

# Agri-food commodity mapping and trade between Indonesia and Australia

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**Abstract.** This article investigates the dynamics of comparative advantage and trade performance in agri-food items between Indonesia and Australia. The method used in this study is to measure comparative advantage and export performance from 2000 to 2019 using balassa index (BI), Lafay index (LFI), and trade balance index (TBI). The findings show that Indonesia significantly reported negative TBI in trading both with the world and Australia, using a 'products mapping' methodology focused on trade balance index (TBI), Balassa index (BI), Lafay index (LFI), and other descriptive approaches. According to the results of both BI and LFI, Indonesia has a high rate of unfavorable TBI in total food items, both globally and in Australia, indicating that the nation has depended heavily on food imports for home use. Indonesia's competitive advantage in trade with Australia was 9/31 food items, according to the product mapping. Indonesia has competitive disadvantages and a negative TBI in 9/31 food items traded with Australia. Indonesia urgently needs to increase investment and enforce policies on domestic agriculture and food value chains to improve its exports and competitiveness, especially in products with natural advantages.

## 1 Introduction

After about ten years of negotiations, the typical average time for trade negotiations, Indonesia and Australia have reached an agreement on the bilateral economic agreement's effective date of entry into force. This arrangement does not just address trade problems; it also considers long-term investment, so it is called a comprehensive economic cooperation agreement. Since Indonesia joined the reform, economic ties between the two countries have grown stronger, beginning with more official visits and conversations [1]. In 2010, Indonesia and Australia started discussing the possibility of concluding a straight bilateral agreement as a precursor to the Free Trade Area (AANZFTA).

The anticipation and enthusiasm for this bilateral have increased in the lead-up to July 2020. Indonesia and Australia are the Cairns Group, APEC, RCEP, and the East Asia Summit. However, both countries lack bilateral economic cooperation and need to establish

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development program frameworks and trade agreements, despite their shared goal for trade and investment cooperation. Along with this requirement, the world has become increasingly interested in broad bilateral economic cooperation. In 2010, the CPTPP and the RCEP ushered in a new era of bilateralism to counter mega regionalism. Bilateral CEPA becomes the most viable option for two countries wanting to expand economic relations from trade to investment without giving in to international pressure.

Before the entry into force of the IA-CEPA, Indonesia had concluded bilateral trade agreements with Japan (IJEPA), Pakistan (IPPTA), and Chile (CEPA). In contrast to the PTA, bilateral CEPA agreements include both goods and services trade and long-term investment partnerships. Economic evaluations must consider commercial connections and indications of commerce; other forms of central economic cooperation, such as foreign direct investment, may also be evaluated [2]. Indonesia needs broader bilateral economic cooperation, and Australia is an ideal partner. While international economic relations include both trade and investment, the agreement may focus only on business (PTA and FTA) or on both business and investment (EPA and CEPA).

Historically, agricultural trade patterns and specialization have been described in nations and regions' competitive or comparative advantages [3–5]. Recently, several researchers have utilized the comparative advantage method to examine the performance of food items in the marketplace and their competitiveness [6–10]. Fertő [5], for example, used the Balassa method to examine the evolution of Central European nations' agri-food trading patterns. The findings indicate that in Czechia, Hungary, Slovenia, Poland, and Lithuania, trade patterns have converged through time, while in Slovakia, Latvia, and Estonia, trade patterns have polarized. Bojnec and Fertő [10], in a similar vein, analyze competitiveness in food trade between EU member states. The findings indicate that the EU member states have increased their food industry competitiveness. Benesova et al. [8] examine the agricultural sector's performance in Russia. Their results show the Russian agri-food product had comparative advantages development countries such as Africa and Asia. Rather than that, the nation didn't have competitive advantages in trade with the European Union and the United States. Other research on trade performance in the agricultural sector was conducted by Esquivias [9]. This research analyzed the performance of Indonesia's and East Java's agricultural trade patterns to those of six major ASEAN exporting countries. The agricultural product categories were classified into four distinct quadrants based on their comparative advantage and export specialization using the revealed comparative advantage (RCA) method. The findings indicate that ASEAN countries have a greater degree of competitive advantage and trade specialization than East Java and Indonesia economies.

This study seeks to analyze the export performance of agri-food products between Indonesia and Australia by mapping trade. This was done because the previous research had not sufficiently discussed the export performance and competitiveness of agri-food products. So, your research seeks to bridge that gap.

## 2 Methodology

The method used in this study is to measure comparative advantage and export performance from 2000 to 2019 using balassa index (BI), Lafay index (LFI), and trade balance index (TBI). The data used in this study is trade data sourced from UN COMTRADE. There are 31 agri-food product groups analyzed in this paper—the agri-food products trade code classification used in this article is based on the SITC revision 3. The agri-food product groups are shown in Table 1.

**Table 1.** SITC Code, commodity and data source of Indonesian agri-food product groups.

<b>SITC CODE</b>	<b>Commodity</b>	<b>Data Source</b>
001	Live animals	UNCOMTRADE
011	Bovine meat	UNCOMTRADE
012	Other meat, meat offal	UNCOMTRADE
017	Meat, OFFL. PRPD, PRSVD, NES	UNCOMTRADE
022	Milk and cream	UNCOMTRADE
023	Butter, other fat of milk	UNCOMTRADE
024	Cheese and curd	UNCOMTRADE
034	Fish, fresh, Chilled, Frozen	UNCOMTRADE
036	Crustaceans, molluscs etc.	UNCOMTRADE
037	Fish etc.,. PREPD,PRSVD.NES	UNCOMTRADE
041	Wheat, meslin, unmilled	UNCOMTRADE
044	Maize unmilled	UNCOMTRADE
048	Cereal preparations	UNCOMTRADE
054	Vegetables	UNCOMTRADE
056	Vegetables, PRPD, PRSVD, NES	UNCOMTRADE
057	Fruit, nuts excl.oil nuts	UNCOMTRADE
058	Fruit, preserved, prepared	UNCOMTRADE
059	Fruit, vegetable juices	UNCOMTRADE
061	Sugars, molasses, honey	UNCOMTRADE
062	Sugar confectionery	UNCOMTRADE
071	Coffee, Coffee substitute	UNCOMTRADE
072	Cocoa	UNCOMTRADE
073	Chocolate, oth.cocoapreparations	UNCOMTRADE
074	Tea and mate	UNCOMTRADE
075	Spices	UNCOMTRADE
091	Margarine and shortening	UNCOMTRADE
098	Edible product preparations, nes	UNCOMTRADE
122	Tobacco, manufactured	UNCOMTRADE
411	Animals oils and fats	UNCOMTRADE
421	Fixed Veg. fat, oils, soft	UNCOMTRADE
431	Animal, Veg. fats,oils,nes.	UNCOMTRADE

Source: [20]

To accurately evaluate the trade specialization in particular goods, it is necessary to analyze the disclosed comparative advantages of the relevant industries. Balassaproposed the revealed comparative advantage (RCA) index, often known as the Balassa index [12,13], to do this (BI). The following formula represents the BI:

$$BI_{ij} = \frac{\frac{X_{ij}}{X_i}}{\frac{X_{wj}}{X_w}} \quad (1)$$

Whereas: X for exports items, i for a particular country, j for a specific product, and w for the world export. The BI's value ranges from zero (0) to infinity. Values less than one indicate that the product had a competitive disadvantage. It suggests that the country is the net importer of that particular commodity. In contrast, a value greater than one indicates that the nation has a competitive advantage for that specific industry.

Due to the BI's limitations, Sanidas and Shin [14] are worth comparing to another index. As a result, the LFI is chosen [15]; unlike the BI, which utilizes just export values, the LFI operates all trade values (export and import value). The following formula represents the LFI:

$$LFI_j^i = 100 \left\{ \frac{x_j^i - m_j^i}{x_j^i + m_j^i} - \frac{\sum_{j=1}^N (x_j^i - m_j^i)}{\sum_{j=1}^N (x_j^i + m_j^i)} \right\} \frac{x_j^i + m_j^i}{\sum_{i=1}^N (x_j^i + m_j^i)} \quad (2)$$

Where x and m represent the export and import values of a particular food product category, zero is the comparative advantage-neutral value. A positive number indicates that a specific industry has a comparative advantage, whereas a negative value indicates a particular food product's disadvantage. A higher index value indicates a greater degree of comparative advantage and specialization [16].

Additionally, the trade balance index (TBI) is used to determine if a country specializes in export (as a net exporter) or import (as a net importer) of a particular set of goods. TBI is stated as follows:

$$TBI_j^i = \frac{x_j^i - m_j^i}{x_j^i + m_j^i} \quad (3)$$

Where:  $TBI_j^i$  refers to trade balance index of specific country i for certain product j;  $x_j^i$  and  $m_j^i$  relates to exports and imports of certain product products j by specific nation i, respectively—the values of the index range from negative 1 to positive 1. Exceptionally, the TBI equals negative 1 if a country imports exclusively. On the other side, if a country exclusively exports, the TBI equals positive 1. If the TBI value of a particular food product is positive, Indonesia is a net exporter of that food commodity. If the value is negative, Indonesia is a net importer of a consumer of the food product category. Similarly, domestic trade balance and global competitiveness are analyzed to determine trade balance and comparative advantage [16]. As a result of combining the LFI and TBI, products mapping is created, which divides a commodity and a country into several categories (Table 2).

**Table 2.** Product mapping scheme.

Trade balance index (TBI)		
	TBI > 0	TBI < 0
LFI > 0	Group A	Group B
	have comparative advantage	have comparative advantage
	have export-specialisation (net-exporter)	no export-specialisation (net-importer)
LFI < 0	Group C	Group D
	have comparative disadvantage	have comparative disadvantage
	have export-specialisation (net-exporter)	have export-specialisation (net-exporter)

LFI: Lafay Index

Source: [16]

### 3 Result and report

From 2000 to 2019, Appendix 1 shows the results of a comparative competitiveness analysis of Indonesia and the rest of the world and Indonesia and Australia, utilizing BI, LFI, and TBI. According to these findings, Indonesian agri-food goods are competitive in the global market based on their export value (BI). This finding is in line with studies from Dewanta et al., Oktavilia et al., Sukmaya, and Saptana [17–19]. This study found that Indonesian agri-food goods are competitive in the global market, such as fish and crustaceans, Fruit, tobacco, and vegetable oils.

When the export and import trade balances are examined (LFI), the competitiveness of Indonesian agri-food goods on the global market is typically neutral (LFI value = 0). This distinction exists because BI assesses a product's competitiveness only based on its export value. At the same time, LFI analyzes the export value and the import value of agri-food goods. Then, based on TBI measures, it was determined that Indonesia is a net importer of agri-food goods into the global market. Meanwhile, the trade relationship between Indonesia and Australia demonstrates that Indonesia has competitive advantages in agri-food goods (LFI). However, given that Indonesia is a net importer of agricultural goods, Indonesia has a trade deficit in agri-food products.

Trade-in agri-food goods between Indonesia and Australia has historically been less lucrative. Australians profit more than Indonesians from agri-food trading. This is evident from the TBI value from 2000 to 2019 (Appendix 2), which is harmful, indicating that Indonesia is a net importer of agri-food items to Australia. Additionally, the number of goods classified as group A and group D may be observed. According to Table 4, between 2000 and 2019, the number of Indonesian agri-food commodities classified as group A (having a comparative advantage) has been as little as 4-6 items out of 31 commodities, with sluggish growth. While Indonesia's agri-food commodities are classified as group D (comparative disadvantage), as many as 21-24 commodities out of 31 were found to be in this category.

Mapping agricultural goods using comparative advantages analysis through BI and LFI (Appendix 3) demonstrates that Indonesia's trading circumstances with Australia are balanced. The balance of Indonesian trade with Australia is shown by the number of competitive agri-food goods and those that are not. There are as many as nine commodities in the group A category (have comparative advantage-net exporter). There are as many as nine goods in the Group D category (have comparative disadvantage-net importers). There are five commodities classified as group B (have comparative advantage-net importers).

Additionally, eight commodities are classified as group C (have comparative disadvantage-net exporters).

## 4 Conclusions

The results indicate that Indonesia has a high rate of unfavorable TBI in total food items, both globally and in Australia, meaning that the nation has depended heavily on food imports for home use. Indonesia's competitive advantage in trade with Australia was 9/31 food items, according to the product mapping. Indonesia has competitive disadvantages and a negative TBI in 9/31 food items traded with Australia. To increase exports and competitiveness, Indonesia urgently needs to expand investment in domestic agricultural and food value chains, particularly in goods where the nation has comparative advantages. Indonesian authorities should prioritize food items in Group B and C since these products can advance to Group A due to competitive advantages and positive TBI.

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**Appendix**

**Appendix 1.** Descriptive statistics (BI, LFI, and TBI Indexes)

	2000	2002	2004	2006	2008	2010	2012	2014	2016	2018	2019
BI (Ina-world)	1.590	1.259	1.376	1.161	1.416	1.358	1.039	1.104	1.329	1.104	1.274
LFI (Ina-world)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TBI (Ina-world)	-0.481	-0.571	-0.620	-0.780	-0.587	-0.567	-0.767	-0.583	-0.537	-0.674	-0.612
LFI (Ina-Aus)	0.269	0.278	0.148	0.152	0.371	0.151	0.156	0.144	0.204	0.291	0.096
TBI (Ina-Aus)	-0.418	-0.571	-0.602	-0.786	-0.709	-0.585	-0.655	-0.766	-0.673	-0.674	-0.611

**Appendix 2.** Dynamics of agri-food trade between Indonesia-Australia

Indicators	2000	2005	2010	2015	2019
Number of food Products	31	31	31	31	31
TBI (index)	-0.452	-0.681	-0.663	-0.482	-0.533
Product Mapping (LFI)					
A (Number of Product)	6	5	4	5	6
A (TBI)	0.931	0.953	0.921	0.921	0.973
B (Number of Product)	3	3	3	2	4
B (TBI)	-0.423	-0.231	-0.532	-0.091	-0.352
D (Number of Product)	22	23	24	23	21
D (TBI)	-0.962	-0.974	-0.942	-0.871	0.963

**Appendix 3.** Product mapping (BI and LFI) between Indonesia and Australia, 2000-2019

<b>GROUP A</b> (Have Comparative Advantage-Net Exporter) 9 Commodity	<b>GROUP B</b> (Have Comparative Advantage-Net Importer) 5 Commodity	<b>GROUP C</b> (Have Comparative disadvantage-NetExporter) 8 Commodity	<b>GROUP D</b> (Have Comparative disadvantage-NetImporter) 9 Commodity
122 Tobacco, manufactured 098 Edible product preparations, nes 072 Cocoa 048 Cereal preparation 037 Fish etc.PREPD, PRSVD,NES 034 Fish, fresh, chilled, frozen 071 Coffee, coffee substitute 058 Fruit, preserved, prepared 036 Crustaceans, molluscs, etc.	074 Tea and mate 075 Spices 431 Animal, veg. fats, oils,nes 062 Sugar confectionery 056 Vegetables,PRPD,PRSVD,NES	054 Vegetables 421 Fixed veg. fat,oils,soft 073 Chocolate,oth.cocoa Prep.091 Margarine and shortening023 Butter, other fat of milk 411 Animal oils and fats 059 Fruit, Vegetable Juices 044 Maize unmilled	001 Live animals 011 Bovine meat 041 Wheat, meslin,unmilled 061 Sugars, molases, honey 057 Fruit,nuts excl.oil nuts 012 Other meat, meat offal 022 Milk and cream 024 Cheese and curd 017 Meat,OFFL.PRPD,PRSVD,NES