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Diversification perspectives of Guyana's agrifood sector

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Abstract

Guyana's agrifood systems are facing an increasing level of risk: rising sea-levels are eroding its coastal area, where much of the agricultural activity is located; recent off-shore oil discoveries threaten to crowd-out non-oil sectors; and a dependency on a limited number of agricultural export commodities exposes the agricultural sector to price and market volatility. The diversification of agricultural production and exports has the potential to generate growth and increase the resilience of the agricultural sector. This study identifies Guyana's diversification potential using comparative-advantage and export-sophistication metrics, which are combined for a proximity analysis based on Guyana's production space. The objective is to identify a set of commodities with high export potential, which is in relative proximity to the current agrifood export basket. We find oil seeds, bovine meat, sunflower seed oil, fish flours (for animal feed), palm oil, fowl, cocoa beans, cocoa paste and sunflower seeds to be commodities with high export potential. These commodities share characteristics with the current agrifood export basket. This implies that expanding the exports of these goods will not be costly and is likely to promote economic development, agricultural sector growth and reduce risks associated with market concentration.

Keywords: agrifood, trade, proximity analysis, export diversification.

JEL codes: Q17, Q13, Q54.

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1 Introduction

In the next years, Guyana's agrifood systems and its agricultural sector are facing three substantial challenges: First, recent off-shore oil discoveries are expected to induce an immense inflow of revenues starting in 2021, which are expected to change Guyana's economy and specifically the labour, prices and the competitiveness of the agricultural sector (IMF, 2019). Second, Guyana's coastal area, which is home to 90 percent of its population and agricultural activities, is at risk due to climate-change-induced, rising sea levels (Guyana Bureau of Statistics, 2012). Lastly, the loss of preferential access to the EU market in 2009 resulted in a crisis of Guyana's sugar industry and triggered an ongoing major restructuring of the agricultural sector (FAO, 2019; FAO and CDB, 2019).

Guyana is the third largest agricultural economy in the Caribbean, with agriculture representing 15.44 percent of total employment in 2019 and contributing 16.85 percent to GDP in 2020 (World Bank, 2021a, 2021b). In 2018, Guyana's national poverty headcount was among the highest in Latin America and the Caribbean, at 43.3 percent, and over 80 percent of the country's poor live in rural areas (World Bank, 2020b). Agriculture is a main source of income for the majority of the rural population and serves as a driver of an inclusive and diversified economy in the long run (Government of Guyana, 2011).

Sugar, rice, selected fruits, such as bananas, and livestock are the most important agricultural sub-sectors. Historically, agriculture has played a central role: Large plantations of sugar and bananas represented an important sector of the economy. Guyana's state-owned sugar Company (GuySuCo), for example, contributed 3.4 percent to GDP in 2014 and provided employment for some 18 000 labourers (Derlagen *et al*., 2017; Ministry of Agriculture of Guyana, 2020). Reforms of the EU preferential market access for sugar, however, had a dramatic effect on export demand for sugar and bananas and stimulated the restructuring of farming systems and a shift of exports from raw materials to processed food and niche products.

Today, Guyana's agriculture is more diversified but the prevailing dependency on a limited number of export commodities exposes its agricultural sector to higher prices and market risks (FAO, 2019; FAO and CDB, 2019). Guyana's Ministry of Agriculture recognises the need for further agricultural diversification to improve food security, increase the profitability of small farmers and link to new export markets (Guyana Chronicle, 2021). Furthermore, to circumvent negative impacts by recent oil discoveries and the crowding-out of non-oil sectors, also known as Dutch disease, investments in Guyana's non-oil sectors are essential. To respond to these diverse challenges, there is need to adopt a holistic and inclusive approach that contributes to sustainable development and addresses underlying issues in the agricultural sector.

In this context, the diversification of local agricultural production and export crops certainly holds a vital role for the future sustainable development of Guyana's agrifood systems: Diversification is associated with economic growth and its importance for developing countries is recognised by the 2030 Agenda for Sustainable Development, in goals 8.2[1] and 9.b[2] (United Nations, 2015). There is extensive literature exploring the relationship between economic

[1] Goal 8.2: Achieve higher levels of economic productivity through diversification, technological upgrading, and innovation, including through a focus on high value added and labour-intensive sectors.
[2] Goal 9.b: Support domestic technology development, research, and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities.

diversification and economic development that finds a higher degree of diversification to be associated with higher levels of GDP (see Lei and Zhang, 2014, Huchet-Bourdon *et al*., 2018) and leading to exports of less ubiquitous[3] products than existing exports (see Hausmann and Hidalgo, 2011).

Particularly in the agrifood sector, a country's existing product mix affects potential new products that could emerge in the economy, i.e., diversification is path dependent. This path dependency results in challenges for countries to move directly from the production of one product to another that is further away in terms of productive capacities. Based on results from simulation experiments, Freire (2017) concludes that effective diversification strategies need to emulate the production prevailing in more diversified countries, and target products that require similar existing technologies but have a higher degree of complexity than average exports.[4]

Few analyses examine the state of export diversification in Guyana's agricultural sector. Taylor and Francis (2003), more than 17 years ago, investigated export diversification trends across Caribbean nations using export diversification metrics and found an increasing export concentration in the case of Guyana. The present analysis addresses this research gap by providing an updated roadmap for diversification in Guyana's agricultural sector.

Using the most recent data available and focusing on the most relevant agricultural products in Guyana, i.e., rice, sugar and its derivates, fish, and nuts, we quantify the export potential of agricultural products by analysing Guyana's comparative advantage, export sophistication, products space and distance. This allows us to identify competitive agricultural commodities from the perspective of international markets. This analysis focuses on an export market perspective and does not account for any potential long-term climate-change induced developments.

[3] Ubiquity is defined as the number of countries that export a product.

[4] A product is considered more complex than another when it is produced by fewer countries that are also more diversified, which suggests that it requires a more exclusive set of technologies to be produced.

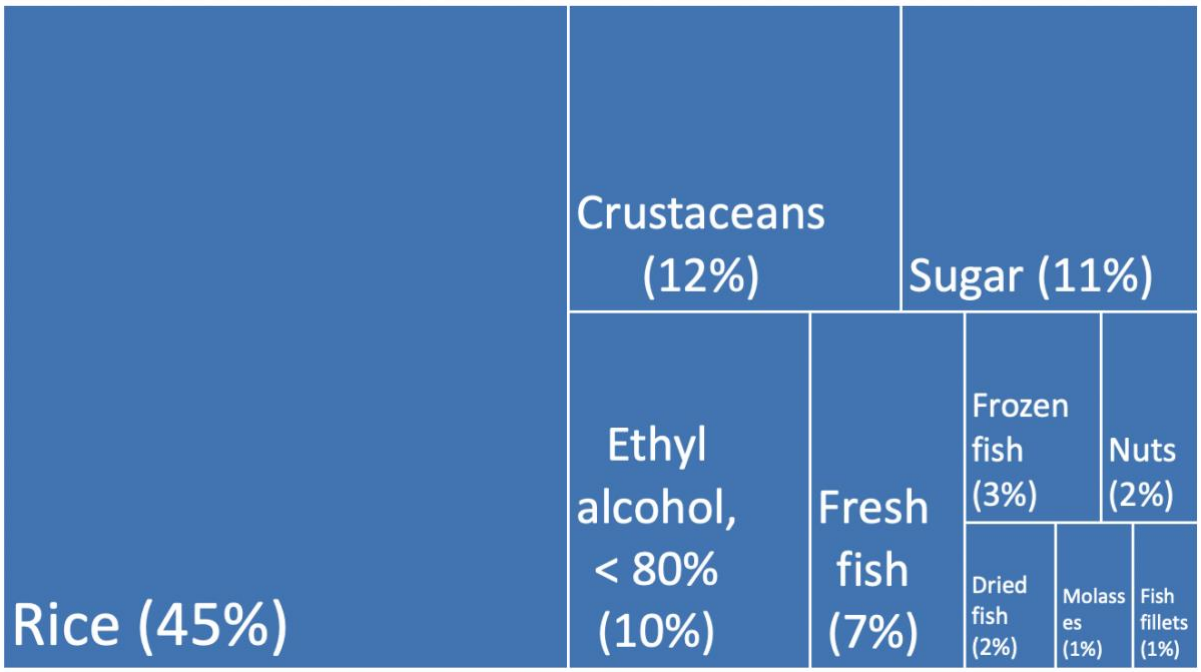
2 Background: production and trade portfolio

The main commodity in Guyana's agrifood export basket is rice, contributing 45 percent or roughly USD 200 million to Guyana's agricultural exports in 2017 (Figure 1). The main exported sub-products include other white rice, other rice in husk (paddy or rough), and semi-milled white rice. The second most important products are sugar and its derivatives, with 11 percent of exports stemming from sugar, 10 percent from ethyl alcohol (<80 percent) and 1 percent from molasses, i.e., sugar derivatives. The main exported sub-product of ethyl alcohol is rum. Crustaceans contribute 12 percent to the agrifood export basket, with frozen shrimps and prawns being the main contributors.

Furthermore, (agricultural) trade in Guyana is increasingly concentrated as illustrated using the Agricultural Exports Concentration Index, i.e., the Herfindahl-Hirschman Index (Figure 2). The lower the index value, the less concentrated a country's export and *vice versa*. We observe an increasing trend of export concentration of the full economy, while the agricultural sector reveals a decreasing trend in concentration starting in the mid-nineties. Since 2015, the agricultural trade concentration has started to increase again (see Figure 2).

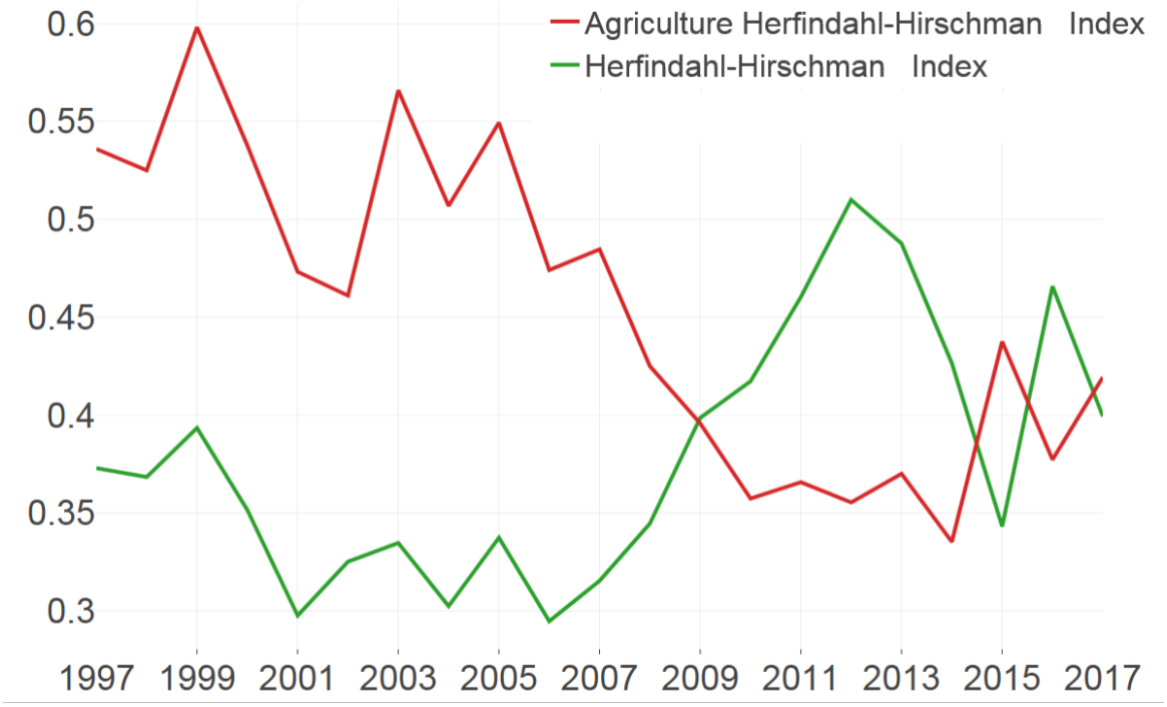
To counter this increasing trend in agricultural trade concentration, trade diversification has regained attention. From 2007–2014, through the Agriculture Export Diversification Programme, the Government of Guyana started to promote the production and export of non-traditional agricultural products (Derlagen *et al*., 2017). Furthermore, the Government initiated a process of divestment and privatisation of GuySuCo, and sustainable private investments aim to be triggered by a diversification strategy on focused value chains, such as roots and tubers, herbs and spices, small ruminants and fisheries (Ministry of Agriculture of Guyana, 2013).

Figure 1**. Agricultural export composition in Guyana, 2017**



Source: Authors' own elaboration based on data form United Nations. 2020. *UN COMTRADE.* Cited 3 December 2020. https://comtrade.un.org/data

Figure 2. Export concentration index



Source: Authors' own elaboration based on data form United Nations. 2020. *UN COMTRADE.* Cited 3 December 2020. https://comtrade.un.org/data

3 Methodology and data

To identify commodities from the current agrifood export basket with potential for trade expansion, we pursue a three-tiered analytical approach: (i) a comparative advantage analysis to reveal specialisation patterns in Guyana's agricultural sector; (ii) an export sophistication analysis; (iii) a proximity analysis of Guyana's current agrifood export basket. Steps (i) and (ii) reveal agriculture and food commodities with a positive export potential, while step (iii) identifies high potential products in which the country could invest to diversify the agricultural sector.

The comparative advantage is used to reveal the specialisation patterns in Guyana's agricultural sector. David Ricardo's theory of comparative advantage and the Heckscher-Ohlin model of factor endowments serve as a theoretical baseline that contributes to relating trade to productivity. Product specialisation and labour allocation are associated with initial levels of productivity. In a dynamic perspective, specialisation patterns affect productivity growth and the trade evolution (Proudman and Redding 2000). Then, we look at the development of the comparative advantage to capture Guyana's relative production costs (relative productivity) distribution and its evolution over time.

We rely on a normalised revealed comparative advantage index (NRCA) index (Yu *et al*., 2009). The NRCA is comparable across commodity, country, and time and is given by:

$$NRCA_j^i \equiv \frac{\Delta E_j^i}{E} = \frac{E_j^i}{E} - \frac{E_j E^i}{EE} \quad (1)$$

where E_j^i is the export of product *j* of country *i* (here, Guyana); E is the export of all commodities by all countries; E_j is the export of commodity *j* by all countries and E^i country *i*'s export of all commodities. The NRCA captures the degree of deviation of Guyana's actual export from its comparative-advantage neutral level in terms of its relative scale respect to the world export market and thus provides an indication of the underlying comparative advantage. If $NRCA_j^i > 0$, the actual export of commodity j is higher than its comparative-advantage neutral level.

We follow Hausmann *et al*. (2007) and measure the quality of exports through an index of export sophistication**.** The index captures the implied productivity of exported commodities based on income levels of countries that produce them. The index is a weighted average of the per capita GDP of countries producing that commodity, with weights given by the revealed comparative advantage. Sophistication may be measured at commodity level ($PRODY_k$) and at country level ($EXPY_j$):

$$PRODY_k = \sum_j \frac{\frac{X_{kj}}{X_j}}{\sum_j \left(\frac{X_{kj}}{X_j}\right)} Y_j$$

where X_{kj} represents the value of product *k* exported by country *j*; X_j is the total value of exports of country *j*; Y_j is the GDP per capita.[5]

[5] We use the GNI per capita, PPP (current international USD) by World Bank.

The product level sophistication variable is used to measure the overall level of income associated with a country's export basket that is the export sophistication level of a country *j* during the year *t.* The index is the average of the PRODY of all commodities that a country exports, weighted by its share of total exports:

$$EXPY_{jt} = \sum_k \frac{X_{kjt}}{X_{jt}} PRODY_k$$

By construction richer countries are associated with a higher level of sophistication than poorer countries, but countries with an equal level of GDP per capita may have a different level of sophistication.[6]

As indicated by Reis and Farole (2012), Hausmann *et al*. (2007) show that countries with high sophistication tend to have higher future growth rates, i.e. countries converge to the income level implied by their export baskets. Lall *et al*. (2006) show cases of high technology commodities with low levels of sophistication, suggesting that some production processes can be fragmented and, thus, parts of the process re-located to lower wage countries. Also, there are low technology commodities with high sophistication levels, suggesting that the products have specific requirements for natural resource or logistics, or that these products are subject to policy interventions.

3.1.1 Product space and distance

As underlined by Reis and Farole (2012), when studying the ingredients for economies to diversify, it is fundamental to identify the capabilities[7] required by each economic activity, from labour-training and physical assets to regulatory requirements, property rights, and infrastructure (Hausmann and Klinger, 2007; Hidalgo *et al*., 2007). For example, exporting coffee requires different capabilities, e.g. decent sanitary and phytosanitary measures, than producing synthetic apparel. Yet, the capabilities for producing coffee are likely to be similar to exporting bananas and plantains. Similarly, gold mining or extraction of forest products requires a higher level of property rights enforced than the assembling of electronic parts.

The ease with which an economy can move to produce new exports is contingent on its installed capabilities. The hypothesis is that countries that build up competences in producing a certain good can redeploy their human, physical and institutional capital more easily if they seek to produce goods that are "nearby" those that they are producing already (Reis and Farole, 2012).

Using the comparative advantage measure as a proxy of the effectiveness of a country to export a commodity, Hausmann and Klinger (2007) define the proximity between commodity *k* and *h* as:

$$\varphi_{kh} = \min\{P(NRCA_k > 0 | NRCA_h > 0), P(NRCA_h > 0 | NRCA_k > 0)\}$$

[6] Following Fortunato et al. (2015), we normalise the export sophistication level at country level to a scale from 0 to 100 for every year. The country with the highest sophistication has $EXPY_{jt}$ equal to 100 and the country with the lowest sophistication has an index equal to 0.

[7] In theory, many factors could contribute to relatedness between products, such as broad factors like labour, land, capital, as well as technological sophistication, inputs and outputs in value chains and institutions. The productive capabilities approach is an outcomes-based measure, based on the notion that if two goods are related, because their production needs similar infrastructure, physical factors, technology, and institutions, they tend to be produced together, which is less likely for dissimilar goods (Hidalgo *et al*., 2007).

where $P(NRCA_k > 0|NRCA_h > 0)$ is defined as the probability that a country exports commodity *k* with a positive comparative advantage, given it also exports commodity *h* with a positive comparative advantage. More specifically, proximity is calculated by comparing how many countries that export product *k* with a positive comparative advantage also exports product *h* with a positive comparative advantage. For example, if 10 countries export product *k* with NRCA > 0, and 5 out of those 10 countries also export product *h* with NRCA > 0, then the *proximity* (or the general probability to export) for product *k* in relation to product *h* is 0.5 (Fortunato *et al*., 2015).[8]

To identify 'nearby' products, we constructed the entire product space of Guyana, followed by an estimation of the distance to not-yet exported goods to discover which products are closest to Guyana's current agrifood export basket.

Following Fortunato *et al*. (2015), we use the methodology by Hausmann and Klinger (2007) to measure the probability of moving from a given set of commodities (current agrifood export basket) to a new, not-yet exported product *h: distance.* Distance is the conditional probability of exporting a new commodity *h* given the current export structure. If a commodity requires the same capability of the actual basket, then its probability to be exported is high. Distance measures the capabilities that are lacking to export commodity *h*. Distance is the sum of the proximities between a commodity and all the products that country *j* is not exporting, normalised by the sum of proximities between all products and product *h*. If Guyana exports most of the commodities "close" to commodity *h*, then the distance is small. Otherwise, if Guyana exports a small proportion of the products that are related to product *h* then the distance is large. The distance between export basket *b* and a new product *h* is measured by

$$distance_{bh} = \frac{\sum_{k=1}^{N}(1 - M_{kh})\varphi_{kh}}{\sum_{k=1}^{N}\varphi_{kh}}$$

where {1,N} denotes the entire product space and M_{kh} = 1 if Guyana exports product k with NRCA>0 and 0 otherwise.

We calculate the comparative advantage and estimate the product space and distance using export data from United Nations Comtrade, which we download at the four-digit HS level (United Nations, 2020). We use data based on the Harvard Atlas of Economic Complexity for data on Guyana's product space (Hausmann and Hidalgo, 2020).

[8]This definition considers the minimum of the two conditional probabilities because conditional probability is not a symmetric measure: P(k|h) is not equal to P(h|k), yet the notion of proximity between two goods is symmetric. More importantly, as the number of exporters of any good k falls and eventually goes to one, the conditional probability of exporting another good given you export k becomes a dummy variable, equal to 1 for every other good exported by that country, and 0 otherwise, thus reflecting the peculiarity of the country and not the similarity of the goods. Focusing on the minimum of the pairs of conditional probabilities solves this problem since we would get a high value of proximity only if all countries exporting good k would also export good h (Fortunato et al., 2015).

4 Results

The ranking of the ten agricultural and food commodities with the highest comparative advantage in 2017 shows that the food commodities with the highest comparative advantage are rice, crustaceans and sugar (Table 1). Comparing the rankings over time (2007 and 2017) allows us to analyse the dynamics of Guyana's comparative advantage. The most significant dynamics can be found in rice, which increased its share in total agrifood exports by almost 30 percentage points during this period. At the same time, the share of sugar exports fell by 46 percentage points.

This change in rankings confirms the general state of Guyana's agricultural sector: the sugar industry is declining due to the loss of preferential access to the European market and the resulting increase in competition. The past and current importance of sugar is still visible: while the export share of sugar significantly decreased, sugar (including sugar derivates) still ranks third after rice and crustaceans. This relative importance of sugar implies that a long-term, sustainable agenda to reform the sugar industry needs to be designed and implemented in the upcoming years.

Table 1. Normalised comparative advantage product groups (HS – four-digit level)

Code	Commodity	Ranking comparative advantage		Agrifood export share (%)		Δ Export share
		2017	2007	2017	2007	2017–2007
1006	Rice	1	2	45.4	15.5	29.9
306	Crustaceans	2	3	12.4	8.1	4.3
1701	Sugar	3	1	11.0	57.3	-46.3
2208	Ethyl alcohol <80% (sugar derivative)	4	4	10.4	5.5	4.9
0302	Fish; fresh or chilled, excl. fillets	5	7	6.6	1.7	5.0
0303	Fish; frozen, excluding fillets	6	14	3.5	0.3	3.2
0801	Nuts	7	35	2.5	0.0	2.4
0305	Fish; dried, salted or in brine	8	10	1.6	0.5	1.1
1703	Molasses	9	8	1.4	0.8	0.6
0304	Fish fillets and other fish meat	10	6	1.1	3.1	-2.0

Note: Codes and commodity definition are according to the harmonised system of the UN at the four-digit level.

Source: Authors' own calculation based on data from United Nations (2020).

Guyana's eight most sophisticated agrifood export commodities are shown in Table 2. These are mostly part of the fishing industry, but also include rice, sugar and ethyl alcohol (rum).

Table 2. Highly sophisticated agrifood exported commodities

Code	Commodity name	Sophistication ('000)
0303	Fish: frozen, excluding fillets	62.71
0302	Fish: fresh or chilled, excluding fillets	19.77
0304	Fish fillets	17.36
2208	Ethyl alcohol <80%	16.73
0307	Molluscs	15.89
1701	Sugar	13.95
0306	Crustaceans	8.85
1006	Rice	6.48

Source: Authors' own elaboration based on data form United Nations. 2020. *UN COMTRADE.* Cited 3 December 2020. https://comtrade.un.org/data

We subsequently combine the results from both comparative advantage and export sophistication index (Table 3). This allows us to identify products with a high sophistication index and a comparative advantage, which has the potential to be sold on the international market while promoting economic development through a higher degree of sophistication. Six commodities with these characteristics are presented in Table 3. Three commodities with high sophistication level (Table 2) – sugar, molluscs and fish fillets – are not included due to their negative trend in terms of comparative advantage (see Table 1). The remaining six commodities share a positive comparative advantage and a high level of sophistication. Again, these feature many products from the fishing industry (frozen, fresh, dried fish and crustaceans) as well as rice and ethyl alcohol.

Table 3. Highly sophisticated agrifood export commodities with high comparative advantage

Code	Commodity name	Trade value (million USD)	Export share (%)	Sophistication ('000)	Comparative advantage ranking
0303	Fish: frozen, excluding fillets	15 306	3.5	62.71	6
0302	Fish: fresh or chilled, excluding fillets	29 188	6.6	19.77	5
2208	Ethyl alcohol <80%	45 727	10.4	16.74	4
0306	Crustaceans	54 283	12.4	8.85	2
1006	Rice	199 331	45.4	6.48	1
0305	Fish: dried, salted or in brine	7 053	1.6	6.04	8

Note: Values are for the year 2017.

Source: Authors' own elaboration based on data form United Nations. 2020. *UN COMTRADE.* Cited 3 December 2020. https://comtrade.un.org/data

Lastly, to identify nearby products we arrange all not-yet exported commodities into ten different groups (using quintiles) based on their distance from Guyana's agrifood export basket in 2017. Then, we measure the level of sophistication of the not-yet exported commodities and compare them to the average sophistication level of the current agrifood export basket.

The commodities with the highest sophistication levels are shown in Table 4. The table shows the distance of each commodity from the 2017 agrifood export basket and its level of sophistication. It depicts agricultural goods that Guyana is already mostly prepared to produce, thus raising the aggregated sophistication level of the country's exports; these include fish flours for animal feed, palm oil and sunflower seeds. As noted above, our analysis for future product diversification relies on a purely macroeconomic perspective. These results should not be interpreted at face value. Rather, they should be seen as inviting further analysis of the microeconomic, environmental, social, territorial and agricultural dimensions of Guyana's export potential.[9]

Table 4. Highly sophisticated agrifood commodities 'nearby' the current agrifood export basket

Distance rank	Commodity name	Sophistication	Distance
1	Other oil seeds	1 055	0.46
2	Bovine	3 218	0.47
3	Sunflower seed oil	2 686	0.48
4	Fish flour for animal feed	10 931	0.48
5	Palm oil	4 396	0.48
6	Fowl	521	0.49
7	Sheep	795	0.50
8	Cocoa beans	9 767	0.51
9	Cocoa paste	581	0.52
10	Sunflower seeds	1 499	0.52

Source: Authors' own elaboration based on data form United Nations. 2020. *UN COMTRADE.* Cited 3 December 2020. https://comtrade.un.org/data

[9] For example, an agronomic analysis would likely point out that producing sheep in a tropical climate is difficult and thus would not be a feasible investment.

5 Discussion: challenges and opportunities

The application of the concepts of product space and export sophistication allows us to identify commodities with the highest potential in Guyana's national agrifood sector, contingent on productive capabilities already present in the country. Currently, Guyana's agrifood export basket particularly focuses on rice and, to a lesser extent, on fish (frozen, fresh, and dried), crustaceans, sugar and ethyl alcohol. Guyana's sophistication and dynamics in promoting a comparative advantage for rice, fish and ethyl alcohol bode well for development.

Our analysis identifies a set of commodities with high export potential, which share characteristics with the current agrifood export basket. This implies that expanding the exports of these goods will not be costly and likely to promote development. They include oil seeds, bovine meat, sunflower seed oil, fish flours (for animal feed), palm oil, fowl, cocoa beans, cocoa paste and sunflower seeds.

Comparing the aggregated sophistication level of Guyana's agrifood exports to the level that could theoretically be reached also raises an important question: what has prevented Guyana from developing a productive export structure that is closer to the one identified by the empirical results? There are many possible hypotheses. The low rates of transformation could relate to domestic factors, such as local barriers to the political economy e.g. the underdevelopment of the financial sector and regulatory environment and lack of labour training, as well as to the global macroeconomic context, such as adverse terms-of-trade movements and exchange rates. Institutional challenges hampering Guyana's export and diversification perspectives include low credit levels, high tariff and non-tariff barriers, and difficulties for traders to receive permits.

Also, intraregional trade within the Caribbean Community (CARICOM), a group promoting economic integration, presents an opportunity to boost trade and diversification, which has not been explored to the fullest extent (Al Hassan *et al*., 2020). Interregional trade and non-trade barriers within CARICOM remain the major bottleneck of agrifood export growth in the region. While Guyana has a strong potential to be a major player covering rice demand across CARICOM countries, it has not fully tapped into its export potential, with Jamaica and Trinidad and Tobago being the only two CARICOM nations among Guyana's top 10 export destinations for rice in 2020 (United Nations, 2020).

Furthermore, changing consumption trends driven by supermarkets and fast-food chains provide opportunities for Guyana's farmers (Reardon *et al*., 2004). However, farmers currently cannot benefit from these trends due to a lack of quality and quantity standards and the inability to deliver their products in a timely manner. Guyana has experienced an increase in investments taking place in other value chain segments downstream from the farmer (e.g., in retailing and processing), and a shift in the composition of exports towards processed foods.

These important structural changes create opportunities to realise economic growth through the expansion and diversification of agricultural production and trade. At the same time, they also create challenges to meet the higher and more elaborate standards. Value chain development policies and programmes can enable local agriculture to fulfil local, regional, and international demand for high-value agrifood produce. Most importantly, this involves improving the environment in which farmers and agribusiness operate to enable them to meet this demand locally.

Diversification can help reduce Guyana's economic vulnerability by spreading the risk over more commodities and markets and has the potential for high economic return to the country. Yet, our findings are based on a purely macro-economic analysis and should be considered a first step in the identification of potential export commodities. A supplementary agronomic and value chain assessment is required to understand the feasibility of a shift in agrifood exports.

In addition, more research is needed to understand whether the identified agrifood commodities are sufficiently resilient in the face of climate change and its expected effect on Guyana's agrifood systems over the next decades. Furthermore, rising sea levels are likely to impact Guyana's coastal area, which hosts most agricultural activities and will, hence, influence Guyana's productive capabilities. Diversification into climate change-resilient commodities and exports can serve as a tool to mitigate Guyana's elevated risk from natural disasters, which requires more rigorous models and analyses to understand the different system dynamics.

Furthermore, given that a shift in exports of agrifood commodities is likely to increase the availability of products locally, diversification has the potential to be linked to food and nutrition objectives. The agrifood commodities identified in the analysis, mostly plant oils and animal protein, have limited value for the food and nutrition security objectives and further research is needed that links export diversification to Guyana's food and nutrition security objectives.

Achieving greater diversification of the country's product mix may require significant resources. The potential future financial windfalls from oil production put Guyana in a favourable position to tackle the risks of each challenge through smart investments in reforms and holistic sector development, ultimately promoting inclusive and sustainable growth. The development of an updated, evidence-based investment strategy for the agricultural sector could contribute to guiding the Government in Guyana on investments that promote export diversification and Guyana's long-term strategic goals for its agricultural sector and food security.

References

Al Hassan, A., Bursiher, M.E., Chow, J. T., Ding, D., Di Vittorio, F., Kovtun, D., McIntyre, A., Ötker, I., Santoro, M., Shui, L. & Youssef, K. 2020. *Is the Whole Greater than the Sum of its Parts? Strengthening Caribbean Regional Integration.* IMF Working Paper. WP/20/8. Washington, DC, IMF (International Monetary Fund).

Derlagen, C., Jelle, T., Boyce, R., Shik, O. & De Salvo, C. P. 2017. *Analysis of agricultural policies in Guyana*. Agricultural Policy Reports. Inter-American Development Bank. http://dx.doi.org/10.18235/0000889

FAO & CBD (Caribbean Development Bank). 2019. *Study on the State of Agriculture in the Caribbean*. Rome, FAO. www.fao.org/3/ca4726en/CA4726EN.pdf

FAO. 2019. *Current Status of agriculture in the Caribbean and implications for Agriculture Policy and Strategy*. 2030 - Food, agriculture and rural development in Latin America and the Caribbean, No. 14. Santiago de Chile. www.fao.org/3/ca5527en/ca5527en.pdf

Fortunato, P., Razo, C. & Vrolijk, K. 2015. *Operationalizing the product space: A road map to export diversification.* United Nations Conference on Trade and Development No. 219.

Freire, C. 2017. *Economic Diversification: Explaining the pattern of diversification in the global economy and its implications for fostering diversification in poorer countries.* United Nations, Department of Economics and Social Affairs. Working Papers 150.

Government of Guyana. 2011. *Guyana Poverty Reduction Strategy Paper, 2011-2015.* https://eeas.europa.eu/archives/delegations/guyana/documents/eu_guyana/prsplaugust2011_en.pdf

Guyana Chronicle. 2021. Guyana aiming for further agriculture diversification. In: *Guyana Chronicle*. Cited 3 December 2020. https://guyanachronicle.com/2021/04/17/guyana-aiming-for-further-agriculture-diversification

Guyana Bureau of Statistics. 2012. *Guyana Population and Housing Census, Preliminary Report.* https://statisticsguyana.gov.gy/wp-content/uploads/2019/10/2012_Preliminary_Report.pdf

Hausmann, R. & Hidalgo, C.A. 2020. *The Product Space.* MIT Harvard Collaboration. Cited 9 September 2021. www.michelecoscia.com/?page_id=223

Hausmann R. & Klinger, B. 2007. *Structural Transformation and Patterns of Comparative Advantage in the Product Space.* Working Paper No. 128. Cambridge, UK, Centre for International Development, Harvard University.

Hausmann R., Hwang J. & Rodrik D. 2007. What you export matters. *Journal of Economic Growth*, 12(1): 1–25. www.nber.org/papers/w11905

Hausmann, R., Hidalgo, C.A., Bustos, S., Coscia, M., Chung, S., Jimenez, J., Simoes, A. & Yildirim, M.A. 2013. *The Atlas of Economic Complexity. Mapping paths to prosperity*. Cambridge, UK, The MIT Press.

Hidalgo, C. A., Klinger, B., Barabasi, A.-L. & Hausmann, R. 2007. The Product Space Conditions the Development of Nations. *Science*, 317(5837): 482–487. https://doi.org/10.1126/science.1144581

Huchet-Bourdon, M., Le Mouël, C. & Vijil, M. 2018. The relationship between trade openness and economic growth: Some new insights on the openness measurement issue. *The World Economy*, 41(1): 59–76. https://doi.org/10.1111/twec.12586

IMF (International Monetary Fund). 2019. *Guyana 2019 Article IV Consultation*. IMF Country Report No.19/296. Washington, DC.

Lall S., Weiss J. & Zhang J. 2006. The "sophistication" of exports: a new trade measure. *World Development*, 34(2): 222–237. http://hdl.handle.net/10454/3700

Lei, H. & Zhang, J. 2014. Capabilities' substitutability and the "S"curve of export diversity. *EPL (Europhisics Letters),* 105(6): 68003. https://iopscience.iop.org/article/10.1209/0295-5075/105/68003

Ministry of Agriculture of Guyana. 2013. *A National Strategy for Agriculture in Guyana, 2013-2020.* Cited 3 December 2020. www.ptccb.org.gy

Ministry of Agriculture of Guyana. 2020. *Guysuco*. Cited 3 December 2020. https://agriculture.gov.gy/guysuco

Proudman, J. & Redding, S. 2000. Evolving patterns of international trade. *Review of International Economics*, 8(3): 373-396. https://doi.org/10.1111/1467-9396.00229

Reardon, T., Timmer, C.P. & Berdegue, J.A. 2004. The Rapid Rise of Supermarkets in Developing Countries: Induced Organizational, Institutional, and Technological Change in Agrifood Systems. *eJADE*, 1(2): 15–30.

Reis, J.G. & Farole, T. 2012. *Trade competitiveness diagnostic toolkit.* Washington, DC, World Bank.

Taylor, T.G., & Francis, B. 2003. Agricultural Export Diversification in Latin America and the Caribbean. *Journal of Agricultural and Applied Economics*, 35: 77–87.

United Nations. 2015. Resolution adopted by the General Assembly on 25 September 2015, Transforming our world: the 2030 Agenda for Sustainable Development (A/RES/70/1).

United Nations. 2020. *UN COMTRADE.* Cited 3 December 2020. https://comtrade.un.org/data

World Bank. 2021a. *Employment in agriculture % of total employment – Guyana*. Washington DC. Cited 3 December 2020. https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=GY

World Bank. 2021b. *Agriculture, forestry, and fishing, value added (% of GDP) – Guyana.* Washington DC. Cited 3 December 2020. https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=GY

World Bank. 2020a. *A pivotal moment for Guyana: Realizing Opportunities. Systemic Country Diagnostic.* Report Number 135127-GY. Washington, DC.

World Bank. 2020b. *Commodity Markets Outlook—Persistence of Commodity Shocks, October.* Washington, DC.

Yu, R., Cai, J. & Leung, P. 2009. The normalized revealed comparative advantage index. *The Annals of Regional Science*, 43(1): 267–282. https://doi.org/10.1007/s00168-008-0213-3

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