements of regulations on the margins of trade. *Japan and the World Economy*, *59*, 101088.

Nga, Minh, Cong (2023). Assessing the Impacts of Nontariff Measures on the Export of Vietnam's Main Agricultural and Seafood Products. ijirss, 1(6), 72-79.

Nguyen, T. A. T., & Jolly, C. M. (2020). Global value chain and food safety and quality standards of Vietnam pangasius exports. *Aquaculture reports*, *16*, 100256.

Niranjan, Shivakumar, Prahadeeswaran, Rohini (2021). Nontariff Measures (NTM) and Their Significance in Agricultural Trade of India and European Union. AJAEES, 79-87.

Nugroho, A. (2014). The impact of food safety standard on Indonesia's coffee exports. *Procedia Environmental Sciences*, *20*, 425-433.

Nyein, K.T., Naing, Z.Z. (2017). NTMs in Textile and Apparel Industry in Myanmar: Analysis of Impacts of Trade Barriers. In: De, P., Raychaudhuri, A. (eds) Myanmar’s Integration with the World. Palgrave Macmillan, Singapore. https://doi.org/10.1007/978-981-10-5134-0_7

Otsuki, T., Wilson, J. S., & Sewadeh, M. (2001). Saving two in a billion:: quantifying the trade effect of European food safety standards on African exports. Food policy, 26(5), 495-514.

Peterson, E., Grant, J., Roberts, D., & Karov, V. (2013). Evaluating the trade restrictiveness of phytosanitary measures on US fresh fruit and vegetable imports. *American Journal of Agricultural Economics*, *95*(4), 842–858.

Rawal, V. & Navarro, D.K., eds. 2019. The Global Economy of Pulses. Rome, FAO.

Semba, R. D., Rahman, N., Du, S., Ramsing, R., Sullivan, V., Nussbaumer, E., ... & Bloem, M. W. (2021). Patterns of legume purchases and consumption in the United States. Frontiers in Nutrition, 765.

Sharma, D., Murali, K., & Sangeta, S. (2022). Importers Perspective of Market Access in Peanuts: Analysis of National Tolerance Limits (MRLs) Across Five Markets. *Available at SSRN 4186909*.

Shepherd, B., & Wilson, N. L. (2013). Product standards and developing country agricultural exports: The case of the European Union. *Food Policy*, *42*, 1–10.

Silva, J. S., & Tenreyro, S. (2006). The log of gravity. *The Review of Economics and statistics*, *88*(4), 641–658.

Suvannaphakdy (2021). Streamlining Nontariff Measures for Agri-food Trade in ASEAN. East Asian Policy, 04(13), 60–77.

Thuong, N. T. T. (2018). The effect of Sanitary and Phytosanitary measures on Vietnam's rice exports. *EconomiA*, *19*(2), 251–265.

Traoré, O. Z., & Tamini, L. D. (2022). African trade of mangoes to

OECD countries: Disentangling the effects of compliance with maximum residue limits on production, export supply and import demand. *European Review of Agricultural Economics*, *49*(2), 383–432.

UNCTAD, 2018; Generalized System of Preferences HANDBOOK ON THE SCHEME OF AUSTRALIA

UNCTAD, 2020, Non–Tariff Measures in Australia, China, India, Japan, New Zealand and Korea; Preliminary Findings

UNCTAD, 2021; Handbook on preferential market access for ASEAN Least Developed Countries.

United Nations Conference on Trade and Development, 2019, International Classification of Non–Tariff Measures

United States of America, International Trade Administration, 2023: https://www.trade.gov/country-commercial-guides/burma-trade-agreements

Wei, G., Huang, J., & Yang, J. (2012). The impacts of food safety standards on China's tea exports. *China Economic Review*, *23*(2), 253–264.

Wilson, J. S., & Otsuki, T. (2004). To spray or not to spray: Pesticides, banana exports, and food safety. *Food Policy*, *29*(2), 131–146.

Winchester, Rau, Goetz, Larue, Otsuki, Shutes, ... & Faria (2012). The Impact of Regulatory Heterogeneity on Agri–food Trade. World Economy, 8(35), 973–993.

Wongmonta, S. (2021). Evaluating the impact of sanitary and phytosanitary measures on agricultural trade: evidence from Thai fruit exports to China. *The Singapore Economic Review*, 1-19.

Wood, J., Wu, J., Li, Y., & Jang, H. (2017). The economic impact of SPS measures on agricultural exports to China: An empirical analysis using the PPML method. Social Sciences, 6(2), 51.

World Trade Organization Integrated Trade Intelligence Portal (I-TIP), 2023, http://i-tip.wto.org/goods/Default.aspx

WTO | Understanding the Sanitary and Phytosanitary Measures Agreement. https://www.wto.org/english/tratop_e/sps_e/spsund_e.htm

X. Diao, I. Masias, W. Y. Lwin, Agri-food Trade in Myanmar Its Role in Myanmar's Future Economics Takeoff. Washington, DC: International Food Policy Research Institute, (2020)

Yotov, Y. V., Piermartini, R., & Larch, M. (2016). *An advanced guide to trade policy analysis: The structural gravity model*. WTO iLibrary.

Zhang, Maeda, Wang (2021). The Effects of SPS Measures on The Duration of China's Agroproduct Exports. Journal of the Faculty of Agriculture Kyushu University, 1(66), 145-153.

Appendix

Appendix A 1 Pairwise correlations (SPS Cumulative)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) ExpValue	1.000							
(2) LnGDP	0.288*	1.000						
	(0.000)							
(3) LnDistance	-0.174*	0.449*	1.000					
	(0.007)	(0.000)						
(4) LnPOP	0.532*	0.554*	-0.091	1.000				
	(0.000)	(0.000)	(0.162)					
(5) LnTariff	0.012	-0.259*	-0.264*	-0.076	1.000			
	(0.849)	(0.000)	(0.000)	(0.241)				
(6) LnProduction(l-1)	-0.012	-0.076	-0.012	-0.015	0.068	1.000		
	(0.849)	(0.240)	(0.849)	(0.812)	(0.291)			
(7) LnPriceRatio	0.535*	0.162*	-0.433*	0.485*	0.110	0.073	1.000	
	(0.000)	(0.013)	(0.000)	(0.000)	(0.092)	(0.264)		
(8) SPS (Cumulative)	-0.077	0.075	-0.175*	0.251*	-0.147*	-0.252*	0.084	1.000
	(0.233)	(0.250)	(0.007)	(0.000)	(0.023)	(0.000)	(0.198)	

**** p<0.01, ** p<0.05, * p<0.1*

Appendix A 2 Pairwise correlations (SPS-FI)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) ExpValue	1.000							

(2) LnGDP	0.288*	1.000						
	(0.000)							
(3) LnDistance	-0.174*	0.449*	1.000					
	(0.007)	(0.000)						
(4) LnPOP	0.532*	0.554*	-0.091	1.000				
	(0.000)	(0.000)	(0.162)					
(5) LnTariff	0.012	-0.259*	-0.264*	-0.076	1.000			
	(0.849)	(0.000)	(0.000)	(0.241)				
(6) LnProduction(l-1)	-0.012	-0.076	-0.012	-0.015	0.068	1.000		
	(0.849)	(0.240)	(0.849)	(0.812)	(0.291)			
(7) LnPriceRatio	0.535*	0.162*	-0.433*	0.485*	0.110	0.073	1.000	
	(0.000)	(0.013)	(0.000)	(0.000)	(0.092)	(0.264)		
(8) FI	-0.103	-0.062	-0.332*	0.144*	-0.038	0.140*	0.065	1.000
	(0.112)	(0.342)	(0.000)	(0.026)	(0.557)	(0.030)	(0.322)	

**** p<0.01, ** p<0.05, * p<0.1*

Appendix A 3 Pairwise correlations (SPS-CR)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) ExpValue	1.000							
(2) LnGDP	0.288*	1.000						
	(0.000)							
(3) LnDistance	-0.174*	0.449*	1.000					
	(0.007)	(0.000)						
(4) LnPOP	0.532*	0.554*	-0.091	1.000				
	(0.000)	(0.000)	(0.162)					
(5) LnTariff	0.012	-0.259*	-0.264*	-0.076	1.000			
	(0.849)	(0.000)	(0.000)	(0.241)				
(6) LnProduction(l-1)	-0.012	-0.076	-0.012	-0.015	0.068	1.000		
	(0.849)	(0.240)	(0.849)	(0.812)	(0.291)			
(7) LnPriceRatio	0.535*	0.162*	-0.433*	0.485*	0.110	0.073	1.000	

	(0.000)	(0.013)	(0.000)	(0.000)	(0.092)	(0.264)		
(8) CR	-0.101	-0.043	-0.320*	0.173*	-0.066	0.087	0.084	1.000
	(0.119)	(0.504)	(0.000)	(0.007)	(0.306)	(0.177)	(0.200)	

*** *p<0.01*, ** *p<0.05*, * *p<0.1*

Appendix A 4 Pairwise correlations (SPS-Dummy)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) ExpValue	1.000							
(2) LnGDP	0.288*	1.000						
	(0.000)							
(3) LnDistance	-0.174*	0.449*	1.000					
	(0.007)	(0.000)						
(4) LnPOP	0.532*	0.554*	-0.091	1.000				
	(0.000)	(0.000)	(0.162)					
(5) LnTariff	0.012	-0.259*	-0.264*	-0.076	1.000			
	(0.849)	(0.000)	(0.000)	(0.241)				
(6) LnProduction(l-1)	-0.012	-0.076	-0.012	-0.015	0.068	1.000		
	(0.849)	(0.240)	(0.849)	(0.812)	(0.291)			
(7) LnPriceRatio	0.535*	0.162*	-0.433*	0.485*	0.110	0.073	1.000	
	(0.000)	(0.013)	(0.000)	(0.000)	(0.092)	(0.264)		
(8) SPS (Dummy)	-0.094	-0.041	-0.287*	0.166*	-0.088	0.134*	0.070	1.000
	(0.147)	(0.524)	(0.000)	(0.010)	(0.175)	(0.038)	(0.284)	

*** *p<0.01*, ** *p<0.05*, * *p<0.1*

OLS Regression (Equation 6)

Appendix B 1 Linear regression (SPS-Cumulative)

LnExpValue	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LnGDP	.27	.113	2.39	.018	.047	.494	**
lnDistance	-1.013	.167	-6.07	0	-1.342	-.684	***
LnPOP	.21	.084	2.49	.013	.044	.376	**
LnTariff	-.14	.077	-1.82	.07	-.292	.012	*
LnProduction(l-1)	-2.587	.641	-4.04	0	-3.85	-1.324	***
LnPriceRatio	.716	.058	12.44	0	.602	.829	***
SPS(Cumulative)	-.017	.006	-2.65	.009	-.03	-.004	***
Constant	54.079	10.221	5.29	0	33.939	74.219	***

Mean dependent var	15.626	SD dependent var	2.413
R-squared	0.703	Number of obs	236
F-test	77.081	Prob > F	0.000
Akaike crit. (AIC)	814.034	Bayesian crit. (BIC)	841.745

**** p<.01, ** p<.05, * p<.1*

Appendix B 2 Linear regression (SPS-FI)

LnExpValue	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LnGDP	.286	.115	2.50	.013	.06	.512	**
lnDistance	-1.045	.177	-5.89	0	-1.394	-.695	***
LnPOP	.181	.084	2.17	.031	.017	.346	**
LnTariff	-.123	.077	-1.60	.112	-.275	.029	

LnProduction(l-1)	-1.965	.639	-3.07	.002	-3.224	-.705	***
LnPriceRatio	.709	.059	12.04	0	.593	.825	***
o	0	.	.	.	.	.	
FI	-.004	.002	-1.80	.073	-.009	0	*
Constant	44.793	10.176	4.40	0	24.743	64.843	***

Mean dependent var	15.626	SD dependent var	2.413
R-squared	0.698	Number of obs	236
F-test	75.315	Prob > F	0.000
Akaike crit. (AIC)	817.867	Bayesian crit. (BIC)	845.577

**** p<.01, ** p<.05, * p<.1*

Appendix B 3 Linear regression (SPS-CR)

LnExpValue	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LnGDP	.282	.114	2.47	.014	.057	.507	**
lnDistance	-1.045	.175	-5.96	0	-1.391	-.7	***
LnPOP	.187	.084	2.23	.027	.022	.352	**
LnTariff	-.128	.077	-1.66	.098	-.281	.024	*
LnProduction(l-1)	-2.022	.632	-3.20	.002	-3.267	-.777	***
LnPriceRatio	.71	.059	12.14	0	.595	.826	***
o	0	.	.	.	.	.	
CR	-.004	.002	-1.97	.05	-.008	0	**
Constant	45.692	10.078	4.53	0	25.834	65.549	***

Mean dependent var	15.626	SD dependent var	2.413
R-squared	0.699	Number of obs	236
F-test	75.615	Prob > F	0.000

Akaike crit. (AIC)	817.210	Bayesian crit. (BIC)	844.921

**** p<.01, ** p<.05, * p<.1*

Appendix B 4 Linear regression (SPS-Dummy)

LnExpValue	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LnGDP	.278	.114	2.43	.016	.052	.503	**
lnDistance	-1.02	.174	-5.87	0	-1.363	-.678	***
LnPOP	.185	.084	2.20	.029	.019	.35	**
LnTariff	-.128	.078	-1.65	.101	-.281	.025	
LnProduction(l-1)	-1.99	.638	-3.12	.002	-3.247	-.732	***
LnPriceRatio	.713	.059	12.17	0	.598	.829	***
o	0	.	.	.	.	.	
sps_un4	-.374	.219	-1.71	.089	-.806	.058	*
Constant	45.154	10.164	4.44	0	25.127	65.181	***

Mean dependent var	15.626	SD dependent var	2.413
R-squared	0.698	Number of obs	236
F-test	75.160	Prob > F	0.000
Akaike crit. (AIC)	818.207	Bayesian crit. (BIC)	845.917

**** p<.01, ** p<.05, * p<.1*

국문 초록

미얀마 건조 콩류 수출에 동식물위생검역(SPS) 조치가 미치는 영향

Van Tha Ceu[29]

농경제사회학부

농업.자원경제학전공

서울대학교

자유무역을 지향하는 양자 또는 다자간 무역협정의 영향으로 관세는 인하하는 추세이지만, 이와는 달리 비관세조치는 지속적으로 증가하여 무역장벽으로 작용할 수 있다는 우려가 있다. SPS 조치의 무역 영향을 분석하는 연구는 있었지만, 동 조치가 미얀마의 건조 콩류 수출에 미치는 실증연구가 없었다. 이에 본 연구는 2010~2011년 미얀마 건조 콩류 수출의 99% 이상을 차지하는 20개 수입국을 대상으로 포아송 유사 최우추정법(PPML) 추정법을 적용하여 수입국의 SPS 조치가 미얀마 건콩류 수출에 미치는 영향을 중력모델로 분석하였다. 비관세조치의 빈도지수(FI)를 살펴본 결과, 태국이 가장 빈번하게 비관세조치를 취하는 것으로 나타난 반면, 마얀마산 건조 콩류의 주요 수입국인 인도는 비관세조치를 취하지 않는 것으로 나타났다. 이러한 결과는 수입국의 조치가 WTO와 UNCTAD에 통보되지 않아 집계되지 않은 것이 원인으로 파악된다.비관세조치의 범위지수(CI)결과 또한 태국의 조치가 가장 영향력 있는 것으로 나타났다. 중국의 경우 조치가 시행된 해에는 영향력이 있는 것으로 측정되었으나, 그 조치가 지속되는 해에는 영향력이 없는 것으로 나타나는 한계가 있었다. 수입국의 GDP가 클수록 미얀마 건조 콩

[29]본 논문작성자는 한국정부초청장학금(Global Korea Scholarship)을 지원받은 장학생임

류의 수출액이 증가하는 경향을 보였다. 미얀마와 거리가 먼 국가일수록 수출액이 감소하였고, 거리가 가까운 국가일수록 수출액이 증가하는 것으로 나타났다. 가격비율 (PriceRatio)과 미얀마의 생산량(Production)은 각각 미얀마 건조 콩류 수출액에 양의 관계가 있는 것으로 나타났다. 또한 수입국의 SPS 조치는 미얀마산 건조 콩류의 수출액을 감소시키는 것으로 나타났다.

주요어: 농산물 무역; 건조 콩류; 미얀마; SPS; PPML
학번: 2021-2687

Acknowledgement

First and foremost, I am deeply thankful to my supervisor, Professor Hanho Kim, for your unwavering guidance and support, throughout my studies. I would also like to extend my thanks to Professor Oh Sang Kwon for your insightful comments and invaluable feedback, which have greatly enriched the quality of my work. Special appreciation goes to Professor Jongwook Lee for providing me with valuable feedback that has contributed to the refinement of my ideas.

My gratitude extends to my supportive seniors, whose assistance and encouragement have made my academic pursuits more fulfilling and enjoyable. To all my friends, thank you for being there for me and taking care of me during my studies. Your friendship has been a source of strength and joy. I am deeply grateful to the Government of Korea for granting me the opportunity to pursue my Master's degree at Seoul National University. Your support has been pivotal in shaping my academic journey.

Lastly, I would like to express my heartfelt thanks to my family for their unwavering prayers and encouragement. Your love and belief in me have been a constant source of motivation. Without the support and encouragement of these incredible individuals and institutions, my academic achievements would not have been possible. Thank you all for being an integral part of my academic and personal growth.