

HARNESSING THE POTENTIAL OF  
NUTRACEUTICAL PRODUCTS FOR EXPORT  
DIVERSIFICATION AND DEVELOPMENT IN  
LANDLOCKED DEVELOPING COUNTRIES

**ASSESSMENT OF COMPARATIVE  
ADVANTAGES AND BINDING CONSTRAINTS**





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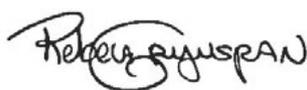
## FOREWORD

Landlocked developing countries are characterized by high levels of natural capital, limited productive capacities, dependence on a handful of unprocessed commodities and the geographical challenges of being landlocked. These challenges have been exacerbated by the disruptions to global supply chains, production and the movement of goods and persons brought about by the coronavirus disease (COVID-19) pandemic. Despite these complex development challenges, landlocked developing countries have great potential to join successful exporters from other developing countries in nutraceutical products, owing to their rich natural capital and resources base. However, this requires effectively addressing demand and supply constraints, fostering productive capacities and putting in place regulatory and institutional mechanisms to meet the requirements of export markets in terms of international quality and safety standards.

This report explores the potential of developing nutraceutical products, health foods or health-enhancing foods for export diversification and development in landlocked developing countries. More technically known as “functional foods” and food supplements, including tropical and other fruits, vegetables and grains, these products are known or considered to have health benefits. The report provides analysis and assessments of the comparative advantages and binding constraints facing nutraceuticals development in six landlocked countries, namely Azerbaijan, Bhutan, the Plurinational State of Bolivia, Burkina Faso, Ethiopia and Nepal. The report argues that, for exports of nutraceuticals and other health-enhancing products, the most binding constraints are limited levels of productive capacities that, in turn, mean low production as well as lack of compliance with environmental standards, quality control measures and health-related safety requirements that export destination countries impose to protect their citizens. Many landlocked developing countries, particularly those in the African continent and that are least developed countries, enjoy the duty-free and quota-free preferential market access opportunities offered by major development and trade partners. Having market access opportunities, however, does not mean that entry into these markets is straightforward.

The report reveals the breadth and depth of the potential of nutraceuticals. It argues that, in pursuing their export diversification and structural transformation objectives, landlocked developing countries should explore the possibility of developing production and export capacities in a diverse range of areas, sectors and economic activities. While diversification into manufacturing is critically important, it is not the only way to achieve higher value addition, productivity growth and structural transformation over the short and medium terms. In addition, the report provides a synthesis of successful and less successful experiences of developing countries in the field, with policy lessons and recommendations for action at the national, regional and global levels.

Landlocked developing countries and their development and trade partners may consider the policy recommendations suggested in this report in formulating and implementing export diversification strategies and in realigning international support mechanisms. Where possible, incentive structures and government support should also be targeted towards the enhanced participation of women, in particular young women, rural women and members of vulnerable population groups, in the production of nutraceuticals.



Ms. Rebeca Grynspan  
Secretary-General  
UNCTAD

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## ACRONYMS

<b>AGOA</b>	Africa Growth and Opportunity Act
<b>AMAL</b>	Agrarian Employment Enhancement Project
<b>AMC</b>	Agriculture Machinery Centre
<b>APEP</b>	Association of Producers and Exporters of Pomegranates
<b>AYPROMO</b>	Azerbaijan Persimmon Exporters and Producers Association
<b>BAFRA</b>	Bhutan Agriculture and Food Regulatory Authority
<b>BDBL</b>	Bhutan Development Bank
<b>BNB</b>	Bhutan National Bank
<b>BoB</b>	Bank of Bhutan
<b>BRC</b>	British Retail Consortium
<b>CBD</b>	Customs and Border Control
<b>CBE</b>	Cocoa Butter Equivalent
<b>CBE</b>	Commercial Bank of Ethiopia
<b>CBEC</b>	Cross Border e-Commerce
<b>CGMP</b>	Current Good Manufacturing Practices
<b>DAMC</b>	Department of Agricultural Marketing and Cooperatives
<b>DHI</b>	Druk Holdings and Investments
<b>DoA</b>	Bhutanese Department of Agriculture
<b>ECDF</b>	Environment Conservation and Development Forum
<b>ECX</b>	Ethiopian Commodities Exchange
<b>EIF</b>	Enhanced Integrated Framework
<b>FCG</b>	Finnish Consulting Group
<b>FDA</b>	Food and Drug Administration
<b>FMCL</b>	Farm Machinery Corporation Limited
<b>FNFC</b>	Foods with Nutrient Functional Claims
<b>FOSDU</b>	Food for Special Dietary Uses
<b>FOSHU</b>	Foods for Specified Health Uses
<b>FSMA</b>	Food Safety Modernization Act
<b>FSVP</b>	Foreign Supplier Verification Program
<b>GACC</b>	General Administration of China Customs
<b>GIs</b>	Geographical Indications
<b>GMS</b>	General Marketing Standard
<b>GNH</b>	Gross National Happiness

<b>GVW</b>	Gross Vehicle Weight
<b>HAACP</b>	Hazards Analysis and Critical Control Points
<b>HDI</b>	Human Development Index
<b>ICDS</b>	Integrated Child Development Services
<b>ICIMOD</b>	International Centre for Integrated Mountain Development
<b>IDRC</b>	International Development Research Centre
<b>IRRI</b>	International Rice Research Institute
<b>IUCN</b>	International Union for the Conservation of Nature
<b>LLDCs</b>	Landlocked Developing Countries
<b>MARA</b>	Ministry of Agriculture and Rural Affairs
<b>MCPD</b>	More Crop Per Drop
<b>MNASGP</b>	Mongolian National Association of Sea buckthorn Growers and Producers
<b>MoAF</b>	Ministry of Agriculture and Forests
<b>MT</b>	Metric tons
<b>NGPTA</b>	Nepal Ginger Producers and Traders Association
<b>NHM</b>	National Health Mission
<b>NPHC</b>	National Post Harvest Centre
<b>NPPC</b>	Bhutan's National Plant Protection Centre
<b>NTFPs</b>	Non-timber Forest Products
<b>PQSI</b>	Plant Quarantine Services of India
<b>REDCL</b>	Rural Enterprise Development Corporation Limited
<b>RVWRMP</b>	Rural Village Water Resources Management Project
<b>SABAH</b>	SAARC Business Association of Home-Based Workers
<b>SAMR</b>	State Administration of Market Regulation
<b>SOFI</b>	Safe Quality Food Institute
<b>SOFITEX</b>	Burkinabé Textile Fibres Society
<b>SRI</b>	System of Rice Intensification
<b>TFK</b>	<i>Table Filière Karité</i>
<b>UN CDP</b>	UN Committee on Development Policy
<b>USDA</b>	United States Department of Agriculture
<b>VQIP</b>	Voluntary Qualification Import Program
<b>WAEMU</b>	West African Economic and Monetary Union



## EXECUTIVE SUMMARY

Research on trade from Landlocked Developing Countries (LLDCs) shows that the average cost of transporting a container from a landlocked country is more than double of what it would cost transporting the same container from a transit country. The high cost of trading due to their geographically disadvantaged position is a major factor that negatively affects the competitiveness of LLDCs in international markets, especially those that are also least developed. It is evident that to remain competitive in international markets, what a country produces and exports, how it produces and the efficiency in which it delivers export products matter. The more competitive goods are often associated with higher productivity levels and product distinctiveness that gives them special features as export products. This is particularly important for LLDCs, which suffer from structural and geographical disadvantages. One would expect, for example, as growth and economic expansion takes place, an LLDC will begin to engage in the production and exports of goods and services that are easier to transport and where production will be based on revealed and latent comparative advantages. This would involve exploring or prospecting the potential for developing niche or unique products for export specialization and shifting resources to the production and exporting of high-value and low-volume products as, for example, some landlocked countries in Africa have done by encouraging investment in high-value horticultural goods that are airlifted to high-income markets in Europe.

This report examines the potential for exports of nutraceutical products from LLDCs as part of their respective export diversification strategies. Nutraceutical products are defined as health foods (or health-enhancing foods, more technically known as “functional foods”) and food supplements, including tropical fruits, which are generally known as nutraceuticals. This report argues that in pursuing their export diversification and structural transformation objectives, LLDCs should explore the possibility of developing production and export capacities in diverse range of areas, sectors, or economic activities. Diversification into manufacturing is vital for sustained growth and development. However, it is not the only way of achieving higher value-addition, productivity growth and structural transformation. In fact, export diversification and structural transformation can also take place in the agricultural sector, through specialization in higher-value products. This is particularly the case if LLDCs give greater attention to their biodiversity and natural ecosystem in general and explore through bioprospecting to identify specific products that have health-enhancing benefits. There is a growing demand for nutraceuticals driven by several factors, including increasing consumer awareness of health issues as populations age, greater focus on preventing rather than curing illness, wariness about modern medicine’s invasive procedures and severe side effects, and greater interest in and knowledge about traditional cures in other cultures. If the right policy and institutional frameworks are put in place, harnessing nutraceuticals can greatly complement the drive to diversify export, add value and achieve structural economic transformation in LLDCs.

However, to tap into the global demand for nutraceuticals, LLDCs must be able to enhance their productivity and boost economy-wide productive capacities. They must also meet the strict environmental, regulatory, and quality standards in more developed countries, even though generally nutraceuticals are less regulated than pharmaceuticals. This is a challenging task for any product and even more so for those targeted to consumers concerned about health effects. As shown in this report, due to health-related implications, governments in developed markets continue to impose and administer stringent regulations on standards, which can be a major barrier to potential exporters from LLDCs. This report reviews some of the various regulations, standards, product quality and health safety-related requirements that enterprises from LLDCs will face in exporting nutraceuticals.



## 1. Introduction: LLDCs' need for export diversification

Maritime transport is the backbone of international trade and the global economy. Around 80 per cent of global trade by volume and over 70 per cent by value are carried by sea and are handled by ports worldwide (UNCTAD, 2018a). These facts immediately raise questions about trade from landlocked countries, which are countries that face special challenges stemming from their lack of territorial access to the sea, geographical remoteness and isolation from major world ports and markets. For landlocked countries, global trade must inherently transit through other countries – a process which often involves dealing with neighbouring countries, cumbersome border-crossing procedures, and administrative hassles. These challenges intensify even more if both the landlocked and transit countries are developing economies with limited resources for investment in trade-related transport infrastructure. These difficulties substantially increase transport and trade transaction costs for Landlocked Developing Countries (LLDCs) undermining their export competitiveness and participation in regional and global value chains.

The average cost of transporting a container from LLDCs is more than double of what it would cost transporting the same container from a transit country (Paudel and Cooray, 2018). The high transport costs erode LLDCs competitive edge, discourage investors, reduce economic growth, and subsequently limit the capacity of landlocked countries to promote and achieve sustainable development. This has been a major factor in reducing the competitiveness of LLDCs in international markets, especially for LLDCs that are least developed and lower middle-income economies.

Why single out the landlocked least developed and lower-middle-income countries? Because of their low-level of economic development and weak infrastructure, transaction costs, especially transport and insurance costs, are generally higher in these groups of LLDCs and have been an impediment to trade flows and export competitiveness. As shown in this report, least developed LLDCs such as Nepal, Bhutan, Ethiopia and Burkina Faso and lower-middle-income LLDCs such as Bolivia and Paraguay face more challenges in export diversification due to their low-level of economic development, limited capacity to invest in transport infrastructure and generally weaker productive capacities than developed landlocked countries that have substantially advanced trade-related transport infrastructure such as Switzerland and Austria. Nonetheless, the successful development experiences of Austria and Switzerland provide hope, aspiration and evidence that problems of landlocked countries are not insurmountable, and that transformation and development are possibilities in LLDCs as well.

It is understandable, therefore, that much of the global discussion on LLDCs in recent years has focused on trade facilitation and transport-related challenges as reflected, for example, by the exclusive emphasis of the first UN Programme of Action for LLDCs (i.e. the Almaty programme of Action for LLDCs) on transport, logistics, trade facilitation, relations with transit countries and the international support needed by LLDCs to mitigate the negative consequences of disadvantageous geographical location.<sup>1</sup> Given the dire state of transport and trade facilitation services in many LLDCs, it is likely that the focus on transport, trade facilitation and transit agreements will remain priority areas in future efforts to support LLDCs.

However, as UNCTAD has already highlighted on several occasions, the challenges facing LLDCs go beyond the difficulties of distance, lack of easy access to the sea, and delivering goods on-time and at reasonable cost to international markets. It is important to note that LLDCs also face production, investment, knowledge, poverty-related, and structural challenges. In least developed and lower-middle income LLDCs, in particular, the problems of LLDCs go much deeper than transport cost, cumbersome boarder procedures and lack of efficient trade facilitation. A typical feature of most least developed and lower-middle income LLDCs is lack of productive capacity, a high incidence of poverty, excessive dependence on exports of primary products, low level of skills and technological base, a private sector dominated by informality, and limited progress in structural transformation.

<sup>1</sup> The Vienna Programme of Action for the Landlocked Developing Countries for the decade 2014–2024 takes a broader view of the challenges facing LLDCs, and includes a priority on structural transformation.

This is despite many of these countries experiencing a promising period of sustained economic growth during the 2000s and for some time after the 2008 financial crisis. Among African LLDCs, for example, many of them, including least developed LLDCs such as Ethiopia and Rwanda, enjoyed one of the highest growth rates until it was disrupted by the outbreak of Covid-19. However, the jury is still out on whether the growth boom experienced by LLDCs has brought fundamental changes in the structure of their economies or whether it has generated export dynamism and diversification making them less vulnerable to constraints that arise from their geographical position as landlocked countries (Quadri, F.U., 2019). In this context, three observed features of the recent growth and economic boom experienced by many LLDCs are worth noting.

First, growth so far has not had the desired effects on employment, income and human development of LLDCs (Quadri, 2019). Growth has not been translated into sufficient job creation and most employment expansion is happening in the informal economy, usually at very low levels of productivity. Of course, job-less growth is not a feature unique to LLDCs but given the high-level of growth rates (in some cases reaching double-digit level), the failure of economic growth to create opportunities for productive employment is disconcerting and raises concerns for future development trajectory of LLDCs. Low labour absorption rates especially affect the young and new entrants to the labour market and have the impact of slowing down the process of poverty reduction and recovery from external shocks such as the economic crisis instigated by the Covid-19 pandemic.

Second, there is little indication of structural transformation towards productivity-enhancing and higher-value-added production system. Growth in most LLDCs, has mainly been driven by the extraction and export of natural resources. For example, the exports of the 16 landlocked countries in Africa consist of mainly crude oil, primary diamonds, uranium, coffee, cotton, livestock, tobacco, sugar and copper. Therefore, the growth and economic expansion observed in these countries have been largely built on exports of primary products and increased public and private investment in construction, real estate development, non-tradable services and consumer goods, which are all associated with revenues obtained from primary sectors. Otherwise, very little structural transformation has taken place in most LLDCs.

Third and related to the last point is the fact that despite registering economic growth the economies of most LLDCs remain undiversified and dependent on commodity exports. According to UNCTAD, “primary commodities accounted for more than half of the exports of 27 out of 32 LLDCs in 2011–2013, and resource-based goods, that is to say, primary goods and resource-based manufactures, accounted for some three quarters of all exports of goods and services of LLDCs as a group. During the same period, the median share of exports represented by primary commodities among those countries stood at 84.7 per cent. From 1995 to 1997, the same figure was 83.2 per cent. Hence, over time, the degree and extent of commodity dependence has increased in those countries with little or no sign of diversification of exports. Further, they seem to be more commodity dependent than transit developing countries and other developing countries: the median share in 2011–2014 among transit countries was 76.7 per cent, compared with 66.2 per cent among other developing countries” (UNCTAD, 2015).

The above three observations lend a strong support to the argument that the case for economic and export diversification and structural economic transformation remains more persuasive for LLDCs today than ever before. Empirical and historical evidence suggests that diversification, value addition and structural transformation are key to moving-up the development ladder and catching up with developed economies. Indeed, this study underscores the important point of the need for identifying products that will enable LLDCs to diversify their exports and foster the process of structural transformation. Unfortunately, the only form of structural change that has taken place in LLDCs has been a shift from low-productivity agriculture to low-productivity and non-tradable services. Furthermore, despite the growing importance of services, their impact on exports has been minimum (Quadri, 2019). For LLDCs, services exports account for only 11.5 per cent of total exports.

The question is, does it matter whether LLDCs achieve structural transformation or not as long as they continue to record high level of economic growth and they reduce dependence on agricultural sector?

UNCTAD believes that it does matter (UNCTAD, 2015). Historically, successful economic growth has been associated with structural transformation, which is the creation of new areas of activities by shifting resources from traditional to modern sectors and from low-technology and low-productivity to high-technology and higher-productivity areas of production. In this context, structural change takes place not only across sectors – say from agriculture to manufacturing or services – but also by moving from low- to high-productivity activities and the production of new and preferably more advanced and sophisticated products within sectors.

It is evident that to remain competitive, what a country produces, how it produces and the efficiency in which it delivers its export products matter. The more competitive goods are often associated with higher productivity levels and countries that are able to get into such activities are those that have achieved growth with structural transformation. Similarly, to attain competitiveness, especially in international markets, it matters what a landlocked country with all its structural and geographical disadvantages produces. One would expect, for example, as growth and economic expansion takes place, an LLDC will begin to engage in the production and exports of goods and services that are easier to transport and get to markets. These would involve exploring or prospecting the potential for developing niche or unique products for export specialization and shifting resources to the production and exporting of high-value and low-volume products as, for example, some landlocked African countries like Ethiopia, Uganda and Zambia have done by encouraging investment in high-value horticultural goods that are airlifted to high-income markets in Europe.

Therefore, in principle, all sectors present the opportunity for structural transformation. It is often argued that initiating an industrialization process, in particular the development of the manufacturing sector, presents greater opportunities for value-addition, creating productive capacities, productive employment, raising income, providing decent wages, and living standards, reducing poverty and fostering structural transformation. It is correct that generally manufacturing is associated with greater product sophistication and sustainable growth with poverty reduction – although initially it may start with labour-intensive manufacturing, which is important for absorbing surplus labour.

It is also correct that manufacturing activities are normally conducive for technological upgrading, generating linkages and stimulating productivity growth, which are vital for competitiveness and for climbing the development ladder. Indeed, it is impossible to imagine LLDCs, in particular those with large population, providing productive employment and decent income to the millions of young people that are expected to join the labour-market in this decade alone without expanding their manufacturing activities. Therefore, ultimately, a Comprehensive Development Agenda for LLDCs that seeks to promote structural transformation must incorporate a strategy for industrial development.

However, it will be wrong to assume that it is only in manufacturing where value-addition, productivity growth and linkages could take place. It is equally wrong to assume that development is an “either or” option. The manufacturing and export of nutraceuticals can indeed go hand in hand. Moreover, transformation and diversification can and does take place in agriculture and services – the two areas where landlocked countries need to give priority attention in the coming decades. In this respect, recognizing one’s comparative advantages, biodiversity<sup>2</sup> and natural resource endowments in their totality and exploring and bioprospecting to identify specific products that a landlocked country can develop and promote as export items is called for. If undamaged, these species work together in ecosystems to maintain a finely balanced system. Healthy ecosystems provide clean air and water; nutritious foods as well as vitamins, enzymes and other nutritional compounds; botanical products that are used for pharmaceutical and as herbal medicines; scientific understanding; and climate mitigation.

As UNCTAD has noted, the global economy is inextricably tied to the health and productivity of terrestrial, marine, and other aquatic ecosystems and each country has the responsibility not only to protect its

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<sup>2</sup> Biodiversity is the name given to the variety of plants, animals and microscopic organisms that make up the natural world.

ecosystem but also utilize its rich resources sensibly to maximize income and benefit its citizens in a sustainable manner (UNCTAD, 2018a). This is where nutraceuticals feature as specialized products that LLDCs can develop and export competitively. This report will review nutraceutical products from certain LLDCs and the constraints that they face in external markets.

The report is organized as follows: The next section will briefly summarize the objectives and scope of the study. Section 3 will define the term 'nutraceutical' and why the demand for nutraceuticals has increased significantly in recent years. Section 4 will address the issue of bioprospecting and its relevance for identifying nutraceutical products. Section 5 analyses the opportunities for nutraceutical exports in six LLDCs from different regions. For each country, the report begins with an overview of the country's economy and current exports as well as the most binding constraints on export diversification. In addition, the business environment is examined briefly, since it is a key factor for nutraceutical development. The country sub-sections will present detailed analyses of selected nutraceutical products with specific recommendations on how to boost production and exports. For each country, an overview of the institutional and geographical context is also presented followed by product specific analysis. Section 6 surveys the barriers to market access in major markets for nutraceuticals. While regulation of nutraceuticals is typically less stringent than for pharmaceuticals, food safety regulations and some additional regulatory requirements apply to nutraceuticals, and they can be highly restrictive. As shown in Section 6, major emerging markets such as China and India are also strengthening regulations of food and food products. In fact, in Europe, especially, but also in other importing countries, private standards, including on fruits and vegetables, are increasingly superseding official regulations as buyers mandate satisfaction of private standards. Section 7 will present general conclusions and recommendations.

## 2. The main objectives of the study

The main objective of this report is to examine the potential for promoting exports of nutraceuticals from LLDCs and the market access constraints that can be encountered in major markets. As discussed below, it is evident that the concept of nutraceuticals is somewhat imprecise. The very name 'nutraceutical' is an amalgam of **nutrition and pharmaceutical**. It represents neither ordinary foods nor medicines but somewhere in the middle. Moreover, in most countries, nutraceuticals are less regulated than medicines, and deciding which products have health-enhancing properties that elevate them above ordinary products is necessarily somewhat arbitrary. To clarify these issues, the next section presents a definition and description of what 'nutraceuticals' are and their unique features as potential export items from LLDCs.

As a guide for readers of this report, however, the key issues that are addressed in the rest of this report include the following:

- The report provides concrete examples of the types of nutraceutical products that can be exported from LLDCs. However, the products discussed for each country are simply examples and should not be considered to represent an exhaustive list of potential nutraceuticals from that country. In this respect, each country will have to conduct further research to identify exhaustively the range of nutraceuticals that can be sourced from its territory.
- The primary focus of the report is on LLDCs, although many of the issues discussed, particularly on market access constraints, also applies to least developed countries. Indeed, the majority of the country case studies presented in this report are landlocked countries that are also LDCs. These include Burkina Faso, Ethiopia, Bhutan and Nepal. However, the potential for export diversification by sourcing nutraceutical products also applies to LDCs that are not landlocked. For example, many of the marine based biodiversity can generate nutraceuticals that LDCs with coastal areas can exploit as drivers of export diversification and structural transformation.
- The country cases discussed in this report include landlocked countries from all developing regions, including a landlocked country from Eastern Europe. From Africa, the report examines the potential for exporting nutraceuticals from Ethiopia and Burkina Faso, from the Asian

region, Bhutan and Nepal, and from the Latin American region, Bolivia, one of the two LLDCs in the region. The report also examines the potential for sourcing nutraceutical products from a landlocked country in East European region, Azerbaijan. For each country, a short review of the country's export structure and the constraints for export diversification and the implications for nutraceutical exports are presented.

- While the report addresses the potential for exports of nutraceutical products from LLDCs, it gives greater emphasis to production (supply) and market access constraints, particularly the standard and quality control-related challenges that exporters face in attempting to sell nutraceuticals in international markets. Therefore, the report addresses both the supply and demand aspects of nutraceuticals as well as the difference between market access and market entry. As the reader progresses through this report, it will become clear that the existence of demand for certain products, securing market access and developing the supply capacity does not necessarily mean that market entry will be secured. As shown in this report, major markets have introduced a multitude of standards – both public and private – which makes it extremely difficult for exporters to penetrate unless they meet the required standards. This issue is particularly pertinent to nutraceuticals, which are products sold for their contributions to health and human wellbeing.
- The extensive discussion on standards and market constraints presented in this report is highly beneficial for both potential exporters and policymakers that wish to assist potential exporters by developing the appropriate standard and quality infrastructure, testing and research capabilities and the institutions and regulations required to meet international standards.
- The report examines barriers to market access in markets where the demand for nutraceuticals has been increasing or has the potential to expand. In addition to the European Union (EU), market access challenges in five other major markets for nutraceuticals are examined. These include the United States of America, Japan, China, Korea and India. While these countries do not represent the global market, they are, nevertheless, major markets for nutraceuticals and account for the majority of world's population.
- Many LLDCs have not yet been able to harness the often-untapped reservoir of natural resources present in their terrestrial ecosystems for economic development. Hopefully, this report will be the beginning of further studies.

### 3. Nutraceuticals: definition and special features

This report focuses on selected developing countries' potential for exporting health foods (more technically known as "functional foods") and food supplements, also known as nutraceuticals. The scope of the products under study is intentionally broad given the breadth of the issue and the diversity of the products that can be regarded as nutraceuticals. Health or functional foods are foods which have or are believed or viewed to have health-enhancing properties beyond their nutritional value. Health foods include beverages. Food supplements likewise are derivatives from plants and fruits processed into concentrated forms such as liquids, tablets or capsules. In this report, the term 'nutraceutical' is used to describe both these two aspects, including fruits, vegetables, and grains that are known or considered to have health/related benefits.

From this brief description, it is evident that the concept of nutraceuticals is very broad and somewhat imprecise. As already noted above, the very name is an amalgam of nutrition and pharmaceuticals. Thus, it is neither ordinary food that people consume everyday nor officially recognized medicine. It falls in the middle and includes a wide range of plants and fruits that are traditionally and through modern research considered to have health-related benefits on humans. Essentially, therefore, any food product or derivative sold in a "health food" store or found on the aisles of the "health food" section of a supermarket, is claiming the status of nutraceutical. Furthermore, despite the somewhat vague definition and often scientifically unproven benefits of health food and supplements, consumer demand is rising strongly in

developed and even developing countries as shown from the growing demand for nutraceutical products in China and India (Dalili and Lee, 2015). This is exemplified by the rising demand for organic produce and products, despite higher prices than conventionally grown fruits, vegetables, grains, oils etc. For example, in 2016, purchases of organic foods in the United States rose 8.4 per cent compared to 0.6 per cent for all food products.<sup>3</sup> Other examples include essential oils, for which demand is booming despite controversies about their health benefits.<sup>4</sup>

The global nutraceutical market size comprising of functional foods and dietary supplements was estimated at US\$382.5 billion in 2019. Consumer demand is rapidly increasing in many regions including the United States of America, Europe, Asia Pacific, Latin America and the Middle East, with the market expected to reach US\$412.7 billion in 2020. The United States, Europe and Japan – the three markets for nutraceuticals reviewed in the report – account for more than 90 per cent of the global nutraceutical market, with India accounting for approximately 2 per cent of the market (Suleria et al., 2015). Greater product awareness, higher disposable income levels and the evolution of specific wellness diets in society have contributed to this significant growth in consumer demand (Suleria et al., 2015). In addition, the Internet has provided an abundance of information regarding the aetiology, prevention and treatment of various ailments and diseases. With the often-unwanted side effects of prescription medication, consumers seek to derive medicinal benefits from food by way of supplementing their diet with herbal and dietary supplements.

The rising demand for nutraceuticals is driven by several factors, including higher incomes, growing consumer awareness of health issues as populations age, greater focus on preventing rather than curing illness, wariness about modern medicine's invasive procedures and severe side effects, greater interest in and knowledge about traditional cures in other cultures and concerns about environmental and social sustainability (notably in the case of organic produce). There is also an international move from meat to plant with an increasing focus on ethics in food supply (Prevention Web, 2021). Indeed, the global market for plant-based food is changing fast, supported by a shift in the public belief in the capability of plant-based food to assist in treating their health issues. This new paradigm on how we treat disease and health issues has moved from the traditional "local health" approach whereby western medicine believed that individual vitamins or drugs could cure an issue. A new holistic approach recognising that whole plant diets can work across a range of medical issues is now underpinning the growth in this type of product.

Key to the trust now placed in plant-based products is the medical and the academic evidence underpinning the health claims of such diets. For example, the T. Colin Campbell nutrition centre, which is one of the world's leading centres on nutrition, has provided leadership and confidence in the field of plant-based diet and nutrition. The architect of the programme Colin Campbell has 300 peer reviewed publications in this specific field of plant-based diet and health and was a leading figure in the National Institute of Health in the USA (Campbell & Campbell, 2016).

The increasing volume of quality nutrition and health related disease information has provided the scientific basis for creating many of the new types of whole food plant-based diets and products. The public, in many countries, now accept the concept that whole food plant-based diets or plant extracts/supplements are useful substitutes for meat. The retail or food service market has increasingly welcomed the scientific evidence from these studies to support their listing of innovative new plant-based products as part their due diligence.

All these evidence-based information flows have created a booming market in health food and supplements and new opportunities for enterprises in developing countries to produce functional plant-based food products for export as nutraceuticals. In many cases, the ingredients in nutraceuticals have long been

<sup>3</sup> <https://www.usatoday.com/story/money/2017/07/27/organics-popularity-higher-than-ever-43-billion-2016/500129001/>

<sup>4</sup> <https://www.newyorker.com/magazine/2017/10/09/how-essential-oils-became-the-cure-for-our-age-of-anxiety>

cultivated or found in the wild in developing countries. If LLDCs can become competitive producers and marketers of nutraceuticals, the effects could be considerable on incomes, employment and poverty reduction. Moreover, increased returns from growing traditional plants can contribute to preserving biodiversity and indigenous cultures.

To tap into the global demand for nutraceuticals, however, LLDCs must be able to meet the strict regulatory and quality standards in developed countries, even though generally nutraceuticals are less regulated than pharmaceuticals. This is a challenging task for any product and even more so for those targeted to discriminating consumers concerned about health effects. Due to health-related implications, governments in developed markets continue to impose and administer stringent regulations on standards, which can be a major barrier to potential exporters from LLDCs. This report gives special attention to these issues as discussed in detail in Section 6 below.

### 4. Exploring the potential that the biodiversity ecosystem offers: bioprospecting

All countries have a variety of plants, fruits, animals and microscopic organisms that make up that country's ecosystem. Obviously, the diversity of the ecosystem differs between countries depending on geographical location and size. Unfortunately, many developing countries have not yet been able to harness the often-untapped reservoir of natural resources present in their terrestrial for economic development. They need to develop the capacities for bioprospecting or utilize the services provided by international organization such as UNCTAD, among others, which in 1996 launched the BioTrade Initiative. The latter supports developing countries in activities that facilitate the collection of information and the transformation and commercialisation of goods and services derived from native biodiversity.

There is no single internationally agreed definition of 'biodiversity prospecting', commonly known as 'bioprospecting'. The term was first defined by Reid et al. (2016) as the *exploration of biodiversity for commercially valuable genetic resources and biochemicals*. Since then, bioprospecting has been defined in a progress report of the Secretariat of the Convention on Biological Diversity (2000) as the *exploration of biodiversity for commercially valuable genetic and biochemical resources. It can be defined as the process of gathering information from the biosphere on the molecular composition of genetic resources for the development of new commercial products*. The main element, common to all definitions of biodiversity prospecting, is the connection to the commercialisation of pharmaceutical, agricultural, industrial or chemical processed end-products derived from biological resources.

The results of bioprospecting can lead to natural ways to grow crops, production of food supplements to improve health, and the treatment of chronic diseases. It can also create economic incentives for the conservation of biodiversity, serve as a foundation for modern biotechnology in the developing world, and provide local and indigenous communities with ways to benefit from their unique understanding of the environment in which they live. This is possible both in marine ecosystems, which naturally does not apply to LLDCs, and terrestrial ecosystems.

Generally, bioprospecting is time consuming and high risk in terms of expected returns. Many LLDCs have not been able to undertake biological prospecting on a scale sufficient to add value to a genetic resource. Only a few scientists in these countries participate in the more advanced stages of biological prospecting research. The reason for this is the lack of scientific capacity to carry out the high calibre research that would lead to patentable discoveries and the establishment of biotechnology companies. To create the necessary capacity, it is imperative for structurally disadvantaged economies to expand their facilities for collection, extraction, and screening of genetic resources to demonstrate their capabilities to potential investors (Weiss and Eisner, 1998:487). Several LLDCs have established or are in the process of establishing industrial parks, export processing zones and special economic zones to create an enabling environment for entrepreneurship, investment, and technological adaptation often with an exclusive focus on labour-intensive manufacturing.

However, to further strengthen the bargaining position of producers of nutraceutical products, it is essential to establish partnerships in sector wide networks. Such networking could also help to increase productivity and trade and has considerable economic importance. Similarly, partnerships with research institutes, academic and domestic and foreign companies will enable structurally disadvantaged economies to strengthen their capacity to participate in a given value chain and strengthen their human capital, scientific and organisational resources for manufacturing, marketing and the management of sustained research and development. To create such partnerships and be able to obtain market access, producers must adopt an array of standards and codes of conduct related to quality, safety, environmental and health concerns.

The next section will examine in detail the potential for sourcing nutraceutical products from seven LLDCs. For each country, two to three products are identified to demonstrate the potential that exists for exporting nutraceutical products and to understand better the supply-side challenges that LLDCs face in developing the capacities for exporting nutraceutical products. The country case studies will also examine export structure, the business climate, and other supply-side constraints that may hinder the potential for developing exports of nutraceutical products. The country studies will be presented by region starting from Asia (Bhutan and Nepal); Africa (Burkina Faso and Ethiopia); Latin America (Bolivia) and finally the East European region (Azerbaijan).

## 5. The potential and challenges of sourcing and exporting nutraceuticals from LLDCs: country case studies by region

### 5.1 The Asian Region

#### 5.1.1 Bhutan

##### **Overview of export structure and the challenges to diversification**

Bhutan is a small, landlocked country with a population of around 800,000 (IMF, 2018a), bordering China in the north and India in the south. Bhutan has struggled to graduate from its status as a Least Developed Country (LDC) by 2023 because of food insecurity. This is partly due to the challenging mountainous terrain presented by the Eastern Himalayas but is also a product of the country's subsistence agriculture which is vulnerable to climatic changes and weather patterns. Despite geographic challenges, in 2018, GDP per capita was estimated at \$3,316 international dollars (IMF, 2018a). Over the past decade, Bhutan's real GDP growth averaged 7.5 per cent, but recently growth has slowed from 7.4 per cent in 2017 to 5.8 per cent in 2018. This growth rate is expected to be even lower in subsequent years due to the Covid-19 pandemic and its impact on small developing country economies such as Bhutan. Overall, Bhutan enjoys political and macroeconomic stability with low inflation (3.6 per cent in 2018). The country's currency (ngultrum) pegged to the Indian rupee which ensures exchange rate stability and helps the country to accumulated sizable international reserves (World Bank, 2019h), although limits domestic space for monetary policy.

At the sectoral level, agriculture is the mainstay of people's livelihood, with 54.8 per cent of the population depends on agriculture, although the sectoral share is much lower at 17 per cent of GDP, as most agriculture consists of subsistence farming (World Bank, 2019c). Despite the rugged terrain and limited arable land, Bhutan has significant potential in horticulture and medicinal and aromatic plants. Such vegetation lends itself well to use in nutraceuticals, either as ingredients or value-added specialty health foods themselves. Bhutan is also currently investing in organic foods that meet SPS standards of developed countries and slowly expanding into genetically modified foods. Bhutan's diverse geo-ecological zones, commitment to environmental sustainability and abundant electrical energy suggest that food products and particularly nutraceuticals could contribute importantly to the Bhutanese government's goals of improving living standards through diversifying the country's exports.

Regarding international trade, Bhutanese exports are dominated by hydropower, which comprises around 40 per cent of the country's exports of goods and services, and 25 per cent of its GDP (Bhaskar, 2019). Despite this significant contribution to the country's economy, the sector has added few jobs, given its high capital intensity. However, understanding the importance of reducing dependence on hydropower, Bhutan has undertaken initiatives to expand the tourism sector with eco-tourism and cultural preservation, successfully attracting many tourists, particularly from nearby countries (Chudasama, 2019). Bhutan's other main exports of goods are also mostly capital intensive. Metals are by far the largest export category, accounting for 65 per cent of all exports almost all of which is ferrosilicon, making up 62 per cent of all exports. Other metals include semi-finished iron, raw iron bars, copper wires, and other cast iron products. Mineral products make up 10 per cent of exports, of which 5.9 per cent dolomite, 2.6 per cent gypsum, and 1.1 per cent coal briquettes. Other value-added goods include chemical products, which make up 12 per cent (US\$24 million) of total exports. Calcium carbide and silicon carbide make up most of this category. Other inorganic acids, hydrogen, essential oils, chromium oxides and hydroxides, and glaziers' putty are also exported. Bhutan even produces a variety of beauty products, soaps, and perfumes in small quantities.

In recent years, boulder exports to Bangladesh have shown great promise. Bhutanese stone chip and boulder exports increased from 249,800 MT (worth US\$3.65 million) in 2016 to 1.84 million MT in 2017, as Bangladesh reduced its reliance on Indian boulders. Boulder exports increased by an incredible 500 per cent between 2017 and 2018 (*The Financial Express*, 2018). Other noteworthy, exported goods include raw plastic sheeting, flavoured water, water, fruit juices, and cardamoms. Fruit and vegetable preparations account for only about 2 per cent of exports, although this may be an underestimate due to the smuggling of cardamom into India following India's ban on imports. Although plant and animal products contribute little to Bhutan's exports, some of Bhutan's exported products have nutritional qualities that speak to the country's potential in the nutraceutical industry.

As with most LDCs and LLDCs, Bhutan lacks requisite productive capacities and structural economic transformation, despite political stability and significantly improved economic governance and management. In 2018, the score of Bhutan on the UNCTAD Productive Capacities Index was 30.11, significantly higher than the average for LDCs (21.70) and LLDCs (26.11) but slightly lags behind other developing countries' average score (32.63). The country significantly lags in human capital and ICTs. The country's better than average performance within LDCs and LLDCs on transport infrastructure is more a reflection of its geographic size than the actual improvement in transport category of the PCI. Moreover, although Bhutan performed slightly better than the score of most LDCs and LLDCs in energy category of the PCI, this has not significantly improved the country's performance on structural change of its economy, particularly when viewed from the dominance of energy export in its export and overall economy. These challenges are particularly responsible for the weak private sector of Bhutan in creating jobs and contributing to structural economic transformation of the country. Maximizing socioeconomic gains from the country's comparative advantages and relieving some of the binding constraints requires entrepreneurship and dynamic and competitive private sector. However, the country's private sector is underdeveloped. With the public sector and agriculture accounting for 76 per cent of employment, remaining businesses are cottage and small industries with a limited number of medium and large businesses. The vast majority are sole proprietorships, accounting for 92 per cent of all non-agricultural businesses and 91 per cent of agribusinesses (Santini, 2017). The weakness of the private sector indirectly made the public enterprises key in addressing key development challenges such as poverty reduction notably in rural areas. Such organizations that pertain to the agricultural sector include Druk Holdings and Investments (DHI), Bhutan Agro Industries Limited, Food Corporation of Bhutan Ltd., Bhutan Development Bank Ltd., Farm Shops, and various megafarms (Santini, 2017). Bhutan Agro Industries Limited is known for buying up farmers' surplus and processing the crops into value-added products. The government has also provided crop-specific subsidies, in effect giving farmers vegetable and rice packages. These state-owned enterprises have made a great impact on diversifying the economy but have unfortunately hurt private sector growth.

Key challenges facing Bhutan's private sector include limited access to finance, high collateral requirement for lending, shortages of skilled labour, limited domestic market, weak export competitiveness and

heavy sectoral concentration of FDI with little or no production linkages with domestic private sector. For instance, studies confirm that limited access to finance has inhibited private sector growth in the country (Santini, 2017). Banks are generally risk-averse and reluctant to lend, in part due to difficulties in insolvency resolution, although the situation is improving in recent years as the country improves its credit information system by establishing a “credit information bureau.” Borrowers also face high collateral-to-principal ratios, measured at 178 per cent with banks allowing only for the collateralization of fixed assets (World Bank, 2017a). Trade Further challenge facing firms and enterprises particularly those engaged in exports and imports relate to trade facilitation and logistics.

Despite relatively efficient trade facilities, low export costs, and low tariff barriers, only a few Bhutanese firms choose to export products themselves. By using Indian and Bangladeshi merchants already within the country as middlemen, firms tend to avoid incurring high transportation costs. Although feeder roads have improved in recent years, giving firms better access to India, the country’s topography will always present a challenge. The lack of competition among transportation companies further pushes prices up. This lack of competition is in part due to small consignments. If Bhutanese firms increased production, transportation companies could enjoy economies of scale and new companies would enter. There is a two-way relationship between boosting productivity and lowering transport costs. However, even if more transportation companies were to appear, they would be limited by external regulations. The fact that India requires Bhutanese trucks entering India to return empty, disincentives cross-border trips. However, if Bhutan could prioritize transportation and infrastructure, the country could greatly expand its exports. Even the type of transport vehicle is not conducive to the exportation of perishable goods for which there is a market with demand.

It is critical for Bhutan to foster its overall productive capacities and address the above-mentioned challenges facing the private sector. This should include a move toward public-private partnerships enhance the role of domestic private sector in export diversification and innovation. There should also be deliberate policies and interventions to foster linkages between private enterprises and SOEs and between these and FDI firms. Mountain Hazelnuts exemplifies a successful public-private partnership undertaken by the World Bank’s International Finance Corporation. In 2015, the IFC provided a US\$12 million financing package to help Mountain Hazelnuts incorporate 15,000 farmer households into the global supply chain (IFC, 2017). An increase in the number of public-private partnerships would create more direct and indirect jobs, increase farmer income, and encourage private sector growth.

### **Overall assessment and implications for nutraceutical exports**

Agriculture, along with hydropower, mining, tourism, and cottage and small industries, is considered one of the five jewels of Bhutan’s economy. Bhutan’s promising potential to further develop the agricultural sector and expand into nutraceuticals lies in its varying agro-climatic zones and the government’s commitment to environmental sustainability and increasing GNH (Ministry of Agriculture and Forests, 2016). The majority of land cover goes to forests at 70.8 per cent. This is well above the constitutional mandate to leave 60 per cent of the total landmass as protected forest (Youn, 2017). Agricultural land covers over 5,000 km<sup>2</sup> of the total landmass (World Bank, 2019c). Therefore, agriculture production should make up 13.8 per cent of the total land area.

However, a study done by Bhutan’s National Soil Services Center in 2016 found that cultivated agricultural land only covered 2.9 per cent of the country’s total land area. This large disparity between usable and used land comes from the rugged terrain and harsh climate conditions that severely limit agriculture. Most arable land lies vulnerable to flash floods and land degradation in valley bottoms and lower hill slopes (Ministry, 2016). Farmers have made the most of drylands and wetlands, as well as successfully planted apple and citrus orchards, cardamom, and areca nuts.

Bhutan’s mountainous geography ranges widely in altitude (Ministry, 2016). The northern region tends to be much more mountainous than the southern region. Such variation in altitude creates differing geo-ecological zones, including alpine, cool temperate, warm temperate, dry subtropical, humid

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subtropical, and wet subtropical. The zonation determines which types of crops would be most successful in which region of the country, which is divided into 20 larger Dzongkhags (districts) and 205 Gewogs (blocks).

Bhutan's various climate zones enable cultivation of a variety of crops. These include rice, maize, wheat, barley, millet, potato, mustard, beans, ginger, chili, green leafy vegetables, and cardamom, as well as a variety of orchard fruits (Ministry, 2016). Each Dzongkhag has its own specialty based on its geo-ecological zone. For example, the southern Dzongkhag Trisrang is famous for its oranges and other citruses. Likewise, other southern regions focus on perennial cash crops such as citrus fruits and cardamom. In the North where the growing season is short and the terrain is challenging, people rely primarily on livestock for their livelihood. Additional value in locations such as the northern Longzhi region boast a collection of valuable medicinal and aromatic plants sourced by the local Menjong Sorig Pharmaceuticals for use in traditional hospitals. Other Dzongkhags have found supplementary income from growing lemon grass, which is then distilled for use in essential oils (Ministry, 2016).

The Royal Government of Bhutan has time and time again committed itself to the development of agriculture. In 2012, the Minister of Agriculture and Forests launched the program "One Gewog Three Products" (Ministry of Economic Affairs, 2012). This program proposed that each Gewog identify three products with a known market. By developing these products, producers could coordinate an increase in production and enjoy economies of scale (Ministry, 2012). The country also stated its ambitious intention to be 100 per cent organic by 2020. Bhutan's effort to incentivize subsistence smallholder farmers to move towards commercial smallholder agriculture has materialized as a new Flagship Program in the 12<sup>th</sup> FYP, which lays out plans to prioritize environmentally clean production systems (Lorenzen, 2019). However, the shift towards organic has brought to light a "productivity gap" that may worsen food-insecurity. While organic and nutraceutical products are not synonymous, there are lessons that can be gained and opportunities to be maximized from the horizontal and vertical integration of production processes and supply chains along the two broad categories of products.

This concern is not unfounded. Noted during the development of the 11<sup>th</sup> FYP for 2013–2018, domestic cereal production only met 64 per cent of the country's total cereal requirement, despite cereal cultivation occupying 89 per cent of arable land (Katwal, 2010). Malnutrition levels for children under 5 decreased from 33.5 per cent to 21 per cent between 2010 and 2015 (World Food Programme, 2018). A productivity gap could slow progress made towards reaching Zero Hunger by 2030. Therefore, the short-term alleviation of food insecurity has taken precedence over the long-term goal of 100 per cent organic farming. As a result, financial support for the National Organic Program has fallen from 12.25 million to 1.323 million ngultrums between 2012 and 2017. Bhutan's goal of total organic production is possible, exemplified by Gasa Dzongkhag's status as fully organic since 2004 (Lorenzen, 2019). However, the government has many more short-term issues to resolve before exporting organic produce becomes a reality.

Climate change poses the greatest challenge for development in the agricultural sector. Bhutan is located in the seismic zones IV and V and is thus vulnerable to landslides, floods, windstorms, and forest fires (UN, 2018). As previously mentioned, most of the unused agricultural land falls in the valleys threatened by flash floods. Land degradation and decreased water availability and sporadic rainfalls affect flowering and fruiting of plants. Further, erratic weather patterns could lead to the outbreak of new pests and pathogens. For example, citrus greening arose due to erratic rainfall (Gyelmo, 2016). The disease clogs the nutrition system of the plant, interrupting the ripening of the fruit. Bhutan has struggled with pest and disease management in the past. In 2007, a Gray Leaf Spot epidemic affected maize growth in the eastern region, compromising food security.

Farmers overcame these two episodes through crop diversification. Citrus farmers switched to cardamom, which requires less land and sells for a higher price. Others grew avocados, kiwi, and mangoes. However, unlike citrus fruits, farmers found that these fruits faced a higher degree of market competition. Multiple cropping has proven successful in combating such diseases and many pests. It also offers a profitable method to combat fallowness arising from the free grazing of both wild and domestic animals, a shortage

of farm labor, and monocropping of cash crops (Katwal, 2010). Diversifying agricultural products and moving towards climate change-resistant crops may do a lot for “Brand Bhutan,” as Dzongkhags hope to enter existing markets while still upholding environmental sustainability that promotes productivity.

A solution to Bhutan’s export dilemma is targeting niche high-value products. At the moment, Bhutan’s lack of volume and valuable products leaves Bhutan essentially a price-taker on the global market (Santini, 2017). Coupled with Bhutan’s peg to the Indian rupee, the country is vulnerable to price shocks and fluctuations in India. By educating agribusiness about end markets, terms of trade, and standard business practices, skills, and quality requirements, firms can make decisions necessary to cut production costs. Markets can guide farmers towards products within which they would have a comparative advantage. The government should continue to tackle inefficiencies and make necessary reforms to support all aspects of production, processing, and export alongside farmers actively exploring new products and methods. Only through this dual awareness and proactive approach can Bhutan become globally competitive.

### **Selected products with export potential as nutraceuticals**

#### **Cardamom**

##### *Cardamom’s promise as a nutraceutical*

Cardamom has great potential as a nutraceutical stemming from its many health benefits and multiple uses. Already, growing numbers of Bhutanese citrus farmers have found cardamom a viable alternative to their under-producing citrus orchards. Cardamom is one of the world’s most valuable spices, on par with saffron and vanilla, and a well-known cash crop in Bhutan (Royal Spices, 2017). The large, black cardamom variety found in Bhutan is less valuable than its small, green counterpart, but the crop is well-suited to the cold, steep-sloped conditions in the Himalayas. Although Bhutan has run into barriers in exporting to their main market due to India’s newly implemented Goods and Services Tax, this event has highlighted the weaknesses in Bhutan’s production that should be addressed prior to exporting to developed countries.

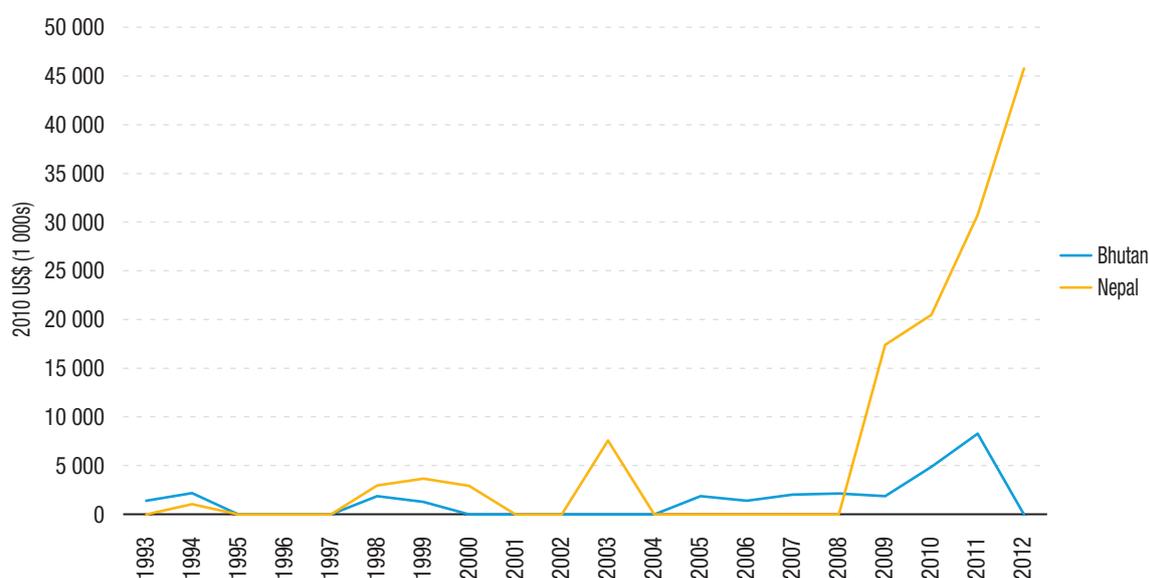
As cardamom is generally sold in dried pod or ground form, most of the crop’s labor-intensity derives from hand picking the pods from the perennial shrub from which it originates (Royal Spices, 2017). A member of the ginger family, the shrub is grown from seeds or slip cuts from a healthy clump. Small, green cardamom is more well-known than black cardamom thanks to its sweet and savoury flavouring, but the large cardamom cultivated in Nepal, India, Indonesia, and Bhutan has its own unique flavour. Large, black cardamom is well suited to Bhutan’s climate and is already extensively cultivated throughout the country.

Black cardamom can survive anywhere from 900–2,000 meters above sea level (masl) and prefers acidic sandy loam soil (Royal Spices, 2017). The cardamom plant prefers shade and colder temperatures and grows well on sloping terrain, which ensures the plant will not be waterlogged. When cracked open, the 2–3 cm long, hairy pods reveal anywhere from 30–50 sticky seeds. These seeds are then removed and dried over a fire. Once the moisture content has reduced from 70–80 per cent to less than 10 per cent, the pods are ground or sold whole. However, pre-grinding the seeds reduces the value of the seeds. The quality of the cardamom seeds depends on colour, moisture content, and level of contamination by insects and mould (Yonten, 2017).

Cardamom has many health benefits. Pods are packed with antioxidants that help fight against inflammation. Cardamom is also known to relieve a variety of digestive issues, including discomfort, nausea, and vomiting. Some research suggests that consuming cardamom may even help heal ulcers. It is most known for its ability to freshen breath and prevent cavities (Streit, 2018). Gargling cardamom can help fight against teeth and gum infections and throat discomfort (Royal Spices, 2017). It has been known to reduce muscle spasms and improve respiratory ease and health. The vitamin C, potassium, and antioxidants are said to lead to healthy skin and hair, which makes cardamom fitting for use in cosmetics as well.

Known for its use in masala due to its smoky flavour profile, cardamom is also used to flavor vegetables and is commonly found in mixed spice preparations (Royal Spices, 2017). Cardamom can also be steeped as tea, though black cardamom is not sweet like its green counterpart (Bhutan Naturals, 2018). Black

Figure 5.1 Value of Cardamom exports (Bhutan and Nepal)



Source: Comtrade.

cardamom can also be found in coffee, which comprises a significant portion of global cardamom exports (Royal Spices, 2017). Cardamom can even be taken as an herbal supplement or used in sweet bakery products (Jadav & Mehta, 2018). Large cardamom is composed of 2–3 per cent oil, from which essential oil can be extracted through steam distillation, maintaining the beneficial properties of the cardamom. It can be inhaled as an aromatic or used in a variety of cosmetics.

Though uncommon on the market, the oil of the cardamom seeds can be used in lip balms, facial cleansers, hand soap, bodywash, and body lotion, as found in Pangea Organics product offerings (Pangea Organics, 2019). Because cardamom is also known to freshen breath, it can be used in breath mints, gums, mouthwash, and toothpaste. Use in bath salts is another option for uses. There are many opportunities for large cardamom use in nutraceuticals, but producers should be aware of the more pungent odor and smoky quality of large cardamom.

As shown below, the largest producer of cardamom is Nepal. As of 2017, Nepal producers supplied 68 per cent of international demand for large cardamom, the main markets being the Middle East, South Asia, Southeast Asia, and Europe (Gautam, 2017). India's *Sikkim* and Darjeeling districts were large producers of black cardamom until the crop was riddled with viral diseases. Old plantations, poor quality planting material, lack of irrigation, and poor canopy management were the largest contributors to India's decline in production (Jamwal, 2018). However, global warming was the greatest threat to India's cardamom, as large cardamom grows under cooler, shaded conditions. Bhutan is the only other producer of large, black cardamom, but it has not yet matched the production of Nepal and India. However, as of 2017, Bhutanese cardamom sold for a higher price than Indian cardamom (Yonten, 2017). Although there are no public data on world price of large cardamom, prices since 2017 have been on a downward trend due to a drop in overseas demand (Gautam, 2017). Between 2014 and 2017, Bhutanese and Nepalis newspapers have reported that prices dropped 75 per cent.

#### *Cardamom production in Bhutan*

Cardamom is a niche, thoroughly cultivated cash crop in Bhutan. As one of the three countries where large cardamom is grown, the sandy loam soil of Southern Bhutan and steep, cool slopes are ideal conditions for cultivation. Cardamom is so plentiful that it can be found in all Dzongkhags except Thimpu, Bumthang, and Paro. In 2016, Bhutan produced more than 2,500 MT of cardamom (Yonten, 2017). The

key markets for export of the cardamom of Bhutan are Bangladesh and India – with a share of 60 per cent and 40 per cent, respectively, of the total amount exported (Mehta et al., 2018). As of 2015, cardamom exports of 845 MT were valued at Nu. 940.85 million (about US\$12 million).

In general, Bhutanese farmers must incur costs associated with seeding, general plant maintenance, land preparation, digging/planting, weeding, and harvesting. Because cardamom comes in pods, the next steps are shelling and drying (Department of Agricultural Marketing and Cooperatives, 2017). It takes around three years for cardamom plants to reach the harvestable stage. Every September, Bhutanese farmers pick the pods by hand, shell, and then dry the seeds using a traditional dryer known as *bhatti*. This drying stage takes around two days. This is an important step in the cardamom processing procedure, as quality is dependent on the drying process (Yonten, 2017). After the drying process, pods are then packed in 40 kilogram jute sacks (Department, 2017).

In recent years, the price of cardamom in Bhutan has slumped. Export prices for cardamom surged in 2014 and remained high in 2015 reaching over Nu 1,000 per kilogram – US\$13.62 (Ghalley, 2018b). As of 2018, the market price was between Nu 400 and Nu 500 per kilogram. This drastic fall in price is partly due to the introduction of India's Goods and Services Tax (GST) on July 1, 2017 (Department, 2017). India's newly implemented system required exporters to produce a Plant Quarantine Services of India (PQSI) certificate, within which Bhutan was not included (Sarkar, 2018). To make matters worse, India did not recognize the Bhutan Agriculture and Food Regulatory Authority's (BAFRA) quality certificate as legitimate. This led to increased domestic supply with resulting low prices, while a poor season in India led to a cardamom shortage and accompanying high prices. The GST's implementation hurt Bhutanese producers' income, as a 5 per cent tax was levied on cardamom. As most products go through middlemen in Bhutan, this extra cost resulted in lower prices for farmers (Department, 2017). The price distortion also led to massive illegal trade. Although implemented a little too late and ultimately underused, the Indian regulations led the Royal Government of Bhutan to commence a buy-back program at a price inclusive of the farmers' profit and expenditure, estimated at Nu 550 (US\$7.4) (Lhamo, 2019).

As of mid-January in 2019, India has approved Bhutanese cardamom importation, so Bhutanese cardamom prices may rise in the coming months. However, even if cardamom prices do increase, Bhutan's recent challenges in India highlight the need for Bhutan to reassess their phytosanitary certification standards, improve cardamom quality, create more direct access to markets for farmers, and tackle climate change, pests, and diseases that have led to declining crop yields on the supply side.

### *Key constraints on Cardamom production and exports*

**Climate change:** Climate change brings with it rising temperatures and extreme fluctuations, both drought and flooding from erratic rainfalls. Bhutan has already invested in what it calls “climate-resilient value chain development” (Gurung, 2017). The ICIMOD's Himalica program has partnered with the Environment Conservation and Development Forum (ECDP) in Taplejung Nepal and has garnered support from the E.U. to teach farmers about best practices to maintain their yields amid the changing climate. The program has developed 12 pilot demonstration farms to teach by example through on-site coaching and training in crop management. These demonstration farms emphasize the use of weather tolerant crops and best management practices. The program encourages farmers to use intercropping to maintain soil nutrients and also diversify into nitrogen-fixing beans. The Himalica program promotes using environmentally friendly methods for moisture management and recommends water smart practices. Keeping with Bhutan's commitment to minimal environmental impact, the Himalica program promotes the use of an improved dryer that requires less fuel wood. By using less wood, farmers can shrink their carbon footprint.

Climate change will continue to be an issue for cardamom farmers, so it is important for programs and the Ministry of Agriculture and Forestry (MoAF) to reach out to farmers and teach them about best climate-resilient practices. It is beneficial to farmers that the government provides hands-on training and brings farmers to India and Nepal to study more advanced production techniques (Department, 2017). However, the government should be aware of the large contingent of farmers who cannot access

such trainings. Cardamom is a widespread crop amongst the different Dzongkhags, and training farmers in the most remote ones on best practices will require a better extension network. Better telecommunication infrastructure and safe, far-reaching roads are important for programs to reach the farmers and vice versa.

**Pests and diseases:** Pests and diseases have increasingly become an issue in cardamom production. With temperatures rising, pests and viruses are having a major impact. Blight and the locally named “Furkey” are the two diseases severely choking cardamom yield in recent years (Ghalley, 2018a). Noticed first in 2015, these two diseases along with two others have continued to thrive even after replanting plantations. The Department of Agricultural Marketing and Cooperatives (DAMC) and the Ministry of Agriculture and Forests (MoAF) have acknowledged that it is difficult to find healthy planting material in Bhutan. However, in 2015 Bhutan invested in nurseries, which were estimated to produce 40,000 cardamom seedlings (Department, 2017). The DAMC and MoAF were also working on a Cardamom Repository to evaluate and multiply germplasm.

The success of cardamom cultivation is largely dependent on yield size as well as quality. If yields continue to decline, then farmers will be unable to make a profit even if they can sell directly to the market (Ghalley, 2018a). However, Bhutan is also aiming to be 100 per cent organic. To combat the existing diseases and maintain their status as organic producers, farmers should avoid the use of agrochemicals. In line with Bhutan’s ultimate goal of being environmentally sustainable, the Himalica program promotes the use of “jhomal”, or cow urine, as a natural alternative to chemical-based fertilizers and pesticides. The program also advises farmers to plant marigolds with their cardamom to control insects.

**Poor drying practices:** Quality of a product determines both the price and the reputation of the producer. Most Bhutanese cardamom producers use the traditional bhatti dryers, but this method can lead to darkened, burned, and cracked cardamom pods with a smoky flavour (Ranjan, 2018). This drying method is quite outdated and has actually hurt the quality of the pods, as quality is determined by colour, aroma, and oil content among other things. The Agriculture Machinery Centre (AMC) and the National Post Harvest Centre (NPHC) have introduced technical programs to improve quality (Department, 2017). Currently, more than 60 improved wood-fueled dryers appear in Dzongkhags such as Dagana, Tsirang, Samtse, Sarpang, Zhemgang, Chukha and Pema Gatshel. Through this government intervention, the Nu 30,000 cost of the improved dryer is shared among the beneficiaries, so no one farmer must bear the burden. The government is also looking into electricity powered dryers to improve efficiency. During their on-site training, the Himalica program also advises farmers to use woods that give off more heat to improve moisture content and cause less environmental damage (Gurung, 2017).

Access to these improved dryers and to the expertise from programs like Himalica is crucial for the survival of Bhutan’s cardamom business. In addition to yield quantity, quality is of the utmost importance. The aforementioned government agencies should continue to establish technologically advanced dryers to improve the quality of the product, but also make sure to reach rural farmers who may not have easy access to more populated areas of their Dzongkhag.

**Direct access to markets:** India’s import ban reveals the immediate need for farmers to have more direct access to markets rather than trade through middlemen (Kuensel, 2018). As cardamom supply amassed within Bhutan between 2017 and 2019, the government created a buyback program and vowed to expand this program to other crops in the case of a repeat event. Although this program was in the works and underused over the past three years, having the buyback program in place is reassuring to farmers. However, it is only a temporary measure and should not be used as a crutch. It fails to tackle the main issue.

In order for farmers to have direct access to markets, they need information. The Himalica program emphasizes the “nature-people relationship” and has a number of initiatives in place to help farmers enter the market (Gurung, 2017). They promote ICT-based information on market prices and work in group and cooperatives to establish connections. They have also implemented buyer-seller meet ups and endorse

the government's buy-back scheme. Field-to-market promotion is only successful if the yield and quality are up to par and farmers have access to information and markets in the first place.

Formal auctions are a potential long-term solution to farmers' price-setting difficulty. The greatest concern is the 3 per cent service fee levied by the Food Corporation of Bhutan Ltd. (FCBL) (Department, 2017). Producers think that the service fee should be lower, falling closer to the service charge of 0.65 per cent on cordyceps. The Royal Securities Exchange of Bhutan Limited (RSEBL) and the FCBL have already engaged in online auctioning as well, but little data has been released on the effectiveness of these auctions.

Developing access to safe roads is imperative if farmers are to cut out middlemen from the process. At the moment, transportation is costly, but increased road access would lower costs as more Bhutanese private companies enter the market. For the moment, the government should continue to develop roads, focus on working with programs such as Himalica to foster buyer-seller relationships, and assist with access to market information.

### *Conclusion and recommendations*

Cardamom is a product of great significance for Bhutan. However, it faces several natural and institutional challenges, particularly climate change, pest control and excessive dependence on the Indian market. Improving extension services to farmers so that they can upgrade quality and yield is crucial.

- BAFRA and the MoAF should bolster the buyback program for cardamom and crop in case of price drops and limited demand. However, they should seriously reassess Bhutan's current phytosanitary certification and reach equivalency with neighbouring countries at least. During the blockade of cardamom to India, determined Bhutanese exporters made the costly trip to Nepal to receive a phytosanitary certificate for a single consignment (Ghalley, 2018a). These equal standards or better should also be reinforced throughout the country through routine inspection. Such high standards are necessary if Bhutan wishes to export to countries with stricter phytosanitary regulations.
- Continue to build safe, rural roads to facilitate farmers' access to markets. A better road network will encourage the private sector to engage in transportation, which will lower transportation costs.
- Outreach programs like the Himalica program are important for building rapport with and between farmers and buyers. These programs are necessary for the dissemination of information about best practices.
- The government should continue to invest in new dryer mechanisms with the aim of low cost, high accessibility, and premium quality cardamom.

### **Red Rice**

#### *Red Rice's promise as a nutraceutical*

What better crop to grow and market than one beloved by all of Bhutan's people? Red rice is a nutritious alternative to white and brown rice. Because rice is so widely consumed, the market for Bhutan's unique red rice is quite large. Already, Bhutan's red rice has made its way to the United States and Singapore. Apart from its reddish hue, reddish rice, like other varieties of rice is a grain grown in paddy. Red rice is a unique medium-grain of the red japonica and indica variety and comes in bold and slender varieties (BAFRA, 2015). It is more similar to brown rice rather than the refined white rice, since it retains both the outer shell of bran and the vitamin-rich inner germ (Dreams of Bhutan, 2013). The red variety is semi-milled, which leaves the reddish bran to give the rice its unique red tint. Red rice has equal or better nutritional value of brown rice but cooks in less time and has a rather unique nutty flavour. In only 20 minutes, the red rice transitions from the crunchy, firm texture to being soft and slightly sticky consistency. The colour also changes from a reddish brown to a light pink. The attractive, eye-catching colour will brighten up any dish and the many vitamins and nutrients will leave consumers satiated and full of energy.

Red rice is grown like other varieties of rice. Red rice cultivation takes place in paddy, typically starting in May or June and ending in September or October (Wangchen, 2018). Traditional cultivation and harvesting techniques require hours of backbreaking labour usually undertaken by women, but mechanization has greatly reduced the physical demand where implemented (AMC, 2017) and increased yields. Traditionally, spades and plough animals broke the land, sickles were used to harvest the crop, and threshing involved beating grains on flat stones or logs. Thanks to the Japan International Cooperation System's (JICS) Good Security Project for Underprivileged Farmers KR II grant and Bhutan's Agriculture Machinery Centre and Farm Machinery Corporation Limited, farmers have the opportunity to buy or borrow machines such as power tillers, which could greatly reduce the cost of rice cultivation and the time spent in the fields in addition to greater yields.

The Bhutan Agriculture and Food Regulatory Authority (BAFRA) determines the quality of red rice using rather vague requirements, such as non-toxicity and freedom of abnormalities in color, texture, and odor (BAFRA, 2015). More specific quality indicators include variables such as moisture content, which should be no more than 12 per cent using a moisture meter. Grain breakage, harmful residue from pesticides and weedicides, insect and animal impurities, and foreign seeds should also be removed from the red rice.

Red rice is an even more nutritious alternative to white rice than brown rice, as it has all of the nutritional benefits of brown rice plus several others. Red rice is a whole grain that is higher in fibre than both brown and white rice (Lim, 2018). It is full of antioxidants, as well as minerals such as potassium and magnesium. Red rice also has around 20 per cent more zinc and iron than brown rice. As a gluten-free, low-fat, low-calorie grain with a low Glycemic Load (GL), red rice fulfils the role of a highly nutritious and filling option for those who are allergic to gluten or are trying to lose weight. The many nutritional components of red rice render it a viable alternative to white and brown rice for all. Because of its low glycemic index, red rice is said to help diabetics balance their blood sugar levels (*The Times of India*, 2019). It can help improve oxygen circulation and consumption, therefore preventing asthma and giving the consumer more energy. The high fibre content aids digestion as a natural laxative, as the whole grain component keeps heart disease at bay.

Major different types of rice grown worldwide are indica, aromatic jasmine and basmati, japonica, glutinous and other specialty rices (USDA, 2019). Hybrid varieties of these different types of rice can be bred, but each type has its own ideal climate. Indica grows in tropical and subtropical regions, and accounts for 75 per cent of global trade as of 2018. Aromatic varieties are generally grown in Thailand, Vietnam, India, and Pakistan, accounting for 16–18 per cent of trade. Japonica is grown in cooler agro-climatic zones and makes up only 5–6 per cent of all trade. Finally, glutinous and other varieties are found in Southeast Asia and account for 2–3 per cent of total global rice trade.

Red rice is said to be a japonica grain, sometimes thought to be unique to the Himalayan Mountain region, which includes southern Tibet, Bhutan, and Southern India (Saxena, 2018). However, the California-based importing company Lotus Foods replaced their line of organic Bhutanese red rice products with long grain Malagasy organic red rice, therefore suggesting that production takes place in Madagascar as well.

### ***Red Rice production in Bhutan***

Rice is a staple in Bhutanese cuisine. Most rice is consumed domestically, but the UN has recognized red rice as a niche Bhutanese product that should be given serious consideration for exportation (UNCTAD, 2016). According to a presentation given by the UN in 2014, an estimated 15 per cent of Bhutanese red rice is exported (UNCTAD, 2014). Of all the rice grown in Bhutan, 60 per cent is the red japonica variety. Although the Bhutanese consider Matshob variety to be the highest quality, other varieties include Bajo maap I, Bajo maap II, Khangma maap, Yusi Rey Maap 1 and Yusi Rey Maap 2 (BAFRA, 2015). Red rice is cultivated at 2,400m above sea level mostly in the Paro valley, but throughout the central and southern Dzongkhags. The UN calculated red rice exports in 2014 at 400 MT mostly to the US and Europe (UNCTAD, 2014). It is both marketed for its beautiful red colour and glacier-fed growth (UNCTAD, 2016a). As a natural heritage product and nutritional alternative to white and brown rice, Bhutan's red rice has been recognized as a unique grain with the potential to grow in popularity in the health food world.

Given that Bhutanese red rice is a rather widely grown, unique product, the United Nations has worked with the Royal Government of Bhutan to establish an intellectual property policy (UNCTAD, 2016b). Protecting geographical indications (GIs) and other forms of intellectual property protection would not only improve the livelihoods of rural communities by ensuring premium prices thanks to the limited supply capacity but would also make Bhutanese products attractive to international consumers as a regional brand. This safeguarding of red rice as regional intellectual property becomes of importance as the product makes its way into international markets.<sup>5</sup>

Lotus Foods was the first company to import Bhutanese red rice to the United States and sell Bhutanese products in Whole Foods. Since 2016, Lotus Foods replaced the organic heirloom Bhutan red rice with a Malagasy red rice (Lotus Foods, 2016). The company claims that they chose to transition to Madagascar farmers who could produce higher yields using fewer seeds and less water. Lotus Foods calls what is more commonly known as the System of Rice Intensification (SRI) the “More Crop Per Drop” (MCPD) commitment. According to Lotus Foods, those farmers who engage in MCPD cultivation methods produce more rice, reduce methane gas emissions, and bring in higher incomes while farming organically and minimizing their environmental impact. Although no official statement was released on the motivation for dropping Bhutan’s red rice from their product lineup, it may be linked to Bhutan’s inability to meet the MCPD standards – “to double or triple the yield with 50 per cent less water and 80–90 per cent less seed” (Lotus Foods, 2016). Across the past several decades, Bhutan has struggled to increase crop yield. However, farmers must overcome low yields in order to commercialize red rice without sacrificing their government’s goal of meeting 100 per cent food security.

This is not to say that Bhutanese red rice is unavailable for international consumption. Dragon Herbs is a California based company that sells a Bhutanese organic red rice in its retail locations in Santa Monica and Beverly Hills/Los Angeles. Singapore has also been a destination of Bhutanese red rice (Dragon Herbs, 2019). Bhutan Naturals is a company based in Singapore that promotes artisan crafts, various Bhutanese cultural products, and traditional foods, red rice being amongst them (Bhutan Naturals, 2018). Even McDonalds took an interest in Bhutan after a top chef, Anna Lim, visited Bhutan (Lim, 2018). Inspired by the local cuisine, she worked with Soup Spoon and DrukAsia to create three limited-time Bhutanese dishes sold in stores in 2015. In 2018, a red rice porridge was permanently added to the McDonald’s Singapore menu. Bhutan’s red rice has a place in health food stores and can even sate the appetites of other countries’ people. However, low productivity could lead to another Lotus Foods incident. Unless Bhutanese farmers are able to increase crop yield, manage pests and weeds, and encourage labour participation, Bhutanese red rice may have little future on the global market.

### *Key constraints on Red Rice production and exports*

**Climate change:** Bhutan’s struggle with low yield has three facets, all arising from climate change. Bhutan’s cold temperatures, low soil fertility due to soil degradation, and increasing difficulties with drought all significantly impact rice crop yield. The Royal Government has recognized the need to teach farmers about proper nutrient management as well as invest in high quality, climate-resilient seed development through the Ministry of Agriculture and Forestry in conjunction with National Organic Programme, National Plant Protection Centre and National Soil Service Centre. These government agencies are investing in irrigation, developing new hybrid seeds, and investigating research and technology to better help farmers’ yields (Pem, 2017). Two main organizations working with the Bhutanese government and farmers on increasing crop yield are the International Rice Research Institute (IRRI) and the International Development Research Center (IDRC) of Canada.

<sup>5</sup> Geographical Indications (GI) have a major potential to increase the value of traditional products and in this sense, form an integral part of potential trade policy tools. The origin associated with a specific product gives it a valuable reputation. Thus, protection by GIs allows, under the proper market conditions, the strengthening of consumer confidence, and can, therefore stimulate demand for original products in key destination markets, particularly those in which consumers attach a particular importance to the origin of products. For further information see UNCTAD, 2021.

The Bhutanese government renewed their collaboration with International Rice Research Institute (IRRI) in 2017 after finishing a collaboration in 2010 (Nima, 2017). The IRRI is currently working with the Bhutanese government to breed high-yield, disease-resistant, and drought tolerant seeds (IRRI, 2016). IRRI also facilitates meetings, workshops and conferences, through which Bhutanese scientists can proactively learn about these issues as well as possible solutions. Bhutan has also established a regional seed cooperation agreement with India, Bangladesh, and Nepal, through which to share information about improved rice varieties. However, no matter what types of seeds are grown, crop growth is dependent on water availability. The Ministry of Agriculture and Forestry must recognize that the glacial water-fed crops are a selling point of “Brand Bhutan” rice. As climate change exacerbates water shortages and glacial recession, the Bhutanese government should either aggressively invest in rural irrigation or expand its implementation of the System of Rice Intensification (SRI).

The System of Rice Intensification (SRI), mentioned earlier in the context of Lotus Foods, is a rice cultivation method that requires the thinly spread planting of young seedlings and minimal water usage (Zangmo, 2016). In 2014, a pilot program in three of Samdrup Jongkhar’s gewogs attempted to incorporate SRI into Bhutanese farming practices. The Samdrup Jongkhar Initiative was funded by the International Development Research Centre (IDRC) of Canada, which provided US\$2,000 to be divided amongst the three gewogs. Through these trials, participating farmers provided the government with valuable data on effectiveness of SRI and challenges faced, such as how to effectively control water usage and timing. One downside to SRI is that it is highly labour intensive. However, the amount of labour necessary often decreases as farmers gain experience and learn better techniques.

The Ministry of Agriculture and Forestry, National Organic Programme, National Plant Protection Centre, and National Soil Service Centre should all take advantage of the available conferences and partnerships to better learn about increasing crop yield and should attempt to spread the expertise gained from workshops, meetings, and current initiatives to all rice growing Dzongkhags. In this way, Bhutanese rice farmers can meet domestic demand and produce a quality grain to re-enter the international market.

**Weed management:** Weed management is another major obstacle to increasing paddy yield, as weed infestation stunts paddy growth (Pem, 2017). The Ministry of Agriculture and Forestry has already taken initiative, partnering with the Japan International Cooperation Agency to investigate synthetic herbicides (Tshomo, 2018). This project is designed to explore the use of defatted soybean seeds, mustard cakes, and rapeseeds as organic fertilizer in hopes of maximally utilizing existing wetlands for rice cultivation. The use of such organic fertilizers alone is projected to increase rice yield 150 per cent. The MoAF has found that the Japanese approach has controlled the notorious *Potamogeton distinctus* (Shochum) weed but could not control other aquatic weeds (National Organic Programme, 2018). The MoAF should push to extend their partnership with Japan International Cooperation Agency, as introduced Japanese techniques have benefitted farm biodiversity and plant growth and are in line with Bhutan’s goal to reach 100 per cent organic farming. Weed management is especially important because weeds are one of the main reasons why flooding takes place (Samphel, 2015). In conjunction with the minimally irrigated methods of SRI, informing farmers of the usefulness of rotary weeders would reduce water usage, limit weed growth, and increase crop yield.

**Lack of labor:** In recent times, agriculture has become less attractive to younger laborers than many other vocations. As a result, the future of agriculture is bleak, especially for labour intensive crops like rice. Urbanization has attracted labour from rural areas, leaving farm shorthanded (IRRI, 2016). Although the government wants to implement spring paddy cultivation, it is difficult to manage three annual growing seasons with limited labour (Pem, 2017). The answer lies in farm mechanization. By enhancing agriculture and increasing returns to labour, farming can attract a younger labour force, leading to greater productivity. The Agriculture Machinery Centre (AMC) of Bhutan sells machines at subsidized costs to farmers, who carry their machines or assemble them at their farms. These farming machines were received under the Japanese KR II grant. The money AMC receives go to counterpart funds, which are used for social development projects. Although AMC must first consult Japan’s International Cooperation System (JICS) on the use of these funds (JICS, 2018), AMC has implemented over 300 projects using the counterpart

fund (AMC, 2017). AMC and JICS have provided affordable power tillers, serrated sickles, threshing machines, air-forced dryers, and other processing machines to farmers across Bhutan. AMC should also consider assisting farmers with transportation of machines to farms, since transportation costs are high. The 100 per cent state-owned enterprise Farm Machinery Corporation Limited (FMCL) has also endeavored to facilitate privatization in mechanization services, as farming begins to shift from subsistence to commercial farming (FMCL, 2018). Mechanization will likely increase productivity and return, making farming more attractive to youth, and may also be a gateway to private sector growth.

### *Conclusion and recommendations*

Red rice is currently grown mostly for domestic consumption in Bhutan. If Bhutan begins to diversify into exporting red rice, farmers must strive to improve yields despite climate change. Partnering with multinational companies, the government should attempt to produce a high quality, sustainable seed. Food security is a high priority for the Bhutanese government, so the goal of increasing red rice exports should be balanced against the effort to reduce rural poverty. If productivity can be increased, Bhutan could boost exports while maintaining domestic availability. Lotus Foods shifting their sourcing of red rice from Bhutan to Madagascar was a blow to Bhutan's goal of raising exports, but this episode can serve as a wake-up call to the government to bolster its support programs to raise productivity and quality.

- The MoAF in collaboration with IRRI should conduct meetings with other regional seed cooperation participants on effective use of System of Rice Intensification methods. The Ministry of Agriculture and Forestry should develop demonstration farms implementing SRI in rice growing Dzongkhags and hold sessions to teach local farmers.
- The MoAF should endeavor to extend its partnership with the Japan International Cooperation Agency to explore organic-compatible synthetic herbicides and fertilizers.
- The MoAF should also reach out to Lotus Foods to determine exactly why Madagascar red rice was prioritized over Bhutanese red rice. Although it appears that Bhutanese farmers could not meet the More Drop Per Crop commitment, there may be other underlying factors such as quality that Bhutanese farmers can improve on.
- The AMC should explore the feasibility of transporting machinery directly to the farms of purchasing growers. This could incentivize more farmers to make the investment in machinery, since the time-intensive undertaking of transportation is no longer an issue. If not, then AMC should promote the private sector's involvement in both mechanization services and transportation.

## Citrus

### *Citrus' promise as a nutraceutical*

Bhutan may have potential to expand its production of Citrus fruit, especially the *Kagati* lime, as well as the use of citrus for essential oils. Citrus production in Bhutan is widespread. Found predominantly in the southern humid and wet regions of Bhutan, many Bhutanese farmers have committed themselves to growing mandarin oranges as their main cash crop (ACIAR, 2019). Although the local mandarin is the only citrus currently produced on farms and exported, there have been efforts to diversify citrus orchards and even to consider other native-born varieties.

Citrus has a variety of health benefits. Best known for its historically potent effect against sailors' scurvy, citrus is packed with vitamin C. It is also a good source of potassium, fiber, folate, and phytochemicals such as flavonoids (Bellefonds, 2019). Citrus fruits are popular as health foods, as they contain no fat, sodium, or cholesterol. For Western consumers looking to lose or maintain their weight, citrus are a nutritional option. Although the notion that citrus' vitamin C will cure or prevent the common cold is a common misconception, consumption of citrus does reduce the length and severity of cold symptoms. Additionally, citrus may have some preventative potential against cardiovascular disease, cancer, and anaemia. Research also suggests that citrus may aid against osteoporosis and kidney stones, and even increase cognitive functioning. Another added benefit is the hydrating effect citrus consumption has, while topical use of vitamin C serums

has become a common remedy for wrinkles. With cosmetic and health products rising in popularity, citrus is a product replete with nutrients and antioxidants that support the human body.

Citrus can be consumed in a variety of ways. It can be eaten as a fruit, distilled into an essential oil, packed into a vitamin C pill, or processed into a cosmetic or massage oil (Consulting Industry News, 2019). Citrus oil, considered a Generally Recognized as Safe (GRAS) product, is already widely used. Citrus is also known for its multifarious usage as an antibacterial and antiseptic product, as well as an immune stimulating fragrance. In a variety of forms, citrus has become an essential global product for relaxation, leisure, and beauty. With the recent increase in demand for natural products, the exportation and processing of citrus into high-value health products is a lucrative option for least developed countries like Bhutan.

Many fruits are classified as citrus, including oranges, lemons, limes, grapefruits, and mandarins. Currently, China is the leading producer of citrus fruits. In the 2016–2017 season, China produced 21.2 MT of mandarins, 7.3 MT of oranges, and 4.8 MT of grapefruit (ACIAR, 2019). China comprises a full 70 per cent of the world's mandarin production and 20 per cent of the world's exports. Other major citrus growing countries include Brazil and the United States. Citrus also plays a large role in the EU's Spain and Portugal, Egypt, South Africa, Mexico, Morocco, Argentina and Turkey (Foreign Agriculture Service, 2019). Many of these countries produce more than one citrus variety, but most are competitive in only one or two.

Prices are the lowest they have been in the past decade, with oranges in particular selling for only US\$0.54 per kilogram this past June (IndexMundi, 2017). This decrease in prices matches the global increase in production forecast for the 2018/2019 season (Foreign Agriculture Service, 2019). Due to favourable weather, production is up in Brazil and the southern region of China. Also, U.S. growers have recovered from the decimation of citrus crops by the Huanglongbing virus and Hurricane Irma in 2017. China's production is also up, as the country has developed a new easy-to-peel variety. With the Huanglongbing virus threatening citrus production everywhere, countries that are able to protect their industry and continue to sell high quality citrus will benefit.

Today, consumers demand large, visually appealing, sweet, easy to peel and seed-free citrus (ACIAR, 2019). Although country-by-country demand varies by type of citrus, the top importers overall are the E.U., the United States, Canada, and China. Besides Bhutan, major exporters include Japan, Russia, and Saudi Arabia (Foreign Agriculture Service, 2019). Although fruits remain central, essential oils have increasingly become a major facet of the global citrus market. Europe is currently the largest citrus oil market, with Germany and the United Kingdom accounting for the lion's share (Consulting Industry News, 2019). Demand for citrus oil has also risen sharply in recent years in North America and Asia Pacific, mostly stemming from the spread of massage parlours in these regions. Overall, global citrus production is strong, and prices are low. However, meeting global quality standards or entering the essential oil and cosmetics industries may be beneficial for Bhutan.

### *Citrus production in Bhutan*

According to the Bhutanese government, about 39 per cent of rural households in 16 Dzongkhags grow citrus (Seldon, 2019). It is one of the country's main cash crops, supported by the Bhutan Exporter's Association (Bhutan Exporters Association, 2017). Bhutan's National Plant Protection Centre (NPPC) regards it as Bhutan's most important fruit crop (National Plant Protection Centre, 2018). India and Bangladesh absorb about two thirds of Bhutan's citrus production, (ACIAR, 2019). Currently, mandarins are Bhutan's only commercial citrus crop. The mandarins come in two varieties: *Khasi* in the east and *Sikkim* in the south-west. However, since production has grown little since the early 1990s, the Australian Centre for International Agriculture Research (ACIAR) has worked with the Bhutanese Department of Agriculture (DoA) to introduce Australian varieties to Bhutan's orchards through grafting. These include navel oranges, common oranges, pigmented oranges, grapefruits, and other varieties of mandarin.

Currently, citrus production below 1,200 m above sea level is untenable because of the widespread Huanglongbing (HLB) virus. Citrus plants may grow between 1,200–1,700 masl, but any citrus fruits borne above 1,300 masl tend to be fairly sour (National Plant Protection Centre, 2018). However, the NPPC

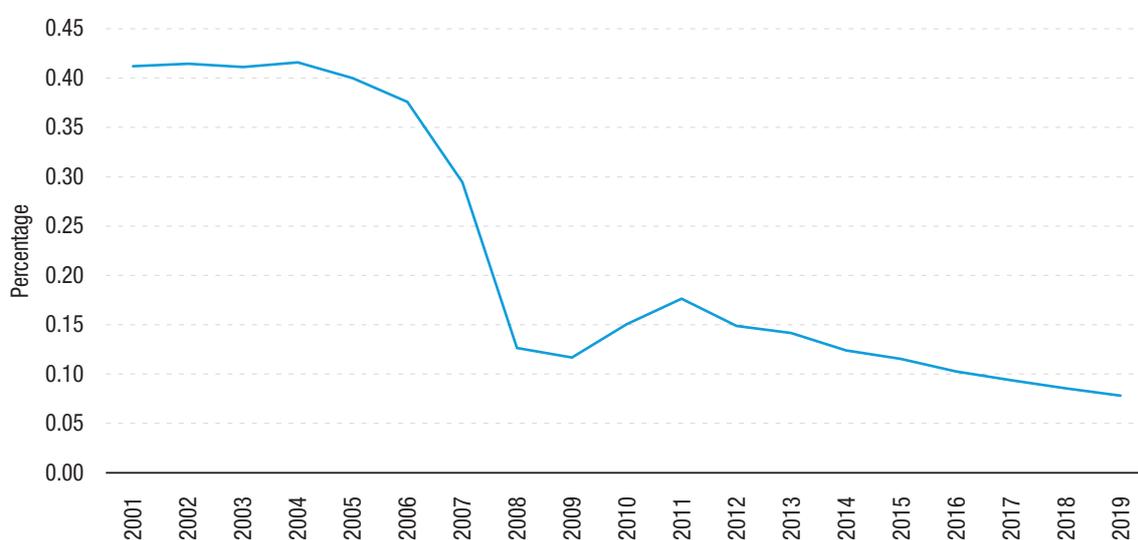
## HARNESSING THE POTENTIAL OF NUTRACEUTICAL PRODUCTS IN LLDCS

claims that these sour fruits can still sell for a good price of (~Nu. 150/kg) in the domestic market. In the coming years as farmers decide which varieties to prioritize, yield and resistance to viruses such as HLB will be key factors. Further research is necessary to establish which newly introduced and native varieties have desirable qualities worthy of export.

In 2016, the Ministry of Agriculture and Forests came across a new variety of *Kagati* lime, dubbed the “Himalayan Lime” (Ministry of Agriculture and Forests, 2016). These limes are found in the forests between 300 and 1,500 masl. Despite genetic differences, the MoAF claims that the Himalayan lime has the potential to replace the similar Mexican lime, but information regarding its cultivation is currently scant. The MoAF has stated that this indigenous lime may be used to treat diarrhea and stomach aches. If cultivated, these limes could be marketed as “Brand Bhutan” citruses with nutraceutical potential.

Use of Bhutan’s citrus in essential oils is another option. Although essential oil production is a high capital investment and requires advanced machinery, it could potentially be feasible (Consulting Industry News, 2019). At the moment, essential oils make up 0.034 per cent (US\$65,800) of Bhutan’s total exports,

**Figure 5.2 Bhutan’s market share**



Source: FAOSTAT.

**Figure 5.3 Bhutan Citrus production**



Source: FAOSTAT.

though the only export destination is Singapore (OEC, 2017a). This is because exporters such as Bhutan Natural are based in Singapore, from which they distribute their product under “Brand Bhutan” (Bhutan Natural, 2018). There are also essential oil producers like Kingdom Essences who source domestically produced inputs, mainly from medicinal and aromatic plants, that use steam to distil the oil. However, Kingdom Essences has noted that they have had difficulty keeping costs down because they have to import expensive bottles and packaging (Dema, 2018). Neither of these companies uses citrus oil as an essential oil, which could be highly marketable and play into the naturally sourced, brand Bhutan image each has endeavoured to preserve.

*Key constraints on Citrus production and exports*

**Huanglongbing virus (HLB)/Citrus greening:** The greatest threats to citrus production in Bhutan are pests and disease. Bhutan’s citrus are affected by a variety of pests and diseases, including the Chinese fruit fly, citrus shield bug, Huanglongbing, and powdery mildew (National Plant Protection Centre, 2018). Currently, Huanglongbing (HLB) is the most devastating. Although HLB is widespread around the globe, Bhutan’s crop is especially affected by the virus, which has led to quarantine and bans in countries such as Japan. Unless Bhutan is able to grow virus-free fruits, it will have difficulty attracting international demand.

Huanglongbing has affected Bhutan’s citrus production since as early as 1992 (National Plant Protection Centre, 2018). The disease travels by psyllids, which pick up the bacterium. Once a tree is infected, the bacterium spreads through the phloem, clogging the nutritional pathway and causing fruit to drop prematurely. Trees are most vulnerable when they are young and actively growing at altitudes between 1,200–1,450 masl. In a mature plant, it takes 1–3 years for symptoms to show, but may appear faster in younger plants. There is no known cure for HLB, so the only option for eradication of the disease is the destruction of the infected plants. Unfortunately, the NPPC estimates that most orchards below 1,200 masl are already affected. Even if farmers were to graft disease-free branches onto healthy rootstocks, they cannot not guarantee the safety of the trees from HLB.

On the upside, ACIAR has embarked on a number of projects that have helped Bhutanese farmers combat HLB (ACIAR, 2019). The ACIAR provided Bhutanese DoA staff and citrus growers with training on canopy, pest and disease, and nutrition management, which has increased production capacity and reduced HLB cases. Starting in 2007, Bhutan sent DoA staff to Australia, where they gained postgraduate training in specific citrus topics, one of which is HLB. These specialized staff have returned to Bhutan and are engaged in boosting the country’s agriculture. Bhutan has also attended a number of international gatherings centred around citrus. During the International Citrus Congress in Brazil in 2016, Bhutan and India signed a joint research proposal and agreed to exchange information regarding citrus production. Demonstration farms across citrus-growing regions provide training for both first-time and experienced farmers. The Royal Government of Bhutan has committed itself to citrus orchard rehabilitation in the 12<sup>th</sup> Five Year Plan, pledging 250 million Nu (Seldon, 2019). Overall, relocation of the orchards above 1,200 masl and strictly enforced quarantine, as well as quarterly checks for infected plants, will be key to the survival and expansion of Bhutan’s citrus stock (National Plant Protection Centre, 2018).

**Post-harvest losses:** A study conducted through field surveys estimated that between 30 and 45 per cent of mandarins harvested in Bhutan are damaged (Tobgayp, 2019). Damage is sustained during the harvesting process, stemming from improper harvesting techniques or harvesting at the wrong time of the season. Damage sustained during transportation is mainly due to exposure to the elements on open-air trucks, and to bruising due to poor road conditions over long distances and rough handling by transporters. Although the rest of the calculated damage was due to importer handling and natural causes, it is important for farmers to determine how much of their crop actually makes it to market and in what condition. Pre- and post-harvest training in proper handling techniques at all stages of production and transportation can minimize losses and raise farmer incomes. Further, the quality of the fruit exported from Bhutan affects the reputation of the Brand Bhutan on the international market. In order to sell its citrus as high-quality fruit, Bhutan should offer training at each level of the supply chain and maintain and expand its road network to reduce post-harvest losses.

### *Conclusion and recommendations*

Citrus fruits in general have high nutritional value and are used in a variety of health treatments and cosmetics. If Bhutan can overcome the obstacles that stand in the way of mass-commercialization, namely the devastating virus Huanglongbing (HBL) and poor post-harvest management, then citrus may be a viable, profitable export for Bhutan.

- Work with other countries, as Bhutan Natural has with Singapore, to conduct feasibility studies on citrus essential oil production and distribution. Since there are numerous multinational corporations in the industry, finding an interested party could greatly benefit Bhutan's role in the global value chain.
- Encourage production of cosmetics, such as vitamin C pills and vitamin C serum. Countries highly invested in cosmetics, such as Korea, may take interest in citrus fruits for these purposes.
- Relocate citrus production to above 1,200 masl in order to avoid HBL. With climate change leading to rising temperatures, relocation to above the currently estimated maximum growing altitude of 1,500 masl may be possible.
- To stop the spread of HBL, ensure that newly planted trees are not already infected. Currently, affected plantations should be destroyed, including their remaining crops. This includes all producers at or below 1,200 masl. Farmers who continue to produce at elevations higher than 1,200 masl must run routine tests on trees to ensure they are disease and pest-free. Producers should also ensure that grafts are disease-free prior to attachment to existing rootstocks.
- Expand proper management training to all households in all districts. This will allow for more high-yield production across Dzongkhags and reduce the spread of diseases and pests.
- Maintain roads to reduce post-harvest losses due to bruising and extended exposure to the elements.
- Boost training at each level of the value chain, from farmers to importers. Direct exportation of citrus can ensure more careful handling of products, which will be better for Brand Bhutan's reputation in the long run.

### 5.1.2 Nepal

#### **Overview of export structure and constraints to diversification**

Nepal with its total population of 30 million (IMF, 2018b) is situated between India and China, sharing most of its border with India to the south and the rest with China to the north. Despite its position as a landlocked country, its history of political instability, and several recent natural disasters within its borders, Nepal has made significant progress in the last decade. The fact that the UN Committee on Development Policy (CDP) found Nepal, along with Bhutan to have met the criteria for graduation from the LDCs category is another indicator of the progress that the country has made in recent years, although the country's economic and environmental vulnerability index (EVI) remains high, and the Productive Capacity Index (PCI) remains very low. Nepal's progress towards graduation threshold relates to improvements in its GNI per capita and human assets index (HAI). Nepal's per capita GDP in 2018 was around \$2,900 international dollars (IMF, 2018b). GDP growth in 2018 was estimated at 6.3 per cent, lower than the peak growth rate of 7.9 per cent in 2017 but continuing the recovery from 2015's devastating earthquakes. Inflation increased in tandem with India's inflation rate from 4.2 per cent in 2017 to 6 per cent in 2018, stemming from a rise in the prices of many vegetable products, but more recently inflation has slowed. Pegged to the Indian rupee, the Nepali rupee has enjoyed a stable exchange rate, as Nepal has closely monitored its foreign exchange reserves. More generally, India dominates Nepal's trade relations, while China is a more modest trading partner. Sharing 1,800 km of border and 26 border points, India and Nepal are natural trading partners, and their economies are tightly integrated. (World Bank, 2017a). India receives 60 per cent of Nepal's total exports, while China receives around 5 per cent (World Bank, 2018d).

Nepal also exports to the United States, Turkey, Germany, and the United Kingdom. In the wake of the 2015 earthquakes, Nepal has relied heavily on foreign aid as reconstruction efforts have slowed the country's growth.

At sectoral level, agriculture employs three-quarter of the Nepalis population (Karki, 2015). As seen by the effects of the agricultural sector's growth on overall GDP after the flooding in 2017, protecting the land against natural disasters is important. Despite its rugged terrain, Nepal has strong export potential in horticulture and medicinal and aromatic plants. Specifically, Nepal has focused in recent years on exporting cardamom, ginger, tea, and herbs (Pant, 2019). These products (and others like them) are often marketed as high-value specialty foods, but they could also be viably sold as nutraceutical ingredients. To emerge as major exporter of nutraceuticals or nutraceutical ingredients, Nepal must first meet SPS standards of developed countries and further develop its infrastructure to the degree necessary to keep transport costs competitively low. However, entering the nutraceutical industry would allow Nepal to diversify its exports, and the country's diverse climatic zones could also benefit from increased nutraceutical production.

Regarding export structure, Nepal's exports have declined within the past five years at an annualized rate of 0.9 per cent, falling to just 3 per cent of GDP in 2018 (World Bank, 2018c). Nepal's export products are rather diverse as compared to LDCs and LLDCs, but the country mainly exports textiles and foodstuffs. Overall, its top exports include non-retail synthetic staple fibers yarn, knotted carpets, flavoured water, fruit juice, and nutmeg. These products together comprise around 35 per cent of Nepal's exports. The role of Agriculture in Nepal's economy is reflected in the country's exports basket, as agriculture-based products total 29 per cent (US\$233.8 million) of all exports (OECD, 2017b). Foodstuffs is the second largest export category, accounting for 17 per cent (US\$138 million) of total exports. The foodstuffs category is dominated by flavoured water and fruit juice at 5.7 per cent of total exports each. Additional foodstuffs exports include vegetable residues, pasta, bran, animal food, and confectionery sugar. The other agriculture-based product category is vegetable products, constituting 12 per cent (US\$95.8 million) of total exports. Cardamom and green and black tea are the two largest items in the latter category accounting for 5.1 per cent and 2.3 per cent of total exports respectively. Other products of export interest include dried, shelled lentils; ginger; plants used for perfumery, pharmacy, or insecticidal purposes; and a variety of other spices and vegetable products. Nepal also exports fresh fruits in small quantities, such as apples, pears, eggplants, peppers, dates, coconuts and mushrooms. Moreover, Nepal exports chemical products, metals, plastics and rubbers, and footwear and hardware. Specific products of interest include rosin, iron wires, coated flat-rolled iron, textile footwears, and plastic products such as lids.

The role of Nepal's private sector has been increasing since the country shifted away from state-owned enterprises in the 1990s, (World Bank, 2018c). Between 1990 and 2016, the number of state-owned enterprises fell from 67 per cent to 30 per cent. Today, more than 99 per cent of private sector firms are informal, with state-owned enterprises controlling only the utilities and financial sectors. Only 18 per cent of firms have more than 20 employees, and many of those large firms are family-owned and specialize in traditional cereal crops, food and beverages, and basic consumer goods. Firm entry rates are low, and those firms that do enter often have difficulty scaling up production. Further, few firms have close ties with foreign countries, since most do not engage in trade and transfer of technology. Of the 200 medium and large firms, three-quarter are engaged in the production of livestock and dairy, fruits and vegetables, medicinal and aromatic plants, or tea and coffee. However, most firms are small, including 90 per cent of food processing firms.

In the past, the lack of political stability and legal restrictions impedes FDI flows and further development of the private sector in Nepal (World Bank, 2017c). Nevertheless, private investment has done well in recent decades. Private-gross fixed capital formation to GDP has increased from 10 per cent to 23.5 per cent between 1990 and 2017. However, public investment has remained low at 4.5 per cent of GDP between 2007 and 2015, and FDI is minimal at 0.4 per cent of GDP. FDI still faces a

number of challenges and regulatory restrictions. Although Nepal receives FDI from 29 countries, the large majority comes from India and China. Of the total FDI received in 2017, 28 per cent came from India and 18 per cent from China. The low levels of FDI are also partly due to the restrictions on foreign exchange transactions. Other development challenges which constrain productive and supply capacities of Nepal include natural disasters, high transport cost and tariffs on crucial imported intermediary and capital goods as well as a lack of electricity. These problems made domestic product development costly and uncompetitive. Nepal's mountainous topography and vulnerability to natural disasters raises the costs of infrastructure provision, but lack of infrastructure is a crucial issue, given that 80 per cent of the population lives in the mountains (World Bank, 2018b). Nepal currently has a long way to go, given that it has the second lowest road network density in the region and is dependent on road links to India for exporting. Also, Nepal only has one airport, which is already at capacity. With better access to transportation, Nepalese agribusinesses in particular can better access markets at a lower cost and reduce post-harvest losses, which will allow them to export at competitive prices. On the positive side, trade facilitation is relatively efficient in Nepal. In 2019, it takes 99 hours and costs US\$398 to export a container, which is better than the regional average time and cost of 137 hours and US\$507 (World Bank, 2019i). Further challenges facing particularly Nepal's private sector is the lack of access to finance and skilled labour force. Nepal's lack of credit information infrastructure makes it difficult for medium and small firms to take out loans. The credit bureau covers only 2.7 per cent of the adult population (World Bank, 2019i), and requires borrowers to use fixed assets like land and buildings as collateral. The collateral requirement of 364 per cent of principal precludes access to credit for those do not have access to land and other fixed assets (World Bank, 2018c).

Overall, Nepal's productive and supply capacities as well as institutional and infrastructural (including energy and ICTs) reflect characteristics of LDCs economies, although the country has made tangible progress towards graduation from the category of LDCs. Nepal's performance on the UNCTAD's Productive Capacities Index (PCI), in 2018 in energy, ICTs, human capital and transport is almost equal to the performance of LDCs on these categories, although the overall score (26.32) was slightly above the average score of LDCs (24.04) and the same as the LLDCs' average (26.11) in the same year. Nepal needs to make continuing efforts to foster its economywide productive capacities and structural economic transformation by addressing remaining challenges facing the private sector including FDI. These should include fostering skills and developing targeted incentives in support of domestic private sector. Nepal also needs to boost investment in technical and vocational training, as well as encourage tertiary education, to improve the country's productive and supply capacities and tap the potential of nutraceuticals. It can also help young workers build the skills necessary to help Nepal enter the world market. Currently, most educated young workers want jobs outside of agriculture, largely because skilled labour in sectors like manufacturing make eight times what their uneducated peers make. Promoting higher value-added agricultural export products such as horticulture and nutraceuticals can attract skilled young workers to the sector and keep them from leaving the country.

### **Overall assessment and implications for nutraceutical exports**

Agribusiness is very important to the future of sustainable growth in Nepal. Currently, around 70 per cent of Nepal's workforce is engaged in agriculture, and agriculture accounts for 30 per cent of value added in the economy (World Bank, 2018c). Nepal's agricultural sector has strong potential for profitability thanks to the various agro-climatic zones that accompany the country's vast elevation changes. The three geo-climatic zones include fertile flat plains, upland hills, and steep mountains (Lamichhane, 2019). Though only 21 per cent of Nepal's area is cultivable, the six different types of soil found around the country are fertile for numerous types of crops (Dixit, 2013). Rice paddy, wheat, jute, sugarcane, tobacco, vegetables, and oilseed are found in the fertile river basin in South Terai. The North Terai Chure hills boast plentiful forests, though they cannot compete in agriculture with the Kathmandu valley. The lacustrine soil in the valley is good for growing rice, wheat, and a variety of vegetables that can be cultivated even in low rainfall. Rocky-sandy soil is good for potatoes, barley,

buckwheat and millet, some teas, coffee, cardamom, and fruits, while sandy boulder soil is good for Sal and Sisson.

Based on comparative advantage analysis, Nepal's 2016 Trade Integration Strategy outlines 12 products with export potential (World Bank, 2018c). Of these 12, agriculture and forest products include large cardamom, ginger, tea, and herbs (mostly medicinal and aromatic plants). In the agribusiness sector, fruits, vegetables, coffee, goats, and honey are already produced in high volume. Further, coffee and tea, lentils, ginger, and medicinal and aromatic plant exports have potential for further growth. The poultry and dairy processing industries are growing, while rice mills and skimmed powder milk production are no longer competitive. Of the aforementioned crops, Nepal's production of cardamom is likely the most significant. Nepal is already the global market leader in large cardamom production, but the high-value variety of cardamom has potential for even greater export volume. Similarly, Nepal's tea has the potential to rival India's Darjeeling tea industry. The Government of Nepal views agribusiness as a key driver of growth. Some specific, high-value products identified as worthwhile for investment include spices, fruit juice, honey, medicinal herbs, tea, coffee, apples, and cut flowers.

Although there is little monitoring of precipitation dynamics around the country, around 65 per cent of agriculture in Nepal is rain-fed (Karki, 2015). However, with 80 per cent of rain falling during the monsoon season between June to September and climate change a real threat, Nepal has recognized the need to focus on expanding irrigation infrastructure rather than relying on unpredictable monsoon patterns (Nepal Tourism Board, 2019). Currently, Nepal has 1.39 million hectares of irrigated land (World Bank, 2017c). However, only 42 per cent of these hectares have year-round irrigation. Nepal has significant capacity to expand its irrigation infrastructure, with an estimated 18 million hectares of land available for irrigation. This expansion will become increasingly important as climate change continues to threaten productivity. Droughts, forest fires, and floods like those experienced in 2017 have the ability to wipe out crops. Changes in wind patterns, fog, hailstorms, and increases in temperature are also constant threats. Even as it recovers from the deadly seismic activity of 2015, Nepal must maintain focus on containing these longer-term but highly significant threats to its agricultural productivity.

While the agricultural sector has been hampered by the changing climate, most impediments to competitiveness and productivity-reducing factors are man-made (World Bank, 2018c). Challenges especially debilitating to the agricultural sector include the difficulty of scaling up production stemming from barriers to access for land, technology, and transportation, and the difficulty of compliance with strict phytosanitary standards. Although Nepal has expressed interest in moving towards organic farming, the current usage of low-yield seeds accompanied by infrequent use of fertilizers has hurt production. Although the government tries to help, distribution of seeds and fertilizer is unreliable and ends up crowding out the private sector. As previously discussed, the low road connectivity and resulting high transportation costs hurt agribusiness competitiveness.

Further, the high cost of post-harvest storage leads to post-harvest losses. These losses, coupled with limited agricultural insurance coverage and difficulty in acquiring land, disincentivize farmers from expanding production. Finally, many of Nepal's agribusinesses are unable to comply with phytosanitary standards. Unfortunately, Nepal's agricultural goods have been designated to the lowest quintile of countries for food safety (World Bank, 2016). Therefore, Nepal's SPS certifications are not recognized by most countries despite Nepal's preferential market access (World Bank, 2018c). In particular, Nepal's ginger exports have hurt Nepal's export reputation. As a result, Nepal now exports most of its agricultural products to India at low prices.

Nepal's currently produced goods and high-potential products would lend themselves well to sales in the nutraceutical industry, which could help diversify exports and make the agribusiness sector more attractive to skilled labour and investment and more profitable for farmers. Nepal's current focus on a few niches of high-value products could help strengthen the country's exports. However, to achieve this the government must promote quality standards and invest in better infrastructure to support agribusinesses and exporters in order to increase its global competitiveness in the nutraceutical sector.

## Selected products with export potential as nutraceuticals

### Ginger

#### *Ginger's promise as a nutraceutical*

The ginger root is a globally prominent food and medicinal crop with many health benefits, known especially in Asian cuisine for its spicy, warm flavour and aroma. Ginger is the rhizome of a perennial herbaceous flowering plant (Deutsche, 2017). The plant itself is characterized by narrow green leaves and yellow flowers and is grown in tropical and subtropical climates. Planting takes place in April or May during monsoon season, and the ginger rhizome is harvested once the top plant dies. Once the plant has been harvested, post-harvest processing entails washing the ginger rhizome, scraping off the scaly epidermis, and drying. After this, ginger is sold fresh, dried, ground, pickled, or candied. As a food product, ginger is generally used as an ingredient in food and drink preparation. Essential oil and oleoresins are also extracted through steam distillation for use in food or drinks, perfumes, cosmetics, aromatherapy, or traditional medicines. Ginger's main use is generally as a flavoring agent, taste enhancer, or sugar substitute. It is also used in aromatherapy and is commonly found infused in perfumes, skin care creams, soaps, facemasks and shampoos. High quality ginger is large, has undamaged oil-bearing cells, meets certain color and shape standards, and has little residual lime after bleaching.

Ginger is considered one of the healthiest spices in the world. It contains many vitamins and minerals such as vitamins A, C, E, and B-complex, as well as magnesium, phosphorous, potassium, silicon, sodium, iron, zinc, calcium, and beta-carotene (Deutsche, 2017). Ginger's use in traditional medicines stems from the effectiveness of its bioactive compound gingerol (Leech, 2017). It is used to aid digestion and reduce sea sickness, pregnancy morning sickness, and post-surgery nausea. Consuming ginger can help ease gas and diarrhea as well. The root's anti-inflammatory properties and many antioxidants have many health benefits. It is thought to be especially good for reducing risk of heart disease. Ginger is commonly used in cosmetics as well for its sweet and spicy aroma and rejuvenating effects. The antioxidants have anti-ageing properties and can moisturize, detox, and heal skin (Deutsche, 2017). Its antiseptic properties also make it good for reducing dandruff and increasing blood flow to the scalp, which strengthens damaged hair. Some side effects of ginger consumption and topical application include bloating, heartburn, and allergic reactions, but overall ginger and ginger products have great potential as nutraceuticals due to the root's versatility and many health benefits.

Ginger is cultivated in many countries with tropical and subtropical climates. The list includes countries such as Jamaica, Indonesia, Japan, Thailand, Vietnam, Sri Lanka, Myanmar, Peru, and Australia (Deutsche, 2017). African countries include Nigeria, Ghana, and Ethiopia. Some additional areas in Latin American and Asia also cultivate the flowering plant. However, in 2015 ginger production in China and India accounted for a combined 54 per cent of global production. Although India is the largest ginger producing country, the majority of Indian production is consumed domestically, so China is the largest exporter of ginger and ginger. Chinese ginger exporters have taken on large-scale operations in essential oil production, as well as fresh and dried ginger products (Ministry of Commerce, 2016). This has led to short transport times between cooling chains and year-round deliveries (Deutsche, 2017). Many countries have successfully controlled rhizome rot and taken measures to ensure the production of high-quality ginger. Currently, the global average price for fresh ginger is US\$2.84 per kilogram (Tridge, 2019). However, global ginger prices have fallen since 2015 due to surplus in China, possibly exacerbated by steep cuts in Chinese prices (Deutsche, 2017).

On the demand side, Japan and Bangladesh are by far the largest ginger importers in the world, though Japan imports the most by value of ginger and Bangladesh imports the greatest quantity (Deutsche, 2017). Japan's strict quality controls and logistics preclude low-quality sourcing, so it buys almost exclusively high-end ginger. Unlike Japan, Bangladesh's requirements are less stringent, allowing Bangladeshi buyers to offer lower prices. The UAE is a fast-growing export market, largely for sale to Arab and African countries like Sudan, Iran, and Saudi Arabia.

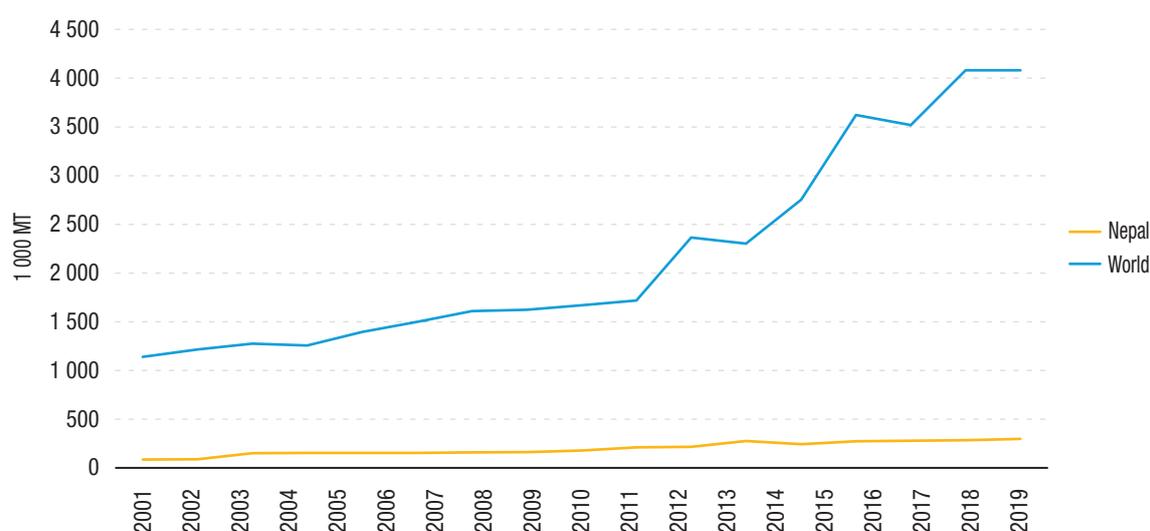
*Ginger production in Nepal*

Ginger production in Nepal is prevalent. With over 1.2 million people (4.3 per cent of the total population) in the Eastern and poorer Western districts involved in farming the crop, Nepal is one of the top five producers of ginger in the world (Deutsche, 2017). The climate is ideal for growing different types of ginger, both indigenous and popular foreign varieties. The indigenous varieties include Maran, Kuruppampadi, Ernad, Wayanad, Himachal and Nadia. Nepal’s ginger varieties fall into two categories: *nasse* and *bosse*. While *nasse* is of inferior quality and is typically used in powders and traditional medicines, *bosse* is less fibrous and is considered premium quality. Over thirty commercial varieties are also cultivated in Nepal. Little is known about the ginger varieties indigenous to Nepal. Because each variety is unique and quality is dependent on growing conditions, more research on the health benefits and oil content of such rhizomes could be beneficial to promoting Nepalese ginger on the international market (Ministry of Commerce, 2016). Ginger’s importance is highlighted in the NTIS 2016 as one of the 12 most promising exports. Ginger in Nepal is mostly sold fresh, though it is not uncommon to see bleached, dried (*suthro*), and ground ginger.

Nepalese ginger is mainly consumed domestically and exported to India. However, even though Nepalese ginger is generally exported fresh, Nepal’s ginger has gained a reputation for not meeting other countries’ SPS standards. As a result, organizations such as the Nepal Ginger Producers and Traders Association (NGPTA) are determined to improve the image of ginger in European and Asian countries (Nepal, 2019). Their efforts will likely require an improvement in quality assurance, greater farmer training in proper management, and investment in post-harvest processing procedures to make any real progress. Unfortunately, in spite of past recommendations of government agencies and NGOs, Nepal’s ginger production infrastructure remains weak and yields inferior quality crops (Deutsche, 2017).

Traditional tools and methods are used for harvesting and cleaning ginger. Some farmers scrape the outside with sharpened bamboo to remove the epidermis and sun-dry the rhizomes for a number of days to achieve a lower moisture content. However, these methods yield inconsistent quality and may damage the crop. In some Eastern regions, even basic washing and packaging is absent (Mercy Corps, 2019). In line with NTIS as foreseen by the Government of Nepal, many organizations continue to support the ginger sector. These include groups such as the Nepal-German Trade Promotion Programme (TPP), Samarth-NMDDP, and Mercy Corps. These organizations strive to assist Nepalese farmers in overcoming major challenges to ginger production. These include access to quality inputs, knowledge on farm

Figure 5.4 Ginger production (World and Nepal)



Source: FAOSTAT.

management, post-harvest processing techniques and technology, and marketing strategies to replace Indian middlemen.

*Key constraints on Ginger production and exports*

**Low quality inputs:** In order to successfully transform the ginger industry, high quality inputs and good management practice are essential. Farmers should invest in *bosse* ginger, meaning fiber-less, higher quality varieties, but they should also prioritize high yield varieties of ginger (Mercy Corps, 2019). Since the earthquake in 2015, Mercy Corps has implemented pilot activities in an effort to increase farmers and traders' margins. They promote high-grade, fibreless ginger, and also assist farmers in tackling rhizome rot. NGPTA also organizes training and workshops in order to educate farmers on best management practices and introduce them to new technologies to overcome rhizome rot (Nepal, 2019). Since little is known about the indigenous varieties' biochemical properties, more research should be conducted through one of two channels.

The first would be direct research through a government organization like Nepal Agriculture Research Council (Deutsche, 2017). A second potential channel for research would be for the Ministry of Agriculture to encourage a public-private partnership between farmers and companies like Himalayan Agri-business & Research Services Pvt. (Samarth: Nepal Market Development Programme, 2019). With more information, the Ministry of Agriculture can better communicate with cooperatives and relay up-to-date information on the best indigenous and commercial ginger varieties to farmers. The Department of Agriculture or the Nepal Agriculture Research Council should also be proactive in bettering the quality of Nepalese ginger on the market (Deutsche, 2017). By establishing an accredited lab that follows international standards, Nepalese farmers could accurately market indigenous and foreign varieties according to their biochemical properties. Proper execution of this strategy could also dispel the belief that Nepalese ginger is low quality, which would allow Nepalese ginger farmers to salvage their reputations on the global market and create new opportunities for ginger exports.

**Post-harvest management:** Post-harvest processing of ginger is minimal. Once harvested, little value is added to the crop due to the lack of cold chain facilities and processing technology (Deutsche, 2017). In some areas, ginger is even sold unwashed, leading traders and exporters to offer even lower prices. Taking the extra steps necessary to wash, sort, and grade the ginger could increase value added. Further, upgrading packaging from the jute sacks provided by many exporters and traders to export-standard materials could help ensure cleanliness, especially as many sacks are left on dusty roads for collection. Investing in more hygienic packaging would likely help with marketing the product and dispelling Nepalese ginger's reputation as low-quality.

Cooperatives could work with the Department of Agriculture to create more washing facilities and invest in technology for the purpose of drying and scraping. However, even if investment in these facilities is provided or jointly undertaken, farmers would still require training. Also, demonstration farms and an informative website are required to provide information on best practices and international SPS requirements to farmers. Recognizing the importance of proper technology in post-harvest processing, the UK Department of International Development funded a five-year-long rural market development program. Samarth-NMDP already provides advice to farmers on topics such as best post-harvest practices (Samarth, 2019). Similarly, NGPTA is working on establishing a processing factory in Jhapa district (Nepal Ginger Producers and Traders Association, 2019). More programs like those of Samarth-NMPD, Mercy Corps, and NGPTA should be created around the country in order to improve quality of ginger and encourage value-added, processed ginger goods. international nutraceutical industry.

**Road infrastructure:** Although there are many beneficial programs taking place in Nepal, access to roads is crucial for buying inputs and is necessary for selling ginger directly to buyers (Deutsche, 2017). Since transportation costs are high in Nepal, Nepalese farmers are highly dependent on Indian middlemen. Further, lack of access to processing plants means that farmers can only sell unprocessed ginger and are offered lower prices. With good roads, farmer would no longer have to leave their jute sacks on the side of the road while waiting for transport, which comes with risks of disease infecting their crop. The first

step to lowering transportation costs is good quality roads. The Department of Roads should work with the aforementioned organizations or lean on the private sector for help in developing an extensive road network. This is essential for proper marketing of Nepalese ginger and reduced dependence on Indian middlemen, who receive the lion's share of the profits. If Nepal is able to improve its input distribution, aid its farmers in improving post-harvest handling, and raise local standards for ginger, transportation would be the greatest remaining obstacle.

### *Conclusion and recommendations*

Ginger is a widely grown crop in Nepal with great potential for export. As the fourth largest ginger producing country in the world, Nepal has the potential to expand around the world. However, the reputation of Nepalese ginger imports is unfavourable. Without the proper post-harvest handling knowledge and technology, much of Nepal's ginger either does not meet international standards or receives low prices. Through extensive research on the benefits of Nepalese varieties, investment in proper processing methods and technologies, and the establishment of internationally accredited laboratories, Nepalese ginger has the ability to enter the international nutraceutical market, which would bring additional income to rural populations and greatly benefit the economy.

- The Nepal Agriculture Research Council should run a comparative analysis on biochemical properties between globally popular commercial ginger and indigenous varieties in order to best inform farmers. Such information on high quality, high yield varieties can help farmers break away from a reputation of selling unsafe, lower-quality produce. The Ministry of Agriculture can also help organize public-private partnerships in commercialization of ginger to incentivize high quality input usage, good farm management, and promoting research while creating opportunities for private sector growth.
- The Department of Agriculture could work with cooperatives to procure equipment necessary for post-harvest processing, such as washing facilities, industrial dryers, and cold storage facilities. Nepal should look into working with the Japanese International Cooperation Agency to subsidize farm machinery like its neighbour Bhutan.
- The Department of Roads should work with NGPTA, Samarth-NMPD, Mercy Corps, and like organizations in order to build and expand its road network. The Department of Roads could also use this opportunity to work with private sector companies involved in construction or transportation.
- Nepal's Department of Agriculture or the Nepal Agriculture Research Council should consider establishing an accredited lab that follows international standards. Once Nepal's ginger industry makes changes to overcome its product's reputation as poor quality, Nepalese ginger could very well be a large player in the international nutraceutical industry.

### **Cardamom**

#### *Cardamom's promise as a nutraceutical*

Nepal is the largest producer of large, black cardamom in the world. Nepalese cardamom sales make up 68 per cent of the international market share (ICIMOD, 2016). These markets include the Middle East, South Asia, South East Asia, and Europe. However, even though the lucrative cash crop is known as "black gold," prices have declined since 2015 due to oversupply (Awale, 2017). Nevertheless, many Nepalese farmers have become dependent on the income gained from this prominent cash crop and have been affected by the drop in prices.

As previously discussed in the section on Bhutan, large cardamom has great nutraceutical potential. The dark, hairy pods from the perennial shrub help ease inflammation, reduce digestive issues, and improve respiratory health. Cardamom also has the ability to freshen breath and fight cavities and gum infections. It is also found in cosmetics meant for healthy skin and hair. Used whole, ground, or processed into an essential oil, large cardamom is an already widespread cash crop that can enter the market as a nutraceutical and benefit Nepalese farmers in the process. Although Bhutan and Nepal would compete

for market share in the black cardamom market, it would be worthwhile for each of them to invest in the product, seeing as black cardamom is such a niche product to high altitudes of the Himalayan region.

**Cardamom production in Nepal**

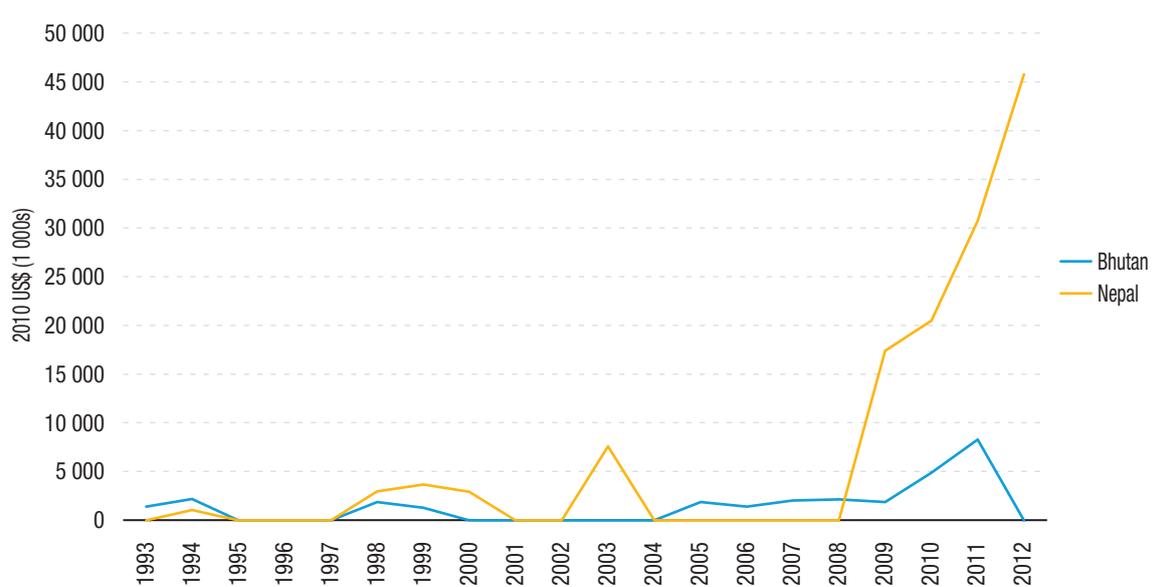
Cardamom is the main cash crop farmed in Nepal. Currently, 41 of 75 districts engage in cardamom farming. The Nepal Trade Integration Strategy has listed large cardamom as a product with great export potential that could help the country reduce its trade deficit (Awale, 2017). Nepalese cardamom is already largely exported, with more than 95 per cent of the produce exported to India (ICIMOD, 2017b). However, although Nepal is the largest large cardamom producing country in the world, India is the largest exporter of large cardamom. India re-exports Nepalese cardamom overseas to Bangladesh, Pakistan, and Gulf countries (Gautam, 2018). Nepalese farmers predominately sell raw cardamom pods to Indian middlemen, who then sell to wholesalers (Awale, 2017).

Unfortunately, since 2015 prices have collapsed from a high of Rs 2,900 (US\$25) per kilogram to Rs 660 (US\$6) per kilogram (Awale, 2017). Nepalese farmers have had little choice but to accept prices proposed by Indian intermediaries since no central marketing facility exists in Nepal (The International, 2019). Nepal's cardamom production has faced many obstacles, including climate change, but efforts by the regional research center International Centre for Integrated Mountain Development (ICIMOD) and Environment Conservation and Development Forum (ECDF) in conjunction with The Rural Livelihoods and Climate Change Adaptation in the Himalayas (Himalica) Program are meant to help farmers adapt to the changing climate and properly manage their cardamom plantations.

The Himalica program is funded by the European Union and benefits several countries, including Bhutan and India (ICIMOD, 2017b). In Nepal, the program is managed by the ICIMOD and began in 2014. The project is intended to promote opportunities that will benefit the Nepalese people's livelihoods. The program provides a "Package of Practices" intended to help farmers properly manage resources, diversify their income, and benefit from strengthened institutions (ICIMOD, 2017b). Himalica claims that stakeholders are community groups and the private sector (ICIMOD, 2017a). Pilot projects in Taplejung district have brought training in new technologies and practices to farmers.

The current pilot involves over 300 households. Organized into 12 groups over 3 communities, Himalica and ICIMOD are working with farmers to improve cardamom production practices on 12 plots (ICIMOD, 2016).

**Figure 5.5 Value of Cardamom exports (Bhutan and Nepal)**



Source: Comtrade.

Reflection sessions run by ICIMOD and ECDF give farmers the opportunity to discuss the importance of farm management and its effects. After noting the success and failures of the utilized methods, ICIMOD and Himalica should expand the program to include more cardamom growers, first in the largest cardamom growing district Taplejung, and then in other districts. Farmers have benefited from the knowledge provided by the program, such as switching to more energy efficient stoves for higher quality large cardamom. The Himalica program has also noted that tail cutting and grading after the curing process can lead to higher market prices. By involving Nepalese farmers in these processing steps currently undertaken by wholesalers, farmers could receive higher prices from traders (The International, 2019).

Due to collapsing prices and currently declining yield, the ICIMOD encourages Nepalese farmers to diversify into other crops, such as kiwi plants (ICIMOD, 2016). However, given that many farmers are deeply entrenched in cardamom production, they also encourage farmers to use the cardamom plant's fibers and process the cardamom into value-added food preparations (Awale, 2017). Cardamom farm homestays are also generally regarded as tourist attractions, furthering the economic benefit from cardamom production. The SAARC Business Association of Home-Based Workers (SABAH) and the ICIMOD have recognized that women who are home based workers are especially involved in cardamom cultivation. To cut out middlemen and provide employment for women, SABAH has provided women with the opportunity to sell finished and value-added cardamom products, such as cardamom fiber bags, wallets, carpets, mats and decorations, as well as edible preparations such as cardamom-infused drinks like iced tea, iced coffee, lassi, mango milk shake, and teas (Awale, 2017). SABAH has even taken steps to hire certified food safety experts to ensure that their products meet international standards. With the right marketing and improved trade infrastructure, selling finished cardamom products directly to international markets would greatly benefit cardamom producers.

### *Key constraints on Cardamom production and exports*

**Climate change resistance:** In recent years, climate change has led to sporadic rainfall, long dry seasons, and severe frostbite (ICIMOD, 2017a; ICIMOD, 2017b). Rising temperatures have induced fluctuating harvest times and have allowed pests and diseases to thrive. Poor soil conditions coupled with these climatic changes have produced declining yields. Increased labour and irrigation, healthy planting material, and crop management have become imperative for the survival of cardamom production in Nepal. Three main issues that the ICIMOD and the Himalica program have highlighted are access to irrigation, pest management, and soil nutrition management.

Regular irrigation is important for large cardamom, as it is a climate-sensitive plant. However, with irregular rainfalls and longer droughts occurring more frequently, many farmers have left their sprinkler irrigation untouched (ICIMOD, 2016). Water availability is seasonal as upstream ponds fill with sediment. The ICIMOD has noted that maintenance, cleaning, and sediment removal is necessary. Farmers should also dig shallow pits and trenches to collect water for use during dry spells. Additionally, farmers should invest in repairing and rebuilding the traditional irrigation system *kulo* (ICIMOD, 2017b). The ICIMOD, Himalica program, and ECDF should assist farmers in digging pits, cleaning ponds, and repairing *kulos* during their pilot program. In addition to reflection sessions and pilot villages, Himalica should have an accessible demonstration farm that utilizes proper irrigation techniques and promote cardamom varieties that tolerant of low moisture soil conditions.

Pests and diseases will likely continue to plague cardamom farmers. For handling common diseases such as Chirke and Furkey, farmers must be aware of signs of disease and proper handling (ICIMOD, 2017b). Once infected plants are removed and burned, selecting clean, high quality planting material is key. Planting good seeds ensures virus-free crops, but it takes up to three years before they are harvestable. Choosing to plant elite clumps from disease-tolerant varieties is faster but requires proper nursery management in advance. The use of crop rotation, farmyard manure, vermi-compost, and jholal bio-fertilizer in addition to the application of *Trichoderma harzianum/viride* and *Pseudomonas fluorescens* will reduce the number of pests and diseases that affect cardamom growth. R&D institutions should learn from the Indian Spices Board, who have utilized these methods to manage cardamom pests and diseases.

Finally, cardamom yields have suffered from poor soil conditions (ICIMOD, 2017a). Soil nutrient management requires that farmers learn to intercrop cardamom with nitrogen-fixing species and properly maintain their farms (ICIMOD, 2016). Soil moisture and nutrient conservation requires a certain level of knowledge about not only cardamom, but other species surrounding cardamom as well. For example, old alder trees usually used for shading cardamom consume more nutrients than they supply and should, therefore, be replanted or replaced with other mixed trees (ICIMOD, 2017b). Proper mulching and composting and maintaining livestock can also help with soil nutrient management. In order to disseminate these techniques, a cardamom web portal to share and exchange information would be useful. However, farmers must first have electricity and internet-capable hardware to access such a portal. Once all households have access to electricity and the internet, this would be a viable option for sharing information. Until then, Himalica, ICIMOD, and ECDF should extend their reach to other major cardamom growing districts in Nepal and hold open meetings in each district in order to share information.

**Lack of access to finance:** Formal financing is not a feasible option for farmers in Nepal, since taking out loans requires immovable assets to act as collateral. Rather than deal with the bureaucratic process, most cardamom farmers look to local traders, who offer cash loans (The International, 2019). In exchange for exclusive rights to crops, traders will advance loans to farmers. This dependence on traders for finance could be reduced if government-backed financial institutions accepted moveable assets as collateral. Access to finance is especially important for agribusinesses since performance depends on their ability to purchase the inputs and machinery necessary for proper cultivation and post-harvest management (World Bank Group, 2019). Currently, traders provide storage facilities for farmers' use during prices slumps. Control over their financing is a necessity for farmers to gain autonomy and apply climate-smart, machinery-dependent practices to their cardamom crops (The International, 2019). Nepal's credit bureau has worked on digital financial services to increase access and credit information availability since 2014 (World Bank Group, 2019). Due to the slow progress, cooperatives have been called upon to provide finance (The International, 2019). However, as the government develops formal financial institutions, they should keep in mind farmers' difficulty taking out loans and the benefits reaped from reduced reliance on middlemen.

**Marketing:** Although Nepal is the largest cardamom producer, nearly 90 per cent of the crop is exported to India, which re-exports most back overseas (Gautam, 2018). Nepalese farmers are bound to the Indian market, and generally must sell at prices determined by Indian importers (Shrestha, 2018). According to traders, Nepalese large cardamom sales in India take place only after cardamom crops from Assam, India are depleted (Gautam, 2018). Further, buyers often prefer Indian large cardamom to Nepali cardamom as Indian large cardamom tends to be cheaper. Although cardamom from Nepal may sell for less than Indian large cardamom in local markets, high transportation costs result in a significantly higher price in Indian markets. Nepalese cardamom farmers could receive a higher price by undertaking post-harvest processes such as tail-cutting, but it is imperative that farmers reduce their dependence on Indian middlemen in order to receive a larger portion of the profits.

To this end, Himalica has offered a number of solutions potentially worth considering (ICIMOD, 2017b). The implementation of a cooperative marketing system would increase farmers' bargaining power and create a more direct line of contact between sellers and buyers, bypassing the middlemen. A web portal would allow farmers to share market information and cultivation techniques, though many farmers would have difficulty accessing such a portal. Finally, Himalica suggests that the ECDF and cardamom cooperatives work with the Nepal Chamber of Commerce to develop an auction center in Taplejung district. An auction center would allow farmers to negotiate directly with regional and national traders and exporters. Because of Nepal's poor transportation infrastructure, an online auction center could also be a feasible option for more rural farmers, to the degree that such farmers have internet access.

### *Conclusion and recommendations*

Nepalese farmers depend heavily on cardamom production but suffer from low prices and worsening natural conditions due to climate change. There are many ways to improve upon current cardamom

production and marketing, allowing farmers to garner higher prices and reduce the rents of Indian traders. Currently, farmers in Nepal are very dependent on the Indian market and Indian traders dominate distribution. One viable option is for Nepalese farmers to diversify into the nutraceutical industry as a sustainable value-added production approach to cardamom.

- Cooperatives should continue to look into providing credit for farmers without immovable assets. Until this becomes widespread, however, the government should develop farmer-friendly credit opportunities. Completion of the credit bureau's digital financial services would allow banks to access credit information, creating a more trustworthy financial environment.
- The ICIMOD, Himalica program, and ECDF should assist farmers in digging water pits, cleaning ponds, and repairing *kulos* during pilot programs and reflection sessions. Himalica should also construct an accessible demonstration farm that utilizes proper irrigation, soil nutrition, and pest and disease management techniques. Finally, Himalica should expand its pilot program to include other districts heavily involved in cardamom farming, such as Sankhuwasabha or Panchthar (ICIMOD, 2017b).
- Himalica and the ECDF in conjunction with the Nepal Chamber of Commerce should develop an auction center to allow farmers to negotiate with regional and national traders and exporters. The ECDF and ICIMOD should also look into strengthening the cooperative marketing system to increase farmers' bargaining power and directly connect buyers and sellers, cutting out the Indian middlemen. However, this requires a robust road network with low transportation costs.
- A web portal and online auction centre would only benefit farmers with internet access. However, developing an online platform would allow farmers to market information and cultivation techniques, and even to sell their product directly to buyers. An online platform, if implemented, would partially solve the information gap created by Nepal's poor road infrastructure.

### Sea Buckthorn

#### *Sea Buckthorn's promise as a nutraceutical*

Sea buckthorn (*Hippophae rhamnoides* Linn), also known as the sea berry, is a mountain shrub indigenous to the sandy, loamy soils of Nepal (ICIMOD, 2019). It has the potential to raise incomes for the country's poor, rural mountain communities. Although this plant is grown around the world, each variety has unique properties and global supply has not yet met the large international demand.

Sea buckthorn can survive in a variety of climates and grows anywhere between 1,500 and 4,300 meters above sea level (Pallavee, 2017). It is dioecious, meaning that there are both male and female plants. Flowers are wind pollinated, so farmers must determine the appropriate ratio of male to female plants for ideal production. This requires abandoning seeds with unknown genders for hardwood stem cuttings from gendered plants (One Green World, 2018; Stobdan, 2017). As a crop, however, sea buckthorn's most crucial asset is its symbiotic relationship with Frankia bacteria, which gives the plant nitrogen fixing properties (Pallavee, 2017). Sea buckthorn has gained in popularity internationally for both its many health benefits and its potential for land reclamation.

Silvery-green leaves are characteristic of both sexes, but only the female plants bear orange-red berries (Pallavee, 2017). These berries are 6–9 mm in diameter and are quite juicy and tart. However, they are delicate and pop from too much pressure. Their secure attachment to the plant's thorny branches makes harvesting both difficult and time consuming. Most berries are either hand-picked or removed by beating the bush with a stick. Cutting the branches is also an option, but not commonly done as second-year branches are thought to be more productive than first-year branches. For those with a small crop, cutting and freezing the branched allows for easy removal with a fork. Such mechanical harvesters as exist are less efficient than simply harvesting by hand (One Green World, 2018).

No matter the method employed, farmers must spend significant removing berries and inevitably face crop loss due to damage. Once collected, the berries are either dried or pressed. Processing should

occur soon after harvest, since the berries are highly perishable, though some farmers prefer to freeze their berries so they can be transported long distances. Such farmers as choose to dry their berries tend to either sun-dry them or use electric driers. If pressing the berries, farmers can either further process them or sell the leftover pulp, seed, and hulls (Stobdan, 2017). Pulp is the main marketable component, which can be used in products like jams. The leftover cake is sun dried and rubbed to separate the oil-rich seeds and hull. The oil is used in cosmetics and supplements and is collected using CO<sub>2</sub> extraction. The silvery-green leaves also have medicinal and health benefits similar to those of the berries, so the male plants also have some economic value. Fallen leaves are harvested and cleaned before drying in the shade to reduce moisture. The leaves can then be crushed into an herbal tea with a taste similar to nettle tea (One Green World, 2018).

Known to have over 100 types of nutrients and bioactive substances, sea buckthorn is a multipurpose plant that has been used in traditional medicines for centuries. Dating back to 618 AD, people in China have taken sea buckthorn to alleviate ailments such as diarrhoea and fevers (Pallavee, 2017). Tibetan medicine also includes sea buckthorn in a variety of formulations (Stobdan, 2017). Today, the berries, seeds, and leaves have all been recognized for their therapeutic benefits and are incorporated into food and drink products, supplements, and cosmetics in addition to traditional medicines. Berries are found in juices, jams, herbal supplements, jellies, wines, and yogurt. Leaves are found in herbal teas, while the oil is either sold separately or incorporated into cosmetics.

Sea buckthorn contains significant vitamin C, more than mangos, apricots, bananas, peaches, and even oranges (Pallavee, 2017). It has a number of additional vitamins, including vitamins A, E, B1, B2, B6, B9, B12, and D (One Green World, 2018). Further, the berries are a good source of carotenoids, antioxidants, sugars, and phenolics (Pallavee, 2017), and the leaves carry vitamin E, calcium, potassium, and magnesium. Sea buckthorn provides the human body eight out of the 18 essential amino acids, which are good for shedding fat and regulating mood. In India, sea buckthorn is used for reducing cholesterol and improving cardiac function, reducing the risk of heart disease, and curing problems such as “indigestion, throat infection, gynaecological problems, ulcer gastritis, bronchitis, acidity, diarrhoea, hypertension, blood disorder, fever, tumour, gallstone, cough, cold, food poisoning” (Stobdan, 2017). The oil from the berries’ hull, seeds, and leaves absorbs UV light, maintaining healthy skin. Sometimes fed to horses to soften their manes, sea buckthorn is also used for human hair products.

Forty countries currently cultivate sea buckthorn (Stobdan, 2017). Since it is quite easy to grow and tolerates a variety of climates, sea buckthorn can be found in various Asian, European, and North American countries. China is the world leader in sea buckthorn cultivation and processing, already selling over 200 sea buckthorn products. Mongolia, Russia, Northern Europe, and Canada are also major players in sea buckthorn production. In 2007, Mongolia adopted a National Sea buckthorn Program through the Mongolian National Association of Sea buckthorn Growers and Producers (MNASGP). Pakistan is also beginning to cultivate sea buckthorn. The International Centre for Integrated Mountain Development (ICIMOD) through its Support to Rural Livelihoods and Climate Change Adaptation in the Hindu Kush Himalaya (Himalica) initiative has focused on developing sea buckthorn that will benefit mountain dwelling residents (ICIMOD, 2018). In Italy, the company Weleda sells a Fairtrade certified brand of face, body, and baby care products, which features sea buckthorn in the body wash, hand cream, oil, and lotion (Weleda, 2019). Although widely grown, sea buckthorn’s properties and concentration of vitamins, minerals, and antioxidants are dependent on its growing conditions (Pallavee, 2017). Sea buckthorn powder is priced between US\$1–200 per kilogram, while oil extract sells for US\$8–55 per kilogram (Alibaba, 2019). Sea buckthorn juice in India is priced between US\$3 and US\$4 per kilogram, (IndiaMART, 2019), while in Nepal sea buckthorn juice has sold for US\$0.88 (BossNepal, 2019).

### *Sea Buckthorn production in Nepal*

Nepal’s sea buckthorn cultivation practices are somewhat rudimentary compared to those of other countries with greater investment in sea buckthorn. Nepal has received several grants from the UNDP to enhance the livelihoods of rural people and revitalize regions degraded by tourism (SGP: The GEF Small

Grants Program, 2012). All of these projects regarded sea buckthorn as beneficial for environmental conservation. The first UNDP grant, gifted in 2007 for a project that ended in 2011, was meant to promote sea buckthorn production and offered an alternative source of income for households (SGP, 2012c). Prior to these grants, sea buckthorn was commonly regarded as a weed, cleared to make room for agricultural production.

However, without the plant, soil was left dry and landslides became more common. As a grantee, the Rural Community Development Centre received US\$45,323: US\$12,309 from co-financing in cash and US\$26,142 from co-financing in kind. The Centre wanted to provide locals with sea buckthorn nurseries and teach the people juicing techniques. Although the project was terminated prior to completion, two other grants taking place from 2009 to 2011 and from 2006 to 2008 were more successful. With a mission to preserve the biodiversity of frequent tourist areas, the Khumbu Alpine Conservation Council received a grant of US\$40,000, with US\$25,000 co-financed in cash and US\$5,000 co-financed in-kind, for their first project and received a grant of US\$50,000, with US\$17,000 co-financed in cash, for their second (SGP, 2012a; SGP, 2012b). Both projects focused on managing a Kerosene depot and disseminating sea buckthorn juice production techniques.

In January 2019, the Finnish Consulting Group Ltd. (FCG) implemented the Rural Village Water Resources Management Project (RVWRMP) (Finnish Consulting Group, 2019). The project was financed by the EU, the Government of Nepal, and the Government of Finland. The mission was to teach residents of the Api Himal Rural Municipality to take advantage of the abundant indigenous sea buckthorn growing on the riverbanks and mountain slopes. The project hosted training and information sessions on sea buckthorn use, cultivation, technology, harvesting, and juicing. The participating members of FCG also taught residents how to hygienically bottle and label the juice for sale. These recent efforts stem from Nepal's underutilization of its natural stock of sea buckthorn and should be continued. Given sea buckthorn's great nutraceutical potential and its usefulness in land reclamation, the Department of Agriculture (DoA) in conjunction with Himalica and ICIMOD should implement pilot villages for the crop in rural areas like those created in Pakistan.

### *Key constraints on Sea Buckthorn production and exports*

**Labor intensive crop:** As noted in the discussion of processing, sea buckthorn berry harvesting is quite labour- and time-intensive. In addition to the long harvesting hours, buckthorn processing is low-tech and requires a great deal of work. After a knife is used to scrape berries off the cut branches, berries are squeezed in a cloth to produce juice, which is then filtered, diluted, and bottled (Finnish Consulting Group, 2019). With many young workers looking for jobs in urban areas, sea buckthorn cultivation faces a shortage of skilled labour. By developing new technology to ease the harvesting process, creating incentives for young workers to enter agriculture, and spurring private sector initiatives, the Nepalese government could easily encourage sea buckthorn cultivation in rural communities.

Nepal is already engaging with other regional sea buckthorn producing countries, such as China, India, and Pakistan (ICIMOD, 2018). The International Sea Buckthorn Association (ISA), in conjunction with regional producers, ICIMOD, and Himalica held a workshop in February 2018 to allow stakeholders to share technology and best practices. Attendees also had the opportunity to visit the Gansu Agriculture University sea buckthorn lab to examine how the lab manages research and design, processing, cultivation, value addition, certification, labelling, and packaging. Such collaboration is likely to continue as the participants signed a bilateral memorandum for future collaboration. However, government assistance from the DoA should focus on domestic research into the therapeutic benefits of the local sea buckthorn variety. The DoA should also consider negotiating with China and the ICIMOD to receive additional funding for their research and development, and the country should consider joining the ISA.

**Logistics/transportation:** Same-day processing is extremely important for sea buckthorn berries since they are highly perishable. Given this, successful transportation from harvester to processor requires either the Ministry of Physical Infrastructure and Transport's Department of Roads to extend the road

network to rural communities or the local farmers to develop a way to immediately process their berries. The less feasible but more desirable option would be to construct cold chain facilities to maintain the berries' freshness before and during transport to a processor (Stobdan, 2017). Since processing is the most important factor determining the sea buckthorn's price, better processing would generate higher profits. However, without cold chain facilities, locals must find a way to more efficiently process the berries.

As previously mentioned, investing in research on product development and technology would benefit all rural regions cultivating sea buckthorn. Extensive, paved roads would allow the berries to quickly reach processors in more populated areas with better access to electricity. Currently, it takes many days both by car and on foot to reach rural villages. The FCG mission to villages in the Api Himal Rural Municipality documented driving on paved and gravel roads, and then walking to reach their final destination (Finnish Consulting Group, 2019). Beyond the usual benefit of allowing greater access to rural villages, the expansion of the road network would allow larger quantities of sea buckthorn berries and other crops to leave for same day processing.

### *Conclusion and recommendations*

Sea buckthorn berries, leaves, and seeds contain abundant vitamins, minerals, and antioxidants, and sea buckthorn's symbiotic relationship with nitrogen-fixing bacteria makes it especially attractive for countries aiming to reclaim nutrient deficient land. As a drought resistant, high-altitude plant, sea buckthorn is a climate change-resilient crop that could greatly benefit Nepal's exports. With investment and partnership aimed towards research and development of sea buckthorn plantations and potential value-added product processing, sea buckthorn cultivation in Nepal could open a gateway to nutraceutical exports.

- The Ministry of Physical Infrastructure and Transport's Department of Roads should propose a joint project with ICIMOD and/or FCG to extend the road network to reach rural communities. Since the lack of roads keeps rural residents from domestic markets and processing plants, sea buckthorn cultivation and processing will remain local without a proper road network rather than growing to meet international demand.
- Since Nepal is already engaging with other regional sea buckthorn producing countries, the Department of Agriculture should take advantage of the knowledge gained from China, India, Pakistan, and the International Sea Buckthorn Association (ISA). In conjunction with ICIMOD and its Himalica initiative, Nepal's Department of Agriculture should create pilot villages to implement the acquired techniques and technologies for sea buckthorn cultivation.
- Nepal should investigate creating a China-funded project attained through the ICI-MOD in sea buckthorn cultivation. Now that the participants have signed a bilateral memorandum for future collaboration, this option seems more feasible. Even if China is unwilling to finance a Nepal-based project, however, Nepal should consider expanding its network by joining the International Sea Buckthorn Association.

## 5.2. The African Region

### 5.2.1 Burkina Faso

#### **Overview of export structure and constraints to diversification**

Burkina Faso is a land-locked developing country (LLDC) in West Africa, bordering Mali and Niger to the north and Côte d'Ivoire, Ghana, Togo, and Benin to the south. Located in the semi-arid Sahel zone, Burkina Faso has a primarily agrarian economy, with nearly 90 per cent of the workforce employed in the agricultural sector. Despite variable rainfall, concerns about terrorism and increasing international oil prices, Burkina Faso's growth has been strong, reaching 6 per cent in 2018, driven primarily by the

services sector and investment in its burgeoning mining industry. Per capita GDP has grown moderately since 1990 (Figure 5.6).

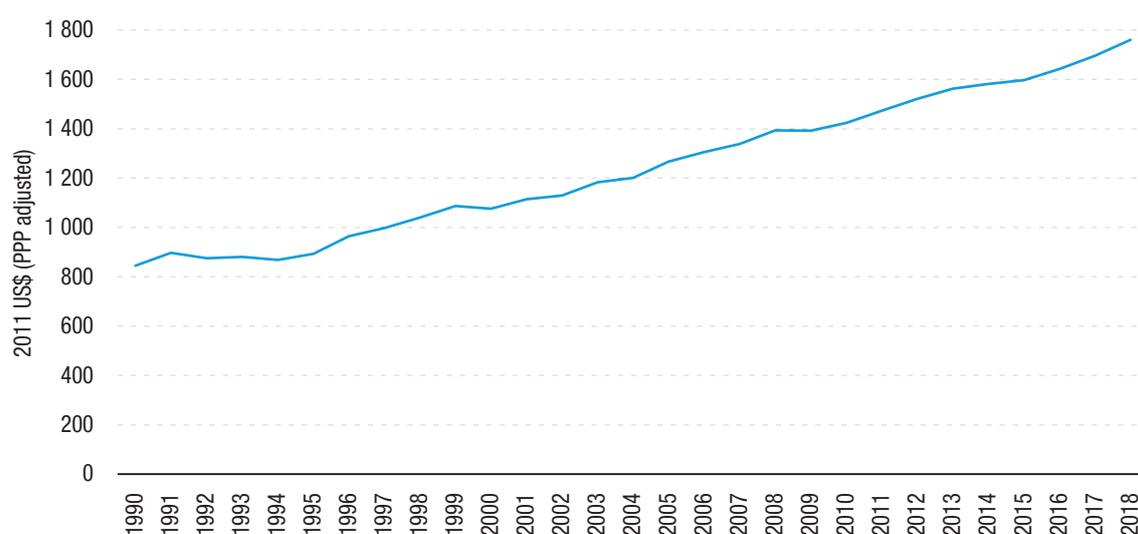
However, the rapid growth rate of its population of 18.6 million and persistently low agricultural productivity have dampened the impact of Burkina Faso’s economic performance on standards of living. Further, the country’s development indices paint a bleak picture. The country’s Human Development Index (HDI) ranks among the lowest in the world at 0.423, 183<sup>rd</sup> out of 189 countries surveyed. Life expectancy is 61 years, and infant mortality is 52 per 1,000 live births. Poverty is overwhelmingly concentrated in rural areas: nearly 90 per cent of those below the poverty line live in rural areas. Most of the country’s economic growth over the past five years has occurred in urban areas, buoyed by significant rural-urban migration.

As a member of the West African Economic and Monetary Union (WAEMU), Burkina Faso’s currency is the CFA Franc, which is pegged to the Euro. The effective exchange rate has been fairly stable since 1994, when the CFA Franc was devalued against the Euro, as most Burkinabé exports are to the EU or other WAEMU countries.

Burkina Faso’s economy is overwhelmingly informal (Mbaye, Golub & Gueye, 2019) with over 90 per cent of employment in subsistence agriculture and the urban informal sector. Accounting for less than 2 per cent of GDP, the modern manufacturing sector is dominated by textiles (37 per cent) and food processing (32 per cent). Only 6.4 per cent of total employment in Burkina Faso is in the modern sector, which is concentrated in the capital Ouagadougou. Though urbanization is occurring rapidly, the vast majority of urban jobs are in the informal sector. Small factories in Ouagadougou, Bobo-Dioulasso, and Koudougou produce light manufactured goods like bicycles and beds, but these products tend to be heavily protected and uncompetitive with imports. Food processing in Burkina Faso is primarily comprised of meat processing and cashew kernel production, while textile production is almost exclusively cotton ginning (EIF, 2007). Burkina Faso will likely need significantly increased foreign direct investment to build a robust manufacturing sector.

Since its independence in 1960, Burkina Faso has relied heavily on cotton as its primary export and the backbone of its agricultural sector. Cotton comprises around 20 per cent of the country’s agricultural production, and until recently, accounted for more than half of its exports. In 2017, Burkina Faso exported US\$180 million worth of cotton. Although cotton production has historically been an engine of growth for the country, pest infestations and declining world prices have led to losses for the sector in recent years. Cotton is Burkina Faso’s main commercial cash crop, and non-commercial farming consists

Figure 5.6 Burkina Faso real per capita GDP



Source: World Bank, *World Development Indicators*.

mainly of small-plot cereals production. According to a national survey of farmers, 77 per cent of individual farmers grow sorghum, 55 per cent grow millet, and 54 per cent grow maize, while only 15 per cent grow cotton (USAID, 2017).

However, cereal yields tend to be fairly low across Burkina Faso, and very few cereal crops are exported or even brought to market. Crops are almost entirely rain-fed, and smallholder farmers have scant access to credit to purchase inputs or equipment. Despite the pervasiveness of cereals production in Burkina Faso, the country is a net importer of sorghum, millet and rice (USAID, 2017). This is partially attributable to widespread fears of food insecurity after Niger's 2005-06 famine, which led Burkina Faso's government to discourage exports of staple cereals (FAO, 2014). Cotton and oilseeds such as sesame and cashews remain Burkina Faso's only significant agricultural exports, which together comprise around 14 per cent of total export value.

In recent years, exports have been dominated by mining, especially gold. Since 2007, eleven industrial gold mines have been opened, boosting the country's gold production from 15 MT to 55 MT in 2018. Burkina Faso is sub-Saharan Africa's fourth largest exporter of gold, with gold exports comprising 15.2 per cent of GDP and 79 per cent of total export value (Figure 5.10). Though the industrial mines account for most gold production, informal mining contributes an additional 8 MT, most of which is smuggled into neighboring Togo and Ghana.<sup>6</sup> Around 1 million Burkinabé workers are directly involved in artisanal mining, compared to 16,000 in the industrial mines. The mining boom has been a financial windfall for Burkina Faso: in 2016, it collected more than US\$200 million in tax revenue, export duties and royalties on gold production (IMF, 2016). However, the dominance of gold exports has left Burkina Faso highly vulnerable to the volatility of international gold prices. In order to stabilize government revenues, boost employment and reduce economic fluctuations, Burkina Faso must diversify its exports into industries with less volatility and greater forward linkages.

Although this paper focuses largely on formal exports, underreported regional trade and smuggling plays an important role in Burkina Faso's economy. As West African borders are quite porous, there is a lively cross-border informal trade in livestock, gold, and cereals. Informal exports are very difficult to quantify, but livestock and cereals make up a significantly greater share of informal trade than their share of formal exports (WTO, 2017).

Regional trade is vital to Burkina Faso as a landlocked country but is handicapped by several factors. Firstly, as agrarian economies with similar climates, many countries within WAEMU have similar comparative advantages. The Sahel climate favors the cultivation of cotton and mangoes, and farmers in the region tend to grow common staple cereals: sorghum, millet, and maize. Secondly, seasonal import and export restrictions on food products weaken the bloc's integration. Chronic food insecurity in West Africa has driven many countries in the region, including Burkina Faso, to impose restrictions on exports of staple cereals such as sorghum, millet, maize, and rice (ECDPM, 2016). Finally, poor road and rail infrastructure, particularly in rural areas, create high costs for the movement of goods across borders.

The European Union is its largest trading partner. The bulk of Burkina Faso's gold and zinc exports flow to Europe, along with most of its fruits and processed vegetable oils. Europe, in turn, supplies a little over a third of Burkina Faso's imports. Switzerland claims more than half of Burkina Faso's total export value (56 per cent), as the industrial gold mines in Burkina Faso sell their unprocessed gold ore to a Swiss refining firm, Metalor (OEC, 2017). Spain, Germany and Italy are all major destinations for Burkinabe zinc ore. All told, the European Union absorbs around two thirds of Burkina Faso's exports.

Beyond its mineral exports, however, Burkina Faso has had difficulty establishing itself in the European market. Quality control in Burkina Faso is inadequate, and its agricultural producers often have difficulty complying with exacting European standards. Further, establishing a meaningful presence in the market usually requires establishing a relationship with major supermarket chains, which control the vast

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<sup>6</sup> <https://eiti.org/news/sitting-on-gold-mine>

majority of the distribution market in Europe. To win contracts with these global chains, producers must demonstrate a capacity to create consistent and high-volume supply of reasonable quality, and often must comply with additional certification standards such as HAACP, Organic Standard, and Eurep-GAP. For crops like mangoes and green beans, Burkinabe producers have failed to demonstrate such capacity, and consequently, have been forced to rely on distribution through small wholesale markets instead. This has hampered the expansion of agricultural exports into the European market, a longstanding goal of Burkina Faso's policymakers.

Finally, the Asian market, while not historically linked to Burkina Faso, is a rapidly growing destination for Burkinabe exports. Asian demand for cotton, sesame seeds, and gold has skyrocketed over the past decade, and much of Burkina Faso's regional trade in these products has begun to flow overseas instead. India is the largest Asian buyer of Burkinabe commodities, primarily gold and cotton, accounting for 27 per cent of Burkina Faso's export value. Japan has blossomed as a market for Burkinabe sesame seeds, expanding from US\$10 million in 2006 to US\$38 million in 2017. Turkish demand for cotton, meanwhile, has grown from US\$3.9 million in 2011 to nearly US\$60 million in 2017 (OECD, 2017). China and Indonesia are also robust consumers of Burkinabe cotton, buying US\$20 million and US\$15 million respectively. At the current rate of growth, Asia will overtake Europe as Burkina Faso's largest export destination within a decade.

Burkina Faso has one of the lowest scores on the Productive Capacities Index (21.70 in 2018) lower than the average for LDCs (24.04), LLDCs (26.11) and other developing countries (32.63) in the same year. The country's performance is dragged down particularly by the lowest performance in energy, ICT, transport, institutions, and structural change categories (UNCTAD, 2020). For instance, the country's score in energy is 14.41 which is the lowest even by countries of Sub Saharan Africa, such as Botswana (27.16), and Senegal (24.4). Access to electricity within the country is prohibitively limited. Even in urban areas, only 58 per cent of consumers have access to electricity, and the electricity prices are some of the most expensive in Africa.<sup>7</sup> Further, electricity generation in Burkina Faso is very unreliable, and subject to frequent blackouts. For many light manufacturing enterprises, such as meat processing and brick production, blackouts can lead to the loss of inventory as well as production slowdowns, greatly harming revenue. Thus, despite modest growth in domestic light manufacturing, foreign investors have been unwilling to invest into the sector.

Regarding transport infrastructure, outside of major corridors, roads are ill-maintained and road density is very low. Railroad infrastructure in the region is functionally non-existent, bottling all inland trade into a few international corridors. This results in both high transportation costs for rural producers and lengthy travel times, sometimes leading to deterioration or spoilage of perishable food products (ECDPM, 2016). Infrastructure gaps affect global as well as regional trade, and poor transport infrastructure represents one of Burkina Faso's largest hurdles to increasing the diversity and competitiveness of its exports.

**Access to finance:** Burkina has 14 commercial banks, with significant cash reserves, but few offer long-term financing. Microcredit has yet to meaningfully impact the Burkinabe financial system, and consolidation in the sector is quite significant, with 3 banks accounting for 78 per cent of total assets in 2015 (IMF, 2019). Interest rates range from 10 per cent to 12 per cent, and even then, only large, well-established clients can generally secure loans. Spurring competition within the banking sector will help boost entrepreneurship and promote small business, particularly within the urban light manufacturing sector.

**Taxation:** The country's tax regime has rendered foreign investment unattractive, despite fairly low government revenues from taxation. Burkina Faso imposes a headline corporate tax rate of 28 per cent, higher than those levied by many developed countries, and an additional 18 per cent value-added sales tax (VAT). However, some of Burkina Faso's largest industries are granted various exemptions, narrowing the overall tax base. Mining companies, for instance, are granted an exemption from the VAT on both exploitation and research operations. This represents a large chunk of potential government revenue, yet the tax code for mining companies has remained largely unchanged even since the advent of Burkina Faso's mining boom. As a result, the country's high headline tax rate and value-added tax deter potential

<sup>7</sup> <https://www.usaid.gov/powerafrica/burkina-faso>

foreign investment, while exemptions granted to large established industries largely offset the revenue gains from the high tax rates. To encourage foreign investment without slashing government revenue, Burkina Faso's Ministry of Finance could consider lowering the headline corporate tax rate (or VAT) and removing exemptions for existing industries.

Ultimately, Burkina Faso is overdependent on cotton as an agricultural export, and would do well to develop competitive, large-scale exports of other crops like sesame seeds, shea nuts, and cashews. The country is beginning to shift towards the production of organic cotton, which enjoys higher prices, but progress has been slow given that special ginning facilities are required to produce organic cotton. Even if it scales production, Burkina Faso cannot rely only on the growing organic cotton market to overcome its current travails.

### Overall assessment and implications for nutraceutical exports

To successfully expand into higher value-added exports, including nutraceuticals, several key steps are required. First, infrastructure must be improved particularly electricity and transport. Second, far greater institutional support for growers outside the cotton sector is needed. The establishment of inter-professional associations and government support would go a long way toward supporting growers. These issues are addressed below in the context of specific products that could be developed and exported from Burkina Faso as nutraceutical products.

#### Shea

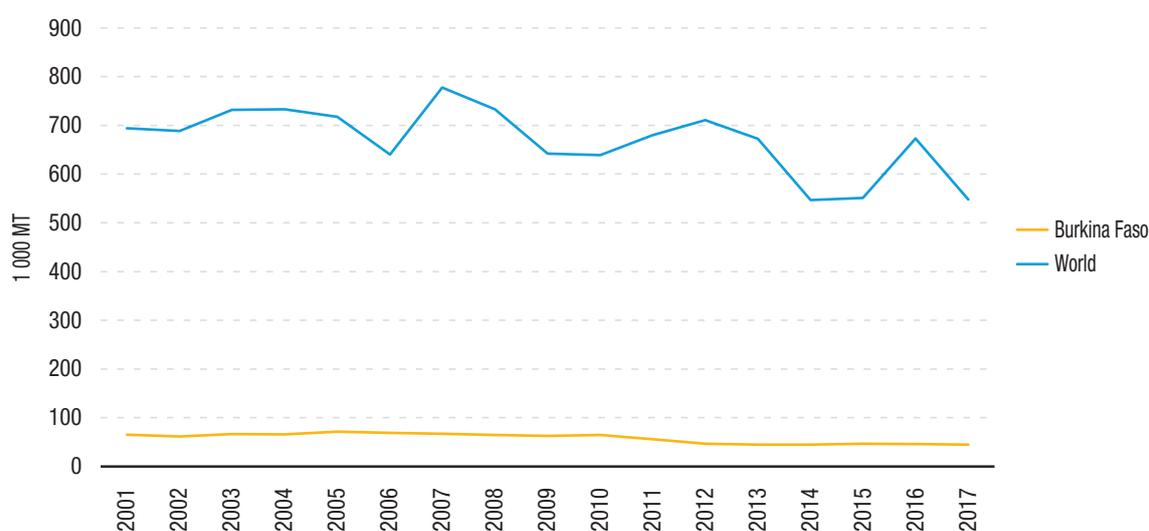
##### *Shea's promise as a nutraceutical*

The shea fruit, cultivated for nearly 2,000 years, is a staple of Burkina Faso's rural economy. Borne by *Vitellaria Paradoxa*, which grows only in the semi-arid Sahel zone of Western and Central Africa, the fruit is prized for its oil-rich kernel. Shea is prevalent within the climate's wooded savannah, with nearly 500 million trees of fruiting age, and collection of the fruit is nearly ubiquitous across the region. The shea tree is an important economic resource for the otherwise barren Sahel: its fruits provide a stable food source, its firm wood makes for excellent charcoal, and the shade provided by its voluminous canopy along with its deep root systems act as a frontline defense against the southward encroachment of the Sahara through desertification. Crucially, stands of shea require little horticultural support to thrive: their deep root systems allow them to tap into subsurface moisture, rendering them quite drought resistant, and their bark is fire-resistant, shielding them against the region's frequent blazes. The parasitic African mistletoe (*Tapinathus Bangwensis*) and over-exploitation pose the greatest threat to shea trees (National Academy of Science, 2006). Although the tree is classified as vulnerable on the IUCN Red List, a spate of recently adopted conservancy laws has helped its numbers rebound in recent years.

The world market for shea is relatively small but has grown significantly since 2001. Several factors have contributed to its rise as a meaningful global market. Firstly, in 2000 the European Union eased its chocolate regulations, allowing for products marketed as chocolate to contain up to 5 per cent "cocoa butter equivalent" (CBE), usually other vegetable-derived lipid butters. Shea butter emerged as a popular choice, given its low price, high melting point and distinctive flavor. Since 2000, cocoa butter equivalents as a whole have grown at a steady 20 per cent per year, and the shea market has performed even better with 1,200 per cent growth since 2005. Nearly 90 per cent of shea butter exports end up as cocoa butter equivalent, so shea butter prices tend to move in lockstep with cocoa butter prices (Global Shea Alliance).

However, although global demand has risen in part because of demand for CBE's, growth in the shea butter market since 2010 has been concentrated in the cosmetics industry, which accounts for around 8 per cent of the global shea market. Driven, in particular, by two multinational cosmetics firms, L'Occitane and The Body Shop, buyers in the cosmetics industry have increasingly begun to bypass the wholesalers and established direct relationships with producers, especially larger cooperatives. These buyers tend to purchase at above the local farm-gate price, sometimes through mechanisms like Fairtrade's minimum guaranteed price (CBI, 2019). Unlike the larger CBE buyers, which almost exclusively import nuts, cosmetics firms generally buy butter that has been hand-processed in Burkina Faso under close

Figure 5.7 Shea production (World and Burkina Faso)



Source: FAOSTAT.

supervision, as it furthers their narrative of “ethically sourced beauty products” and allows for marketing claims that the product was “made in Burkina Faso” (UNDP, 2013).

Although not often used in the CBE industry, organic and sustainability standards have been introduced into the Burkina Faso’s shea production by cosmetics companies. L’Occitane, the pioneering cosmetics firm in the market, requires all cooperatives it sources from to adhere to the Ecocert sustainability and quality standards. Many also adhere to Fairtrade standards, which act to guarantee that producers are paid above-market prices for their products in exchange for compliance with standards. However, unlike many standards mandated by large European supermarket chains, these social responsibility standards generally do not act as a barrier to entry for producers. Most local producers are effectively overseen by the cosmetics firm itself, which then takes the product and further refines it after export to Europe. Rather, the standard acts as a low-cost value-add for the multinational, which can use the certification to boost margins on the final cosmetic product (CBI, 2019).

Adherence to such standards is not a requirement for cooperatives to begin working with multinational cosmetics firms. Nevertheless, cooperatives are already doing so and are well-positioned to enter into agreements with L’Occitane and others. These agreements carry meaningful benefits: analysis of the sector has shown that direct cooperation with multinationals such as L’Occitane has a significant impact on producer earnings. According to the UN Development Program, which conducted a case study of L’Occitane’s impact on Burkina Faso’s shea production in 2013, cooperatives working with L’Occitane “have been able to significantly increase their revenues” because of the Fairtrade subsidy and increased productivity stemming from the firm’s oversight.

L’Occitane pays roughly double the local market price per kilogram of butter, more than offsetting the costs of annual certification, advanced processing equipment, and hiring experienced managers (UNDP, 2013). Further, the demand for high-quality and ethically sourced shea products is strong enough that the Fairtrade market segment is effectively as large as the market for lower-cost, non-certified shea, allowing shea-producing collectives to avoid the demand slump faced by Fairtrade producers in markets such as coffee and bananas (Grieg, 2006). Partnerships with Western cosmetics firms are an effective way for shea cooperatives to boost revenues and build institutional capacity, and Burkina Faso should make efforts to promote such partnerships by encouraging the creation of shea cooperatives and creating registries of sufficiently large, standards-compliant cooperatives to share with interested cosmetics multinationals.

*Shea production in Burkina Faso*

Beyond its ecological importance, trade in shea is a mainstay of Burkina Faso's rural economy. Shea butter is used primarily as a food additive to improve the taste and texture of regional staples such as tô porridge, griddlecakes, and fritters, with per-capita consumption reaching around 1.5 kilograms per year in 2011 (Simelton & Ostwald, 2019). Shea is also frequently used as a cosmetic and medicinal agent. All told, shea nuts account for around 12 per cent of rural household income and are the most traded agricultural product in the country by volume. Women, in particular, are responsible for the gathering, distribution, and processing of shea nuts. More than 500,000 women in Burkina Faso are involved in the shea production value chain, and nearly 60 per cent of women's income in the country derives from shea (Global Shea Alliance, 2013).

The shea nut has been called "women's gold," and several nonprofit organizations have sought to leverage shea production as a means of promoting female empowerment in the country, with mixed results. Despite its wild prevalence, the shea tree has not been domesticated, owing primarily to its 400-year lifespan, decades-long gestation period, and genetic complexity. Consequently, most shea production derives from trees growing on or around farmers' land, in so-called "shea parklands" where cereal crops are interspersed around old-growth shea tree stands (Jakpa, Lovett & Donkoh, 2018). These parklands allow for a division of labor through gender roles, as women are expected to gather and process the shea nuts while men are generally responsible for managing the land and harvesting the cereal crops (Simelton & Ostwald, 2019). Thus, shea trees act as the principal economic resource of women in the region, as land tenure within the region tends to be dominated by men.

Although the gathering of shea nuts is fairly straightforward, processing the nuts into butter will be inefficient in the absence of processing factories. Almost all processing is done by hand, as Burkina Faso has little industrial capacity and most nuts are gathered and then consumed in rural villages far from the big cities where the country's few processing plants are located. To extract the fatty oils from the shea fruit's tough seed, the seed is first boiled or roasted in a charcoal furnace for several hours to soften the shell, or often simply laid in the sun to soften if furnaces or fuel are not readily available. Once the seed has softened, it can be shelled to release the kernel inside. The kernel is then ground into particulate matter, heated into a paste, and then churned and strained until the white fat separates from the rest of the brown paste.

To produce one liter of average-quality butter from a batch of nuts requires nearly eight hours of hard labor; producing the highest quality pure-white butter, the standard for export to Western consumers, usually requires a second round of processing (National Academy of Sciences, 2006). Butter production is so onerous that women often store the nuts and wait until the dry season, as processing the nuts during gathering season is not feasible. The combined task of gathering and processing the nuts effectively makes shea a year-round crop, even though the tree only bears fruit during the summer monsoon months (Shakpa, Lovett & Donkpo, 2018). Further, earnings tend to be fairly meagre (estimated at around US\$35 per family per year), as village prices for shea nuts and butter tend to be significantly lower than the world price. Thus, although shea shows real potential for alleviating poverty, most shea producers still live on less than a dollar a day.

Burkina Faso's shea supply chain is highly decentralized, with many producers and comparatively few exporters, and most producers gather nuts from family plots or communal village parklands. The traditional nature of the shea sector has generally exerted downward pressure on farm-gate prices. Two layers of middlemen separate producers from international buyers, both tacking on noticeable markups. The first layer is the network of regional traders across the country, who rely on familial and social ties to effectively aggregate supply in their respective regions. These traders have a modest margin, with estimated markups of between 10 per cent and 15 per cent (Rousseau, Gautier & Wardell, 2015). Though they make a living as middlemen in the shea trade, regional traders account for little of the discrepancy between village and global prices. Wholesalers, however, enjoy a significant cut of the country's shea revenues. The wholesale trade in shea is dominated by a few well-established, politically powerful families, which have in essence formed a cartel through market division by geography. The limited available data

suggest that wholesaler margins account for most of the discrepancy between producer prices and global market prices (Rousseau, Gautier & Wardell, 2015).

Wholesalers are organized horizontally both in regional trade organizations and in a national federation, *Table Filière Karité* (TFK). TFK has proven to be an especially effective forum for coordinating action among wholesalers. In August 2013, after a surge in international consumer demand, producers began to advocate for increased farm-gate prices. However, the two main multinational buyers raised their purchasing prices only slightly, so a material increase in producer prices would have threatened the wholesalers' margins. After a TFK meeting was convened, wholesalers across the country agreed to freeze their buying prices in a successful attempt to exert their collective power on the value chain (Rousseau, Gautier & Wardell, 2015). Despite their beneficial aggregation of shea's highly atomized supply, wholesale traders extract a heavy toll on the industry. Much of the rise in global shea prices over the past decade has been captured by the wholesalers, while local prices for shea nuts have barely budged.

Despite Burkina Faso's strong position in the global shea market, the artisanal butter production techniques used in the country renders the export of downstream shea-derived products like butter and essential oils impractical. Industrial processing of shea nuts within the country is virtually non-existent, and FDI into Burkina Faso remains fairly low, reflecting the barriers to FDI discussed above. As foreign processing firms have generally proven unwilling to invest in processing plants within the country, Burkina Faso's shea exports will likely remain concentrated in raw nuts. Rather than attempting to develop downstream processing, Burkina Faso should instead focus on securing its share of the global demand for shea nuts and developing partnerships with multinationals willing to work directly with producers.

A second barrier to the flourishing of Burkina Faso's shea export sector is the old age of the country's trees and the lack of new trees being planted. Although shea productivity increases for the first 100 years of the tree's lifespan, it begins to decline thereafter. The average shea tree in Burkina Faso is an astonishing 150 years old, well past the peak productivity 100-year mark (Simelton & Ostwald, 2019). Two factors account for farmers' unwillingness to plant new trees: the long gestation period of the tree, which typically takes decades to bear fruit, and strong social customs against planting the tree. However, as the wild stock of shea trees continues to age, sector-wide productivity may begin to decline. The creation of a new generation of trees, or at the very least management of the existing stock's productivity through grafting and pruning, is critical to ensure that the sector remains competitive for decades to come.

### *Key constraints on Shea production and exports*

Burkina Faso's shea exports to the global cosmetic industry face several challenges to expansion. Firstly, although cooperatives have been successful in producing high-quality shea to sell to international buyers, the cooperative membership rate of shea producers is noticeably lower than that of other comparable industries. This is likely due to the highly decentralized nature of shea production in Burkina Faso, with most producers gathering, processing and selling their nuts without ever leaving their home village. Most rural villages are too small to support the formation of cooperatives with enough institutional capacity to take on multinational partnerships, and such cooperatives are mostly found in large villages and in urban areas (Elias & Carney, 2005). As a result, a significant share of the benefits of multinational partnerships have accrued to urban entrepreneurs and producers in well-off areas of the country, bypassing the rural poor who would benefit the most from higher prices. In order to equitably distribute the gains from international cooperation in the shea sector, Burkina Faso should seek to increase the rate of collectivization in rural areas, perhaps through agricultural extension or the promotion of regional organizations for shea producers. The sector has significant potential to be an engine of pro-poor growth, but a large subset remains untapped.

Secondly, persistent gender inequality within Burkina Faso, particularly in rural areas, is a serious obstacle to the shea sector's productivity and organization. Women rarely have rights to the land upon which their shea trees stand, limiting their ability to make productivity-enhancing improvements like pruning, grafting, or even the planting of new trees. They are constrained in their access to finance and education, meaning that they often lack the skills to organize regional production or the means to purchase necessary equipment like oil presses, charcoal-fired furnaces and milling machines. Without access to such resources, women

in rural areas have little opportunity to form the type of well-organized, well-funded cooperatives capable of doing business with multinationals like L'Occitane.

Although foreign cosmetics firms have on occasion attempted to organize women into cooperatives in rural areas, it is ultimately not their responsibility to remedy the failure of Burkina Faso's government to ensure equal rights for women. This inequality is arguably the most significant barrier facing the sector, and even small improvements to women's access to education and land tenure would have a meaningful impact on the sector's productivity, as well as a host of positive externalities for the country's economy across the board. To fully realize the potential of the shea sector (and of the female labor force writ large), Burkina Faso must make efforts to improve female education, secure political and legal protections for women, and actively encourage the development of women's professional groups. Shea is one of the most promising avenues to achieving economic equality in Burkina Faso, and if the sector is nurtured correctly, it could become a role model for other countries in the region seeking to reduce inequality.

### *Conclusion and recommendations*

Burkina Faso's shea sector is poised to become an engine of poverty reduction for the country. Strong global demand for the product, particularly in the cosmetics industry, should lead to good farm-gate prices for producers if the sector's constraints are properly addressed. Growth in the sector, which is rural, dis-aggregated, and predominately female, would both reduce income inequality and gender inequality, which has made it a popular target for expansion by international NGO's. However, Burkina Faso has struggled to capitalize on the shea sector's favorable circumstances, and growth has been positive but tepid. Following from our analysis of the sector, the authors offer four recommendations to unlock the shea sector's potential.

- Improve shea productivity. Burkina Faso should increase aid to shea producers through agricultural extension and the organization of producers, as it has done with its recent backing of the cashew industry. If possible, the government should encourage the creation of an interprofessional body, which would address many of the coordination and productivity issues currently facing the sector. Improved dissemination of crucial cultivation techniques like pruning, grafting and intercropping would have a significant impact on the sector.
- Encourage multinational partnerships, particularly in the cosmetics industry. Multinational cosmetics firms have offered a convenient solution to the issue of persistently low farm-gate prices for shea producers (despite strong global demand) by bypassing the wholesalers and long supply chain. These partnerships have had a noticeably positive effect on cooperatives, and Burkina Faso's government should offer tax and other financial incentives to cosmetics firms willing to undertake them.
- Organize producers into cooperatives. This imperative arguably falls within the above recommendation, but one of the strongest barriers to multinational-cooperative partnerships is the lack of cooperatives, particularly in rural areas. Multinational such as L'Occitane are ideal partners for cooperative organization, and their entry into the industry should be encouraged. The government could also consider providing seed funding to new cooperatives, as upfront costs are a significant deterrent to the creation of new cooperatives.
- Promote gender equality within the country. Gender inequality has greatly impacted the sector, from land tenure injustices to sub-standard education for female producers to unequal access to capital for female shea entrepreneurs. The creation of a federal fund earmarked for addressing gender inequality would be a strong first step. This fund could provide for capital funding of female-led projects, the creation of land-purchasing cooperatives for women, and even subsidies for female farmers to reduce dependence on male family members. Legal reform of land tenure and/or bans on gender discrimination in marketplace settings would also be beneficial, but this is likely more difficult to undertake politically. If women are freed from the constraints they currently face, the shea sector should undergo meaningful growth.

## Sesame

### *Sesame's promise as a nutraceutical*

Sesame is an emerging crop in Burkina Faso with significant export potential. Driven by strong global demand, sesame exports have increased tenfold since 2000, with a significant share going to Japan. Transplanted from East Africa, sesame is well-suited to the semi-arid Sahelian climate of Burkina Faso, and in 2007 it became the country's second largest cash crop behind cotton. Unlike many oilseeds, sesame requires little horticultural support; it can survive without significant rainfall and can grow well without fertilizer. Sesame is especially known for its nutritional and health benefits. The seed contains the antioxidant gamma-tocopherol, protein and dietary minerals, and has been shown to slightly reduce blood pressure (Kanu et al., 2010). Beyond its applications as a dietary supplement, sesame oil has emerged as a globally demanded skin product. Containing minerals that enhance skin care and proteins that boost hair growth, sesame oil has exploded on the Asian market, where it has become a leading cosmetic product, and is gaining increased traction in the US market as well. Though it currently comprises less than 10 per cent of total demand, the cosmetic industry is the fastest-growing segment of the sesame oil market.<sup>8</sup>

The sesame plant is a bush-like legume found primarily in Southeast Asia, Central America, and sub-Saharan Africa. Sesame is grown as a small bush or upright tree, with several seed-containing pods which burst when ripe. The crop varies in quality, ranging from high-value white sesame seeds to lower-value brown seeds. Burkina Faso's sesame crop consists of mostly white sesame, with brown sesame also found in some parts of the country. Although sesame yields per hectare can be quite high if well-managed, a large proportion of global sesame output is lost to "shattering:" the scattering of seeds from unmonitored pods which become ripe and then burst (del Rio & Simpson, 2015). The sesame seed is prized for its high vitamin, protein, and mineral content. Seeds are typically added to breads and other wheat-based goods in North America and Europe or roasted and processed into oil for use in flavorings in many Japanese, Chinese, and Korean dishes. For health purposes, sesame serves as an antioxidant, lowering cholesterol and boosting immune response (Namiki, 2007).

Sesame processing is generally done in two discrete phases: the hulling process to prepare raw sesame for storage, and the oil production process to refine sesame into its final product. While hulling is not a prohibitively capital-intensive process, oil production is quite difficult and expensive, and is generally done in Asia and Europe. Industrial processing entails four steps, none of which can be easily replicated without proper equipment. First, seeds are heated to between 100 and 150 degrees Celsius and moistened, killing any bacteria and increasing the plasticity of the seeds. The seeds are then flaked into small pieces and pressed extremely thin to facilitate extrusion of oil, and then steam-cooked to further improve plasticity, causing the flakes to cohere together. These larger flakes are fed into a screw oil press, liquefying the mass of flakes. Finally, the resultant liquid is filtered to obtain pure sesame oil.<sup>9</sup>

Some rudimentary processing facilities involving solar-powered screw oil presses imported from China have recently been constructed by larger cooperatives. However, the quality of oil produced is inconsistent. Given the high upfront costs of expansion in processing, further research into the profitability of oil production should be conducted before any meaningful efforts to expand into the sector are undertaken. The greatest obstacle, at present, to developing downstream oil production is in fact the sheer profitability of crude sesame production. Crude sesame prices have risen to such an extent that selling raw seeds is nearly as profitable per unit as selling medium-quality oil, and consequently entrepreneurs have little price incentive to invest in oil production (Gildemacher et al., 2015). If prices stabilize, oil production may become a viable expansion sector, but under current conditions farmers can do well for themselves by simply selling crude sesame.

<sup>8</sup> <https://www.fortunebusinessinsights.com/cold-pressed-sesame-oil-market-103678>

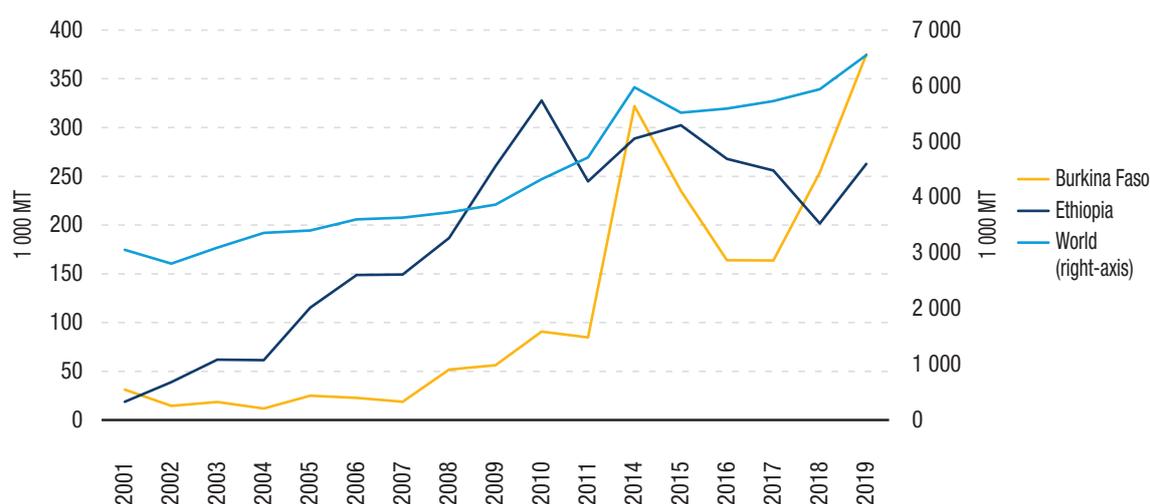
<sup>9</sup> <http://www.bestoilmillplant.com/sesame-seed-oil-processing.html>

Hulling, however, is a more attainable value-addition for cooperatives and even small-holders. The hulling process has three phases: initial cleaning, de-hulling, and sorting. Of these, only the hulling process requires advanced machinery. Wet de-hulling, the norm for industrial processing, is a three-step process. First, the seeds are soaked in water or chemical solvents for six to ten hours to loosen the shell. Once the shell has begun to dissolve, machinery is used to remove what remains, and the scraps of the shell are separated from the nut. Finally, the nut is cleaned with another chemical solvent to remove impurities and air-dried.<sup>10</sup> After the de-hulling is complete, seeds are separated by grade, passed through a magnetic field to remove any final impurities, and packaged for export (Moharram et al.). Unlike oil production, hulling can be done by hand, without meaningful loss of quality or extreme labor intensity. Consequently, many farmers sell some or all of their sesame hulled, though the farm-gate price differential between hulled and un-hulled sesame is only around 14 per cent (Gildemacher et al., 2015). This stems in large part from the fact that a significant share of the crude (non-oil) sesame demand, especially in Japan and China, is for un-hulled rather than hulled sesame.<sup>11</sup> Hulled sesame demand is concentrated in the US and European markets, where it tends to be used as a topping for bread products like hamburger buns and bagels. Given that the market for hulled sesame is likely to remain robust, hulling is a promising expansion sector, particularly given that new advances in low-end processing equipment have been continuously lowering equipment prices over the past decade (Dossa et al., 2017).

*Sesame production in Burkina Faso*

Sesame has historically been viewed as a secondary crop in Burkina Faso, with only 14 per cent of farmers growing the crop. Until around 2000, sesame was a crop of little significance in Burkina Faso: there was little domestic demand for sesame, and the international market was tepid. However, over the past two decades, production of sesame has registered year-on-year growth of more than 30 per cent, leading sesame to become Burkina Faso’s second largest agricultural export after cotton, the country’s flagship cash crop since colonial times (OEC, 2017). The shift has been driven almost exclusively by foreign demand, particularly in Asia. Domestic consumption of sesame is estimated to be less than 1 per cent of production, and nearly 90 per cent of Burkina Faso’s sesame exports are bound for Asia (Gildemacher et al., 2015).

**Figure 5.8 Sesame production (World, Burkina Faso and Ethiopia)**



Source: FAOSTAT.

Note: Values for World appear on the right axis.

<sup>10</sup> <https://sesameseedexporters.weebly.com/blog/the-step-by-step-description-of-process-of-sesame-seeds-manufacturing9736651>

<sup>11</sup> <https://medium.com/@mamster/open-sesame-hull-on-sesame-seeds-taste-better-c4b11bfbd7d0>

Burkina Faso's sesame value chain is characterized by a large number of producers and two smaller, higher levels of roughly equal sizes. Although cooperatives and farmer's groups receive around 10 per cent of the country's sesame through producer-cooperative agreements, producers sell the vast majority (around 75 per cent) to field brokers, who travel directly to producers to buy the crop. Some field brokers are pre-financed by exporters to buy sufficient quantities of sesame, while others are independent traders seeking to establish rents as middlemen between producers and exporters. Exporters make up the final layer of the value chain, with significant competition between exporters for the supply of sesame. Since around 2005, international demand for sesame has generally outstripped supply, with several important consequences for the value chain.

Firstly, as export margins are lucrative, competition among exporters for the available supply of sesame has mostly eliminated the gap between global prices and farm-gate prices. In 2012, sesame producers received 75 per cent of the country's total sesame export revenue, while cotton producers received just 23 per cent of the country's total cotton export revenue. Thus, although Burkina Faso exports more than three times as much cotton as sesame by global market value, the farm-gate value of the sesame sector actually exceeded that of the cotton sector (Gildemacher et al., 2015). This has profound implications for Burkina Faso's agricultural sector: the average farmer seeking to expand into a cash crop would do better, it seems, to cultivate sesame than cotton. The equitable structure of sesame's value chain also strongly suggests that sesame serves as a more pro-poor engine of growth than cotton, or indeed any other major export crop.

Secondly, competition between exporters has also led to a norm of sesame farmers being paid immediately at the farm-gate, and even the pre-financing of harvests when prices are favorable. Though this has undoubtedly helped farmers avoid the usual vicious cycle of bad harvests leading to insufficient use of fertilizer or quality seeds during the next growing season. The harvest season only lasts two to three months, meaning that exporters face the difficulty of paying for an entire year's supply during these months while export revenues come in throughout the year. Although advance orders from larger buyers alleviate some of this pressure, exporters must often turn to commercial banks to finance this gap. Banks in the region are often unfamiliar with the sesame sector, and many exporters are forced to use their capital assets (such as cleaning facilities) as collateral, or else suffer interest rates as high as 20 per cent (Gildemacher et al., 2015). Market-rate loan provision for exporters, whether by Burkina Faso's government or private actors, would be a cost-efficient way to make a difference in the sector.

Sesame's recent expansion in Burkina Faso has been driven in part by a spate of international partnerships which have brought targeted investment into the sector. The country's rapid growth of sesame exports since 2000 caused NGOs and vegetable oil companies to take notice, prompting initiatives that work directly with producers. Two projects of note are the country's partnerships with Lutheran World Fund beginning in October 2016 and with Olvera, a vegetable oil company, beginning in February 2018. The Sesame Marketing and Export (SESAME) initiative with Lutheran World Fund is a five-year, US\$24 million project to bolster the incomes of 500,000 sesame producers. SESAME has provided good-quality seeds, fertilizer, husbandry trainings, and information technology like cell phones with software to communicate directly with extension agents.<sup>12</sup>

The project targets both individual producers and cooperatives, focusing on cooperatives as vehicles to provide trainings and distribute technology, while working with producers to ensure that their fertilizer, seeds, and production techniques allow for high-volume and good-quality sesame yields. Though impact studies on the effectiveness of SESAME have yet to be conducted, it addresses many of the most important constraints on the sesame sector and provides a model of the type of support the Ministry of Agriculture could provide for fertilizer and seed distribution. The Olvera partnership, meanwhile, links Olvera, a Dutch agricultural NGO called ICCO, and Burkinabé sesame producers to strengthen the sesame value chain in Burkina Faso. The motivation behind the partnership is to build up oil production within the country

<sup>12</sup> <https://www.agrilinks.org/post/sesame-reaps-opportunity-west-african-farmers>

by helping 12,500 smallholder sesame producers grow high-quality sesame, which Olvera can process into sesame oil in-country.<sup>13</sup> Despite the project's small scale, public-private partnerships with sesame processing companies are likely the best avenue for Burkina Faso to build a credible oil production industry, and other processing firms may follow Olvera's lead in developing in-country processing capacities. Such expansion has precedent in the global sesame industry; Wilmar, the Singaporean sesame distribution and processing giant, recently constructed several sesame processing facilities in Tanzania and South Africa for recently harvested sesame.<sup>14</sup> Although Burkina Faso has historically received little FDI, mostly owing to heavy regulatory burdens and market-distorting policies, it may be able to leverage its quickly growing sesame sector to draw private-sector investment into the country.

***Key constraints on Sesame production and exports***

The central constraint keeping the sesame sector from taking off has been low adoption rate of fertilizer and quality seeds. More than half of sesame farmers use no fertilizers at all, including manure, and less than 15 per cent use industrial fertilizers. Despite wide-spread farmer perceptions that fertilizers are ineffective in aiding the growth of sesame, all available evidence is to the contrary. In a simple fertilizer trial conducted in 2013, plots of sesame in two areas were divided into three groups, with one receiving regular applications of standard nitrogen-phosphorous-potassium (NPK) fertilizer, one receiving a lower-cost NPK variant and one receiving no fertilizer at all. Yields in the standard NPK plots were significantly greater than those of the control plot in both areas, with yield gains of 70 per cent and 81 per cent respectively. Although the yield gains from the urea plot were lower, profit margins from the urea plot net of fertilizer costs were still noticeably higher than in the control plot (Gildemacher et al., 2015). Less rigorous trials at farmer training schools arrived at the same basic conclusion: most fertilizers, regardless of cost or quality, are cost-effective methods of boosting sesame yields. Given the low adoption rates of fertilizer and the significant impact of fertilizer on yields, universal application of fertilizer could lead to sector-wide yield increases of more than 30 per cent (Gildemacher et al., 2015).

Low adoption of high-quality seeds has had a similarly damaging impact on the sector's productivity. Rather than buying new seeds, regardless of quality, sesame farmers in Burkina Faso tend to recycle seeds from their own crop. In 2013, nearly 55 per cent of farmers reported never replacing their seeds, with the remaining 45 per cent usually replacing their seeds within two years. Recycled seed tends to genetically mix with seeds in nearby fields, leading to a converge of recycled seed quality over the past several decades into a common standard, generally called *bigarré* (Gildemacher et al., 2015). Most of the country's seed is *bigarré*, which has somewhat lower yield than high-quality seeds engineered in labs. As with fertilizer, several studies have been undertaken to determine the impact of seed quality on sesame productivity.

In a tandem study to the 2013 fertilizer trial, two sesame plots were sown in each region, one with *bigarré* and one with pure seed. Although there was substantial variance between the two regions, the higher quality seed plots recorded on average 45 per cent greater yield than the control plot (Gildemacher et al., 2015). Beyond greater yields, higher quality seeds carry several additional advantages, including more regular germination periods and greater demand in the bakery market. Currently, high-quality sesame carries little price premium, but given that demand for sesame seeds has been strengthening over the past decade, a separate market channel for high-quality sesame with more substantial price premiums could well emerge.

Several factors have led to this lack of quality seeds, some of which seem to have relatively simple solutions. Arguably the biggest culprit for the low adoption rate of quality seeds is the Ministry of Agriculture. The Ministry has, for decades, maintained a seed-subsidy system for sesame, selling farmers seeds through farmer training schools and input shops at below-market rates. However, the seed is often bought in bulk by government bureaucrats and little attention is paid to its quality. As a result, the fledgling commercial

<sup>13</sup> <https://www.icco-cooperation.org/en/newsarticle/public-private-partnership-on-sesame-in-burkina-faso>

<sup>14</sup> <https://sbr.com.sg/agribusiness/news/wilmar-establishes-eight-subsidiaries>

seed market, whose seeds tend to be quite high in quality, is priced out of the market by what is effectively government-subsidized *bigarré* (Barry, 2016). This has prevented such seed turnover as occurs from raising the quality of the country's genetic stock of sesame, which could begin a self-sustaining cycle of quality improvement for recycled seeds if a critical threshold is reached. The problem of the subsidy can be solved in two ways: the Ministry of Agriculture can either eliminate the subsidy or source its seeds from the high-end of the commercial seed market. Both options would raise the quality of the seeds that most farmers rely on, likely producing a meaningful increase in yields within a few years. The comparatively small difference between government-provided seeds and common recycled seeds should prevent a meaningful drop in yields for farmers who cannot afford commercial-market seeds.

The second factor constraining improved seed adoption is lack of education about the impact of improved seeds. Even without the subsidy, higher-quality seeds generally cost more, and many farmers have little sense of the potential impact of these higher-cost seeds on yields. Surveys of sesame farmers indicate that farmers with higher levels of education, whether formal, technical or even participation in government-sponsored farmer field schools, have a noticeably higher adoption rate of high-quality seeds even after controlling for income (Barry, 2016). This suggests that the Ministry of Agriculture should seek to expand its fairly robust agricultural extension and technical programs, focusing specifically on farmers in the sesame sector. The sesame sector shows real promise as a breakout export sector, and the government should do what it can to support farmers and exporters.

### *Conclusion and recommendations*

Burkina Faso's sesame industry has experienced strong growth over the past two decades, garnering significant export revenues and lifting tens of thousands out of poverty. Strong global demand, particularly in Asia, should help bolster sesame's position as a mainstay of Burkina Faso's economy. Given the sector's unusually large share of export revenues accruing to producers, further growth in the sector will almost certainly translate to even greater reductions in poverty. Sesame is arguably the most attractive cash crop for Burkinabé farmers: the crop is more profitable per hectare and more drought-tolerant than cotton, and farm-gate payment is immediate. On paper, sesame is a highly promising crop, and should continue to power the growth in Burkina Faso's exports. However, the sector still faces a number of glaring problems: yields are severely constrained by low seed quality and underutilization of fertilizer, commercial input markets face distorting government policies, and exporters often struggle to finance their seasonal purchases. Following from our analysis of the sector, the authors offer five recommendations to overcome the obstacles presently facing the sesame sector.

- Increase productivity by boosting fertilizer usage rates. With a strong and proven impact on sesame yields, even a 20 per cent increase in the number of producers using fertilizers would have a noticeable impact on sesame production. Given that a commercial fertilizer market presently does not exist in Burkina Faso, one immediate possibility would be to extend cotton fertilizer subsidies to sesame producers. Cotton producers can obtain fertilizer through SOFITEX (Burkina Faso's state-run cotton monopsony) at below-market prices. Extending these subsidies to sesame producers (or indeed universalizing them) could significantly increase fertilizer usage, likely recouping much of the subsidy's cost through increased export revenues. Other potential solutions would be to supply low-cost or free fertilizer through agricultural extension programs, or to set up fertilizer distribution sites in sesame-producing around the country. In the long term, once fertilizer usage rates have reached a reasonable level, the Ministry of Agriculture should also research fertilizers optimized for sesame production. Currently, nearly all fertilizer within the country is designed for cotton production, and sesame-specific fertilizer could have an even greater impact on yields.
- Promote the usage of high-quality seeds. Presently, both yields and market opportunities are constrained by the prevalent use of low-quality *bigarré*, and new market segments may open if overall quality improves. Government subsidies of mixed-quality seeds are the primary obstacle to the development of a commercial seed market, so the subsidies should either be eliminated or

directed to support private sector seed vendors. The Ministry of Agriculture could also look into forming seed-crossing partnerships with Mali and Nigeria, with an eye toward growing new seeds with larger grains or higher oil content. Finally, Burkina Faso's public research laboratories should set up a pre-ordering system for high-quality, lab-grown seeds to connect with rural demand. Although these are sorely needed in many areas, few channels exist to connect producers with research labs.

- Open official financing channels for sesame exporters. This can be done either officially, through the Ministry of Trade, or through partnerships with one or more NGO's willing to extend low-interest loans. Exporters are the best mechanism for transmitting the strong global demand for sesame onto the ground in Burkina Faso. If given sufficient funding, they should be able to spur the necessary investment in seeds, fertilizer and equipment to significantly increase production by bringing more field brokers under contract, increasing competition for farm-gate sesame and thus raising farm-gate prices. Exporters are the only link of the value chain with any meaningful inefficiency, and most of this inefficiency can be corrected through the creation of dedicated financing channels.
- Expand linkages with buyers in Asia. Trade missions, focusing on dialogue between producers, exporters, and buyers in Japan and China, are a prime way to expose producers first-hand to their target market, and to learn the particular qualities their biggest buyers select for. Exporters can also develop direct relationships with buyers, building their networks and giving them some degree of leverage on the global markets. Further, the government could promote the creation of an interprofessional association – although the benefits are lower than in sectors with meaningful domestic markets, they would significantly aid the coordination of producers with each other, and by extension would provide a common platform for producers to engage with buyers in Asia.
- Promote entrepreneurship in the sesame hulling sub-sector. Unlike the oil production sub-sector, sesame hulling provides a viable value addition with noticeable price premiums and little capital-intensity. One way to explore the viability of widespread sesame hulling would be for the Ministry of Agriculture to create a set of grants to fund independent sesame hulling enterprises, tracking the results of the first round of grantees before deciding whether to expand funding into the sub-sector. Alternatively, sesame hulling could be integrated into the government's existing agricultural extension training programs focused on collectives. Collectives have the financing and collective knowledge to expand into hulling and could be an optimal introduction point for hulling initiatives.

### Cashews

#### *Cashew's promise as a nutraceutical*

A relatively new cash crop to West Africa, cashews are among Burkina Faso's fastest-growing exports. Backed by strong global demand and targeted government support, Burkina Faso's cashew production grew from 6,500 MT in 2007 to nearly 100,000 MT in 2017 (USDA, 2018). The vast majority of Burkina Faso's cashew production goes to India for processing, with the remainder making its way to the Netherlands, Germany, and the US (OEC, 2017). Originally transplanted from South America in the 1970's, the cashew tree adapted well to Burkina Faso's semi-arid climate and became a staple crop in the country's southwest region. The cashew fruit is prized for its nut, which contains high levels of protein, antioxidants, and many essential minerals like copper and zinc. Consumption of cashew nuts has been shown to boost immune response and lower risk of cardiovascular disease, contributing to its status among Western consumers (Alasalvar & Bolling, 2015). Beyond its historic popularity as a snack or food additive, cashews are increasingly viewed as a dietary supplement. Most cashew nuts are consumed shelled and roasted, but Burkina Faso's exports are dominated by raw nuts.

Cashews are generally processed in two phases: roasting and shelling. Unlike the first-stage processing of many nuts, shelling and roasting are fairly capital-intensive and can be dangerous. The central difficulty

of cashew processing is that outer shell layer contains highly caustic anacardic acid, which causes severe burns if improperly handled, and thus both skilled labor and specialized machinery are needed to safely remove it. The shelling of cashews is done in four steps, each of which must be done slowly and carefully to prevent acid contamination. Firstly, raw nuts are placed in a boiler-heated drum for around 15 minutes to soften the outer shell without melting it and are left in the drum for another 20 minutes to roast after the boiler is switched off. Once their shells are sufficiently softened, the nuts are fed into a shell-cutting machine.

In order to remove the shells without contaminating any inner shells, the nuts must be individually placed into the machine and then cut. This step is both time-consuming, especially for smaller enterprises with few cutting machines, and potentially dangerous to machine operators who are repeatedly exposed to the acid. Once the outer shells have been removed, the nuts are placed into industrial ovens and roasted for another 24 hours to soften the inner shell. Finally, the inner shells are delicately hand-peeled to avoid damaging the fragile kernels.<sup>15</sup> Given the industrial nature of cashew processing, cashews cannot be hand-processed.

International demand for cashews has grown sharply over the past decade. Since 2009, global consumption of cashews has increased nearly 87 per cent, and the global price has increased from around US\$2.85 per pound in 2009 to around US\$4.65 per pound in 2017. Two main factors have contributed to strengthening of the cashew market. First, incomes have risen rapidly in India, which accounts for more than 20 per cent of worldwide cashew imports and more than a third of total consumption. The cashew market in India is growing at more than 10 per cent per year, as cashews have increasingly become a staple for middle-class Indian families. Second, as Western interest in natural health foods has risen over the past decade, US and European demand has surged on the strength of cashew's nutritional properties. The nuts' small size renders them quite portable, and many are sold in snack bags in the manner of peanuts. Cashews are the second fastest growing nut market (after almonds), and global production has struggled to keep pace over the past decade (International Finance Corporation, 2010). Factoring in Chinese demand, which is presently small but growing very quickly, cashews will likely remain a high-margin cash crop for years to come.

Beyond the nut's popularity, cashew juice has also become a globally demanded product. Made from cashew apple, the fleshy pseudo-fruit binding the cashew nut to the stem, cashew juice has ascended from relative obscurity to become a major ingredient in cold-pressed juices and health beverages. Although still a niche product, cashew juice has been studied rather extensively, and is known to have many beneficial health properties. It is rich in antioxidants and vitamins, making for an attractive cold-press juice flavour.<sup>16</sup> However, unlike cashew nuts, there is virtually no industrial processing of cashew apples in Burkina Faso at present. Apples are exported on a limited basis and processed in the US and Europe, often by restaurants. This is a potential area of expansion for Burkina Faso, representing an easy opportunity to add meaningful value to its cashew production. The development of a cashew apple sub-sector would significantly benefit cashew farmers, as presently most cashew apples are eaten or simply left to rot. In India, many farmers increased their incomes by nearly 50 per cent after buyers of cashew apples emerged in their communities (USDA, 2018). Given robust global demand, a push into cashew apple processing through expansion of existing nut processing facilities could greatly expand the cashew sector.

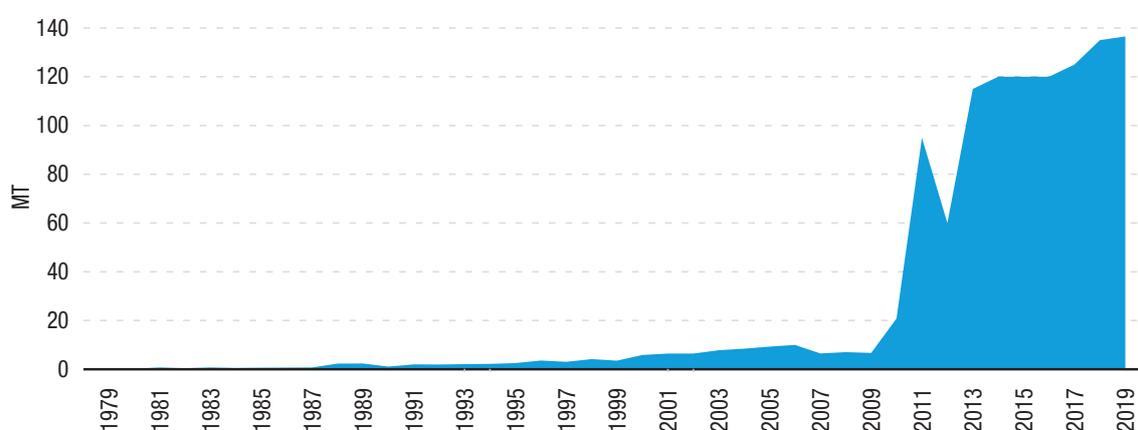
#### *Cashew production in Burkina Faso*

Cashew production has grown rapidly in Burkina Faso (Figure 5.9). The crop first attained widespread prominence in 1997, after a government initiative to plant 500,000 cashew trees in the southern and western regions of the country. Although only around 200,000 were planted, the tree became a staple of the region, and gained a further measure of national prominence as its drought-resistance and wide canopy cover made it a popular anti-desertification and reforestation tree. Cashew trees have since spread to the northern arid region of the country as a frontline defence against the Sahara Desert, with

<sup>15</sup> <http://www.sahakarifarms.com/agroprocessing.html>

<sup>16</sup> <https://www.nytimes.com/2014/08/09/business/international/cashew-juice-the-apple-of-pepsis-eye.html>

Figure 5.9 Cashew nuts production



Source: FAOSTAT.

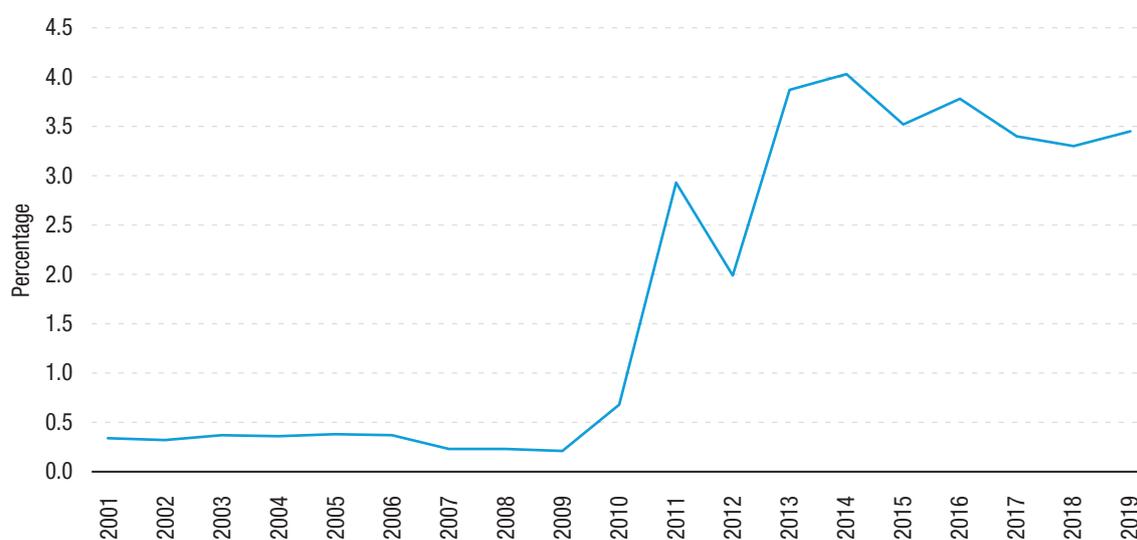
their root systems guarding against soil erosion and providing nutrients for spill over growth (USDA, 2018). The trees have the added benefit of high carbon sequestration, which may increase the tree's value as the country focuses on the threat of climate change. The combination of high global demand and the tree's ecological benefits led the government in 2012 to declare the cashew sector a "national priority sector" in 2012, promising to devote significant federal funding to bolstering the sector.

Indeed, the government has played a significant role in transforming the cashew industry. Beginning in 2014, Burkina Faso's government began an initiative with the Enhanced Integrated Framework (EIF) to identify constraints to growth in the cashew sector. The EIF, working with producers, determined that the sector's lack of communication between producers, processors, and exporters was the central obstacle to growth in the sector. Although 10 industrial processing facilities were in operation, less than a third of total processing capacity was being used because nearly the entire national crop of raw cashew was being sold to wholesalers and exporters (EIF, 2018). Beginning in 2014, the government hosted a series of roundtables designed to foster communication between producers, processors, and exporters, with an eye toward filling the country's processing capacity. From these efforts emerged in 2015 an interprofessional association for the cashew sector: the Comité Interprofessionnel de l'Anacarde du Burkina (CIA-B). Since its inception, the CIA-B has brought industry leaders together to tackle the issues of tough international standards and insufficient supply of raw cashews for processing firms. Although the impact of increased industry cooperation on standardization is as yet indeterminate, domestic processing of cashews has risen to nearly 30 per cent of capacity today (EIF, 2018).

Burkina Faso's cashew value chain is somewhat complex and does not follow the many-producers, few aggregator model. It is comprised of three general levels: exporters, wholesalers, and local dealers. Most exporters are international buyers who have established branches in Burkina Faso (African Cashew Initiative, 2010). Although the wholesalers sell to the exporters, there are more exporters than wholesalers, since the wholesale market is rather oligopolistic while strong global demand has created competition among international buyers in the export market. The local dealers, meanwhile, are split into two traditional groupings: *pisteurs* travel around production areas filling out orders for international buyers, while *collecteurs* are based in villages and sell to wholesalers. Around 90 per cent of the country's raw cashew production passes through the hands of *pisteurs* and *collecteurs*, while the other 10 per cent is bought up by domestic processing firms (USDA, 2018). Prior to the formation of CIA-B, one of the central obstacles to the expansion of processing was the stranglehold of *pisteurs* and *collecteurs* on the domestic supply of raw nuts.

Burkina Faso's cashew exports broadly fall into three categories. The first is the certified crop, mainly organic and Fairtrade cashews. Although no official statistics are recorded for Fairtrade products, certified Fairtrade and organic cashews together comprise an estimated 10 per cent of total production

Figure 5.10 Burkina Faso's market share



Source: FAOSTAT.

(African Cashew Initiative, 2010). The Fairtrade market is somewhat niche, but demand has grown noticeably since 2011 when Human Rights Watch issued a report on widespread worker mistreatment in the Vietnamese cashew processing industry.<sup>17</sup> So-called “blood cashews,” or cashews processed in facilities with high worker injury and mortality rates, have become anathema to many Western consumers, and Fairtrade is a convenient mechanism for such consumers to ensure that their cashews are ethically sourced. Organic cashews, meanwhile, comprise a small segment of the overall market, but demand has grown substantially over the past decade. With cashews emerging as a comparatively high-end healthy snack in many Western countries, the market segment for cashews has gained substantial overlap with the general organic segment (International Finance Corporation, 2010). Much of the future growth in global demand for cashews is projected to be in the organic sub-sector, but global production of organic cashews is not rising drastically, potentially signaling price growth in the sub-sector.

The second category of cashew exports is processed cashews. The processed cashew sector is centred on Bobo-Dioulasso, where nearly half of the country’s processing capacity by tonnage is located (African Cashew Initiative, 2010). Although processed exports have grown significantly since the formation of CIA-B, meeting the quality standards of the EU and US markets is still a meaningful hurdle for processed cashews. Unlike with raw cashews, which are mostly sent to India for processing and require little regulatory oversight, processed cashews are subjected to stringent quality control by the FDA and by supermarket chains in the EU. There are two central quality and safety challenges present for cashews: the relative prevalence of salmonella and *E. Coli* in many African cashews, which poses an obvious health risk, and the low maximum pesticide contamination allowed in both markets (Center for the Promotion of Imports, 2019a). Hazards Analysis and Critical Control Points (HAACP) safety measures are critical in addressing both challenges, and accordingly strategies for robustly implementing HAACP has been a central topic of discussion among producers in CIA-B. Quality control is one of the largest constraints to expanding processed cashew exports, and dialogue should be facilitated between US/European supermarket buyers and processing firms to clearly convey the standards of the Western market to the processing firms. Improving sanitary and phytosanitary conditions for cashews would add value to exports and mitigate the country’s quality control problems in the sector.

<sup>17</sup> <https://www.hrw.org/report/2011/09/07/rehab-archipelago/forced-labor-and-other-abuses-drug-detention-centers-southern>

The final category of cashew exports is raw cashew nuts, uncertified (RCN). RCN makes up around 80 per cent of the country's cashew output, though its share has dropped from nearly 90 per cent just eight years ago. RCN production is concentrated in rural areas, as most certified cooperatives tend to operate in large villages or close to cities. Although it has not grown as quickly as the Fairtrade market for cashews, global RCN demand remains strong, and the competition between *pisteurs* and *collecteurs* is such that farm-gate prices roughly track world prices (African Cashew Initiative, 2010). The vast majority of Burkina Faso's RCN output is sent to India, where it is processed and either consumed domestically or re-exported to the US or Europe. Despite the growing importance of Fairtrade and processed cashews, RCN remains an important source of income for rural farmers and will likely comprise the majority of Burkina Faso's cashew production for the foreseeable future.

Until recently, Burkina Faso has exclusively exported raw cashews. However, following a series of foreign partnerships and a government initiative aimed at building cashew processing capacity within the country, Burkina Faso has developed sufficient processing capacity to export around 10 per cent of its total production as roasted, shelled cashews (Kovacevic, 2018). Large-scale processing of cashews has been developed only in partnership with foreign processing firms, and Burkina Faso should continue to pursue public-private partnerships to boost its processing capacity.

Global market price comparisons between conventional, organic and Fairtrade cashews are somewhat difficult, as most Fairtrade and some organic producers negotiate deals directly with retailers. However, a 2012 survey of US and European cashew retailers showed a substantial premium for raw Fairtrade and organic cashews: 68 per cent for Fairtrade and 77 per cent for organic. Farm-gate premiums are estimated at around 20–25 per cent, meaning that the bulk of the retail premiums go to the retailers themselves. This is due in part to the fact that all grades, including broken cashew pieces, receive the same price under the Fairtrade system as whole cashews despite significant price variation in conventional markets, forcing Fairtrade importers to buy lower grades at a loss and break even by raising prices on whole, high-quality cashews (International Finance Corporation, 2010). As a result, Fairtrade market-price premiums for cashews exceed those of most other Fairtrade products, including coffee, cotton, and bananas. Though the market has experienced double-digit growth for the past several years, Fairtrade still comprises only a small fraction of Western demand for cashews: 0.5 per cent of total cashew imports in Europe and less than 1 per cent in the US. Given the niche nature of the Fairtrade cashew market, there is likely a ceiling for Burkina Faso's expansion into Fairtrade.

Multinational partnerships have been critical to the development of the cashew sector. Although raw nuts are usually exported through wholesalers and international buyers, targeted investment by multinationals and public-private partnerships with several processing companies has led to the creation of eight new processing facilities across the past decade, adding to the four existing facilities created by the government and domestic entrepreneurs. This pattern of investment has greatly increased the country's processing capacity by tonnage, essentially making the present push into large-scale processing of nuts. In particular, the public-private partnership between Burkina Faso and the Dutch Trade & Development Group (TDG) led to the construction of the 6,000 MT Anatrans plant in Bobo-Dioulasso, which now accounts for 75 per cent of the country's processing capacity (African Cashew Initiative, 2010). As the cashew sector in Burkina Faso continues to grow, the Ministry of Agriculture should seek out more partnerships and should also work with processing firms to help secure sufficient supply of raw cashews to ramp up their production to at least 50 per cent of capacity.

### ***Key constraints on Cashew production and exports***

Access to finance is one of the key constraints to the sector at present. Few commercial banks want to lend to the cashew industry, even in the case of foreign-backed processing firms. However, processors must buy their raw nuts in advance, and often have difficulty competing against the larger wholesalers and exporters for their share of the supply. Although the Regional Solidarity Bank has financed several cashew processing operations, on the whole the sector lacks a consistent source of financing. In the case of Anatrans, annual funding is drawn from the Dutch Foreign Ministry to pre-

finance production (African Cashew Initiative, 2010). This model is likely not sustainable if Burkina Faso wishes to meaningfully expand its cashew processing, so the government should strive to interest foreign multinationals or NGO's in the burgeoning cashew sector. Partnering with NGOs to extend low-interest lines of credit to processing firms and entrepreneurs in the processing business could go a long way toward expanding Burkina Faso's processed share of total cashew exports, which would noticeably increase export revenues.

Certification rates within the country are low, despite lucrative premiums on the certified market, and many smallholders lack the technical expertise to shift to Fairtrade or organic production. Further, Burkina Faso's yields are far lower than that of its closest competitors, Vietnam and the Philippines, as many farmers use sub-optimal seed varieties which yield fruits smaller than the global market standard. Although yields have not unduly constrained the sector thus far, yield improvement is a key obstacle to Burkina Faso's emergence as a major player on the global market. Finally, processed cashews still face many regulatory barriers coming into the EU and US markets, which they are not always equipped to overcome.

### *Conclusion and recommendations*

Cashews are a promising export sector in Burkina Faso. Buoyed by strong global demand and rising prices, they have become Burkina Faso's third largest export and are poised to overtake sesame as the second-largest export by 2020. Despite its low overall industrial capacity, Burkina Faso has developed meaningful processing capacity with government and private support and has overcome supply problems through the sector's interprofessional agency. However, despite the sector's strong recent performance, several factors constrain its growth. To these ends, the authors offer three recommendations for realizing the full potential of the cashew sector.

- Expand organic production. Western demand for organic-certified cashews has been quite robust, and the price premiums offered by organic production are substantial. The Ministry of Agriculture should work with the CIA-B to provide trainings to cooperatives seeking to expand into organic certification and should actively cultivate relations with certifying organizations. Expanding organic cashew production would give Burkina Faso a significant advantage over larger competitors like India and Vietnam on the global market and could have positive spillover effects on the agricultural economy writ large by showcasing the country's potential as a sustainable agriculture hub for the world market.
- Harness better seed-distribution mechanisms. Although cashews have a fairly short lifespan, many farmers simply recycle their seeds, leading to little improvement in the long-run yield of the crops. Burkina Faso's Ministry of Agriculture has already developed high-yield cashew trees, but few have been distributed to rural farmers (African Cashew Initiative, 2010). Given Burkina Faso's dearth of private-sector cashew seed vendors, the government could play a role in hastening the development of a distribution sector. The Ministry could consider creating a parastatal to sell seeds and other inputs to farmers (in the model of the cotton sector), offering incentives for seed vendors in neighbouring Côte d'Ivoire to create subsidiaries in Burkina Faso, or even selling high-yield seeds directly to the CIA-B, which can in turn sell them to farmers at lower rates. Given the substantial variance in yields between average and high-quality seeds, an investment on the part of CIA-B in high-quality seeds for the sector would likely pay dividends in the long run.
- Assess the viability of cashew apple processing. Cashew apples offer a massive store of potential income for cashew farmers who often let the fruit go to waste for lack of a market. In order to bring about the development of processing facilities, the government should partner with either NGO's or multinationals seeking to expand into cashew apple juice with public-private partnerships, in the same manner as the expansion into cashew nut processing facilities. Failing this, the Ministry of Agriculture could also seek foreign buyers to create a channel for the export of cashew apples.

## 5.2.2 Ethiopia

### Overview of export structure and constraints to diversification

Ethiopia is a landlocked developing country in East Africa, bordering Eritrea and Djibouti to the north, Somalia to the east, Sudan and South Sudan to the west, and Kenya to the south. nation on the Horn of Africa, Ethiopia is a primarily agrarian economy, with around 85 per cent of the workforce employed in agriculture. With over 110 million inhabitants, Ethiopia is Africa's second most populous nation, and is also one of the poorest with per-capita GDP below US\$1,000 (World Bank, 2020). Over the past decade, however, Ethiopia has averaged GDP growth of more than 10 per cent per year, driven in large part by its services and industrial sectors. Standards of living are steadily rising, with a 26 per cent reduction in poverty since 2004.

Although agriculture makes up more than a third of GDP, its share has been steadily shrinking. Over the past decade, Ethiopia's high growth rates have been driven primarily by growth in the industrial and service sectors. The industrial sector accounts for around 15 per cent of Ethiopia's GDP, with construction driving most recent growth. Although manufacturing exports have grown, their share of GDP has remained roughly constant. Ethiopia has been successful in developing textile manufacturing through the construction of four industrial parks, attracting foreign investment with tax breaks and duties waivers. China, in particular, has invested heavily in these industrial parks, drawn by low labor costs and the existing economic relationship between the two countries. Ethiopia's rapid expansion of its industrial parks will likely lead to a boom in its manufactured exports across the next several years, as foreign companies move in and begin production.

Foreign investment in Ethiopia has skyrocketed over the past decade, rising from less than US\$700 million in 2011 to US\$4 billion in 2017, reaching 19 per cent of GDP.<sup>18</sup> In large part, FDI is from China, which has financed numerous large Ethiopian construction and infrastructure projects including the country's flagship Addis Ababa-Djibouti Railway. As a result, China has become Ethiopia's largest creditor, holding more than half of the country's sovereign debt.<sup>19</sup> In 2018, government debt exceeded 60 per cent of GDP, up from 45 per cent in 2011 (notwithstanding the country's double-digit annual GDP growth over the same period).

Driven in part by urban growth, the services sector in Ethiopia has outpaced both the agricultural and industrial sectors. Generous public investment in the development of urban areas has led to rapid growth of cities like Addis Ababa, and the resulting urban agglomeration helped develop large-scale service firms such as call centers and private banks. Services growth in Ethiopia will likely continue as investment pours in and renewed international interest in the country has also led to an uptick in tourism. Overall, Ethiopia's economic outlook is bright, but the country should design a policy slate to boost its exports without further drowning itself in debt.

In terms of export structure, Ethiopia's economy relies on coffee as its primary cash crop and the mainstay of its exports. In 2017, Ethiopia was sub-Saharan Africa's leading exporter of coffee, comprising 2.5 per cent of the global trade (OEC, 2017). Coffee currently accounts for around one third of Ethiopian exports by value, though its share has been eroded since 2013 by the expansion of gold mining within the country (11 per cent of exports) and rapidly expanding exports of cut flowers (9 per cent). Though coffee accounts for a large share of Ethiopian exports, its production is effectively limited to larger commercial farms, and its production accounts for less than 5 per cent of total acreage and less than 3 per cent of Ethiopia's GDP (USDA, 2018). Coffee production faces a serious, long-term challenge to its position as Ethiopia's top export; climate change is predicted to dramatically reduce the viable acreage for coffee cultivation. Temperatures in coffee-growing areas of Ethiopia have risen more than 2 degrees Fahrenheit over the past 3 decades, which has caused worsened droughts and thus constrained yield (Kew, 2017). The

<sup>18</sup> <https://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD?locations=ET>

<sup>19</sup> <https://tradingeconomics.com/ethiopia/current-account>

largest impact of rising temperatures, however, has been the proliferation of diseases that affect coffee plants, and to a lesser extent pest as well.

Cereals, the crops best suited to the highlands containing the majority of arable land, comprise 70 per cent of total production and nearly 3/4 of acreage. Teff, wheat, maize, sorghum, and barley alone account for more than half of Ethiopia's agricultural production. Though the vast majority of these cereals are domestically consumed, Ethiopia is one of Africa's largest exporters of maize, which accounts for around 0.5 per cent of its exports (World Bank, 2018a). Smallholder crops are generally rain-fed, but the climate of Ethiopia's highlands makes rainfall a more reliable source of irrigation than in most countries in sub-Saharan Africa. Pulses and oilseeds, grown by most smallholder farmers, have also played a large role in Ethiopia's agricultural economy.

Since 2011, declines in coffee and other agricultural commodity prices have led to a precipitous drop in Ethiopian exports. Exports have declined from US\$5.6 billion in 2014 to US\$3.2 billion in 2017 (OEC, 2017). Gold prices have also dipped over the same period, as increasing informal trade volume has chipped away at formal exports. Overall, exports have been a non-factor in Ethiopia's rapid growth since 2010, with domestic consumption and foreign investment driving the boom. Ethiopia's central growth strategy, agricultural development-led industrialization (ADLI), emphasized synergies between agricultural exports and manufacturing exports. However, the rapid expansion of Ethiopia's industrial and services sectors give reason for hope, as a move away from primary-commodity exports would reduce Ethiopia's vulnerability to commodity price volatility.

Ethiopia's primary trade linkages are with Europe (35 per cent), Asia (29 per cent), and eastern Africa (21 per cent). Although Ethiopia is a member of the Common Market for Eastern and Southern Africa (COMESA), most of its regional exports are to Djibouti and Somalia (OEC, 2016). Currently, regional trade flows in northeast Africa are weak, and many countries in the region instead rely on trade with Europe and the Middle East. Ethiopia is in a prime position to capitalize on both markets, as the closest air hub in Africa to the Middle East and the northernmost terminus of eastern Africa's "air corridor" to Europe.<sup>20</sup>

The European Union has historically been Ethiopia's closest trading partner. Global demand for coffee, Ethiopia's most dominant export, is concentrated in Europe, and 51 per cent of Ethiopia's coffee exports are to Europe. Ethiopia's booming cut flower industry and its modest gold production, which together account for more than 20 per cent of Ethiopia's exports, overwhelmingly export to Europe as well (OEC, 2017). Although the EU's exacting standards can make agricultural exports to Europe challenging, coffee and cut flowers are two of the least regulated agricultural imports, relieving Ethiopia of the standards-compliance obstacles many African countries face. However, expansions into sectors such as dried legumes and soybeans have faced quality control barriers, which Ethiopia will eventually have to overcome in order to become a significant player in the European market.

Exports of *khat*, a mild chewing amphetamine which was formerly Ethiopia's fourth largest export, dropped significantly after an EU ban on the substance in 2014.<sup>21</sup> Outside the agricultural and mining sectors, Ethiopian Airlines has attracted European demand as the largest airline in Africa, with a significant advantage in direct flights to Europe over competitors like Kenyan Airways and South African Airways. This air advantage allows Ethiopia to efficiently direct its exports to Europe, which the country has struggled to accomplish in the past. Europe remains the most promising market for Ethiopian exports, and Ethiopia should attempt to target European demand in promising export sectors like sesame and teff.

Asian demand for Ethiopian goods, meanwhile, has been primarily driven by China. China imports massive quantities of sesame seeds, which comprise around 16 per cent of Ethiopia's total exports. Demand for coffee in the region, particularly in Japan and South Korea, has been growing as well. Ethiopian exports to China are helped by the close economic ties between the two countries, and the large number of Chinese

<sup>20</sup> <https://www.wsj.com/articles/crash-puts-spotlight-on-ethiopian-airlines-pride-of-a-nation-11552737600>

<sup>21</sup> <https://www.tesfanews.net/ethiopias-4th-largest-export-khat-suffers-after-european-ban/>

workers in Ethiopia with families in China. As China's investment in the country grows, the budding Ethiopian manufacturing industry may begin sending goods to the Asian market given the economic linkages. However, Asian demand will likely be driven by food and textile products for the near future, as many countries in the region specialize in labor-intensive manufacturing. To maintain strong economic linkages with Asia, Ethiopia should continue to offer incentives for investment, and should develop a national strategy to cater to rising demand for products such as processed coffee, raw cotton or other textiles, and sesame seeds.

Formal and informal trade with countries in East Africa, particularly Somalia and Djibouti, make up a further 20 per cent of Ethiopia's trade volume. Livestock and *khat* dominate Ethiopia's exports to these countries, which have historically been driven by nomad migration within the region. Ethiopia is the world's largest producer of *khat*, which is consumed across East Africa as well as in Yemen. Although the EU ban on *khat* drove prices down due to decreased global demand, cultivation of *khat* is still more profitable per acre than most other crops, which has contributed to its status as a cash crop in the region. Ethiopia also has one of the largest livestock populations in Africa, concentrated in pastoral areas of the northern highlands and the eastern Somali province.

Livestock trade is at the center of nomadic life, and cross-border linkages of many nomadic pastoral communities contribute strongly to Ethiopia's livestock trade. Although livestock exports are likely underestimated because of their often-informal nature, they comprise around 7 per cent of Ethiopia's documented exports (OEC, 2017). Although trade with Eritrea has been greatly hampered by the war between the two countries, the peace treaty negotiated in July 2018 should cause an uptick in exports to Eritrea across the next few years. Increased regional linkages through infrastructure investment (such as the Addis Ababa-Djibouti rail line built in 2018 and the Lamu Port-South Sudan-Ethiopia Transport Corridor) should cause an overall increase in trade volume in the East African region.

Ethiopia's business climate has both positive and negative aspects. Ethiopia has adopted a development policy modeled on East Asian activist industrial policy aiming to target key export sectors. Relatively low corruption has contributed to some significant successes in promoting light manufacturing and cut flowers. On the other hand, some aspects of the investment climate hold back domestic and foreign investment.

As with other LDCs and LLDCs, Ethiopia suffers from low productive capacities and lack of structural economic transformation. The country's score on the UNCTAD Productive Capacities Index (PCI) is 23.53 in 2018, slightly behind the average scores of LDCs (24) but significantly lagging behind the average of other LLDCs (26.11) and developing countries (32.63) in the same year. Ethiopia's category level scores reflect a typical LDC economy where PCI scores are dragged down by poor performance on human capital, energy, ICTs, structural change, and transport categories. These challenges are further compounded by access to land and other barriers to FDI. Construction permits are difficult to obtain in many urban areas, limiting the ability of entrepreneurs to create facilities tailored to their businesses. The government's central leasing system makes it difficult for many businesses to obtain land at all, as political favoritism plays a noticeable role in the distribution of leases. On FDI, although the country begun gradual openings, many industries, including telecoms, commercial aviation, energy, and delivery are controlled by state monopolies, and many others have restrictions on potential entrants. Successful commercial farms receive hefty state support, stifling competition from smaller agri-businesses. Registering a new business takes more than a month, well above the regional average. Ethiopia's new Government has recognized these challenges and begun to address long-standing regulatory excesses. The country has undertaken liberalization of the telecoms and energy sectors and has begun to streamline the land allocation process.<sup>22</sup> Although concrete progress has been made even across the past year, much remains to be done. Regional production and trade agreements in ECOWAS or the EAC could provide other opportunities for investment, helping bridge the gap.

<sup>22</sup> <https://www.reuters.com/article/us-ethiopia-investment/ethiopia-reform-push-faces-major-snap-red-tape-idUSKBN1KN0G0>

**Access to finance:** Access to finance in Ethiopia is difficult. The commercial banking sector in Ethiopia, while including a diverse set of banks, is dominated by the giant state-owned Commercial Bank of Ethiopia (CBE), which controls more than 60 per cent of total deposits. The sector is closed to foreign entrants and interest rates can approach 20 per cent. The CBE loans overwhelmingly to larger, more established entities, with less than 15 per cent of Ethiopian firms reporting having access to a bank loan or credit. The gap left by commercial banks has partially been filled by informal credit associations known as “ekubs.” Nearly 2/3 of small- and medium-sized enterprises had made use of an ekub since 2002.<sup>23</sup> However, informal associations are no real substitute for viable commercial banking. Uncertainty, small loan size, and short maturity periods characterize the informal banking sector, and services in rural areas tend to be lacking. The Ministry of Finance should consider breaking up or privatizing the CBE and overhaul lending procedures. The low default rate of ekubs despite spotty credit information points to the potential for Ethiopia’s banks to lend without exorbitant interest rates, and once competition is introduced into the sector, interest rates should decline. Ethiopia’s banking sector could be an engine of the country’s growth, and greater competition could assist in accomplishing that goal.

**Trade facilitation:** Another barrier to Ethiopia’s growth (and exports) is its cumbersome customs procedures. Despite the rapidly growing demand for imported goods and materials, many of which cannot be efficiently supplied by the domestic market, the Ethiopian Customs Authority mandates onerous checks and duties on imports, stemming in part from prior regimes’ import-substitution policies. The average customs clearance time is 21 days, noticeably longer than the regional average.<sup>24</sup> Tariff rates vary from 0 per cent to 30 per cent, and average around 17 per cent for many items. Although industrial inputs and many raw materials are duty-free, the duties and lengthy waits on imports of many necessary products constrain domestic growth and continue to hamper the export sector they were designed to help. Overhauling the customs systems and expediting the process would be beneficial for Ethiopia.

### Overall assessment and implications for nutraceutical exports

Ethiopia has several significant strengths, particularly an effective government committed to fostering development and low labor costs. Ethiopia has also been successful in attracting foreign investment and boosting exports in important export sectors, notably light manufacturing and horticulture. The cut flower industry in particular provides important lessons for the rest of its budding agricultural export sectors, including nutraceuticals. First, while activist government policies played an important role in later stages of the cut flower industry, openness to foreign expertise was critical at the inception and throughout the development of the sector. Cut flowers exports were largely started by Golden Rose and ongoing involvement of foreign firms in the sector, particularly Sher-Ethiopia, was key to building capacity and disseminating standards during the sector’s second wave of growth. Boosting nutraceuticals will likewise require foreign expertise in production and marketing. To this end, the government should consider reducing regulatory barriers to foreign investment, improving access to land and facilitating trade procedures.

### Selected products with export potential as nutraceuticals

#### Frankincense

##### *Frankincense’s promise as a nutraceutical*

Cultivated since 1500 BCE, frankincense is an important economic resource in the Arabian Peninsula and Horn of Africa regions. Predominately found in Oman, Somalia, India, and Ethiopia, the incense is collected as resin from several species of the *Boswellia* genus. Frankincense is a multifaceted commodity, serving primarily as a personal fragrance, cosmetic agent, religious incense, and pharmaceutical ingredient. A scent of choice since Biblical times, frankincense is used by the Roman Catholic Church and Eastern

<sup>23</sup> <https://www.economist.com/finance-and-economics/2019/04/04/what-self-help-lending-says-about-ethiopian-banking>

<sup>24</sup> <https://www.export.gov/article?id=Ethiopia-Customs-Regulations>

Orthodox Church for masses and has become popular among Western consumers as an essential oil. Within Ethiopia, *Boswellia papyrifera* grows in dry forest stands across the northern and central highlands. The tree is known for its sturdy, drought-resistant bark and its ability to grow and prevent erosion in steeply sloped, rocky areas where few other trees thrive. Beyond its resin, *Boswellia papyrifera*'s leaves are useful for animal fodder, its roots are used in traditional medicine, and its pink flowers are excellent for bee colony maintenance, noticeably boosting yields.<sup>25</sup> The tree is vital to smaller villages, particularly those in Ethiopia's sparse, dry north.

Traditionally used as an incense, frankincense has found widespread use in recent years. Historically, the largest buyer of frankincense has been the Roman Catholic Church, which relies on frankincense and myrrh as its incenses of choice for masses. Many other churches have similar, smaller commitments to frankincense. However, in recent years, health and personal care products have been the primary driver of frankincense sales. The rising popularity of aromatherapy has elevated the status of frankincense, especially given its purported side effects of reducing anxiety when burned.<sup>26</sup>

Building on its reputation as an effective communal incense, frankincense has become a best-selling essential oil and fragrance flavour for consumers. Its distinctive fragrance, storied history, and proven benefits as an anti-inflammatory have given frankincense wide appeal as both a therapeutic and cosmetic staple. As with many other essential oil bases in recent years, frankincense has even been studied as a cancer fighting agent, gaining momentum after a study showed some efficacy in suppressing breast cancer cell growth in vitro (Parr & Ali, 2018). Although cancer research for frankincense lags behind that for such "natural ingredients" as curcumin and garlic, and no trials have yet been conducted on human cancer patients, pharmaceutical research and development remains a promising source of future demand for frankincense.

Among frankincense importers, China, Germany, and Greece are Ethiopia's three largest trading partners, together accounting for more than 75 per cent of Ethiopia's frankincense exports (OEC, 2017). Even in the comparatively stringent EU market, frankincense is subject to few import restrictions as a non-food, non-pharmaceutical health product. Of frankincense's five quality gradations, grades 1–3 are accepted in the EU market while Chinese importers accept grades 1–4 (Kassa et al., 2011). Nearly all of Ethiopia's frankincense exports are in raw form, as the country's industrial processing generally cannot meet international standards for the production of essential oils. However, given that world frankincense prices are comparatively high and rising, expansion into downstream processing is likely not a worthwhile investment of Ethiopia's industrial capital. Given the nature of frankincense harvesting, there is also little global demand for organic or otherwise certified frankincense. As no industrial inputs are used in the tapping of frankincense trees, all frankincense would essentially qualify as "organically-produced."

Certifications like Fairtrade and Ecocert, similarly, have little applicability to the harvesting of wild frankincense (and would likely require a restructuring of the labor hiring process to satisfy worker compensation requirements). A certification system for the sustainable harvesting of wild produce, Fairwild, was developed in 2008 in dialogue with the Fairtrade organization, though it currently has little brand recognition among ethical consumers. Should producer cooperatives emerge as a major force in frankincense production, Fairwild may be a worthwhile certification to promote, but its prospects for boosting producer prices are as yet indeterminate.

Like many other non-timber forest products, frankincense requires little downstream processing once harvested. To extract frankincense from *Boswellia papyrifera*, collectors use sharp blades called *mengafs* to create a tiny incision in the tree's bark. Resin slowly flows out of the tree, covering the incision. The resin is then left to harden for around 10 days, whereupon the small tear-shaped globules are harvested and packaged for storage. Each tree is generally tapped between six and ten times per dry season (al-Harassi et al., 2019). The globules are cleaned, usually with water, and any remaining particulate matter

<sup>25</sup> <http://www.fao.org/3/xii/0845-a1.htm>

<sup>26</sup> <https://www.healthline.com/health/anxiety/essential-oils-for-anxiety>

is removed by hand or with a knife. Finally, the frankincense is sorted by color and size, and packaged for sale. Quality is generally measured by the resin's coloration, with five standard grades ranging from 1A white frankincense to 4B dark brown frankincense.

From 1999 to 2008, Ethiopia's annual exports of frankincense tripled from 1,500 MT to more than 4,500 MT, with the domestically consumed share of production dropping from 77 per cent in 1999 to 22 per cent in 2008. Despite Ethiopia's rapid export growth as the second largest producer in the world, wholesale prices in Addis Ababa nearly tripled from 2006 to 2010, indicating that even Ethiopia's burgeoning supply was insufficient to meet global demand (Kassa et al., 2011). Though global consumption of frankincense has not slowed, every major frankincense producing country has experienced strain on its wild stock of *Boswellia*. *Boswellia sacra*, the predominate species in Somalia, Oman, and Yemen, is listed by the International Union for the Conservation of Nature (IUCN) has been listed as Near Threatened amid raging civil wars in Somalia and Yemen. *Boswellia serrata*, India's variety of frankincense, has been assessed as under threat by India's conservation ministry, and a recent study recommended its addition to the IUCN's Appendix II (vulnerable) category.<sup>27</sup> *Sacra*, *serrata* and *papyrifera* make up the vast majority of frankincense production, and all three species are greatly overtaxed (Bongers et al., 2019). Barring adverse global demand shocks, prices are likely to rise across the next two decades as *Boswellia* populations begin dying off.

#### *Frankincense production in Ethiopia*

As *Boswellia papyrifera* has not been domesticated, frankincense is collected in the wild by rural and generally poorer workers. Frankincense collectors in Ethiopia fall into two categories: farmers and day laborers. Farmers with land bordering dry forests can tap nearby *Boswellia* as an additional source of income, often in conjunction with other forest value-extraction pursuits like apiculture and firewood collection. Although farmers have some stake in preserving *Boswellia* stands as a supplemental source of income, they tend to derive only a small fraction of their overall income from frankincense collection, and often undertake potentially disruptive practices like forest grazing, bark collection, and even deforestation to boost their agriculturally productivity. Day laborers, on the other hand, are mostly employed by resin-production companies, and are paid by volume and quality of frankincense collected. As many regions lease *Boswellia* forests to resin companies and forbid private collection, day laborers greatly outnumber farmers among frankincense collectors (Dejene et al., 2013). Thus, frankincense production is mainly characterized by paid laborers employed by several large wholesale production enterprises in Tigray, *Gondar* and Amhara provinces. These enterprises sell their frankincense to central wholesalers in Addis Ababa, which in turn sell to exporters in the capital and regional distributors in non-producing areas of the country.

Despite the historical importance of frankincense, strong cultural taboos against forest work persist in Ethiopian society, and the harvesting of non-timber forest products (NTFP's) is often viewed as an employment of last resort. In a study of aromatic resin producers, nearly two thirds (63 per cent) viewed "cultural factors" as the strongest constraint to participation in the frankincense sector (Hassan et al., 2019). As a result, day laborers are mostly comprised of seasonal migrants to the production areas rather than being drawn from local labor pools, and they have little wage-negotiating power. In many cases, resin companies provide services such as housing or food for day laborers, deducting the costs from the laborers' paychecks. This system can be incredibly lucrative for the production enterprises and wholesalers, at the expense of collectors: a 2010 study of the frankincense value chain in Tigray found that collectors received as little as 19 per cent of the final sale price in Addis Ababa, while wholesaler margins exceeded 30 per cent and exporters captured a full 40 per cent of the market price (Kassa et al., 2011). In order to make a living, collectors often tap *Boswellia* groves to the point of exhaustion, sacrificing long-term productivity to maximize daily returns.

*Boswellia papyrifera* is under severe threat in Ethiopia. Deforestation, destruction of saplings by grazing livestock, pest attacks, and reduced germination stemming from overproduction have greatly hindered

<sup>27</sup> <https://www.sciencedirect.com/science/article/pii/S0378874118306640>

the ability of Ethiopia's wild stock of *Boswellia papyrifera* to regenerate. A recent study of *papyrifera* populations in Ethiopia, Eritrea, and Sudan found that nearly 80 per cent of observed groups had less than 1 sapling per 25 trees, and more than 55 per cent had experienced complete regenerative failure, lacking even a single sapling. If present trends continue, more than 70 per cent of the region's *papyrifera* stock will die within 25 years. As a result, unless action is taken to preserve the Ethiopia's *papyrifera*, production will fall by 50 per cent in less than 20 years (Bongers et al., 2019). Given the rising international demand for frankincense and increasing pace of deforestation in Ethiopia, preserving frankincense production as an industry of meaningful size may require decisive state action.

Given that the sector is driven in large part by seasonal migration of labor, few collectors can reliably expect to consistently work the same production areas on a yearly basis. Thus, most day laborers do not bear the external cost of significantly over-tapping stands of *Boswellia* across the course of the collection season, which is passed onto the next group of laborers working that area. National guidelines call for 1–2 seasons of rest for every 3–5 seasons of tapping to ensure regenerative capacity, but no effective enforcement mechanisms exist, and many stands are tapped nearly every season. Although production companies have an incentive to maintain the country's wild stock of *Boswellia*, they have largely turned a blind eye to the issue of sustainable management. Labor coordinators, the liaisons between company management and collectors who recruit workers and negotiate compensation agreements, are in the best position to observe the scale of the impending production drop-off and push for sustainable management to prevent the total collapse of *Boswellia* populations (Kassa et al., 2011). However, as they are paid on a commission basis, coordinators have a strong financial incentive to maximize production each season and are unlikely to push for any significant reforms.

However, over-tapping by collectors is only one facet of the threat faced by *Boswellia*. From 1970 to 2000, more than 170,000 hectares of dry forest in Tigray, the main frankincense-producing province, were cleared and converted to farmland, destroying 35 per cent of the region's *Boswellia* population. Several factors have driven the rapid transformation of Ethiopia's forests, but Ethiopia's flawed land tenure system has been the largest driver. The differential land tenure status of forest and cropland in Ethiopia, intended to promote conservation of forest land, has instead created strong incentives for clandestine deforestation by farmers. Since Ethiopia's military junta undertook radical land reform in 1975, all land in Ethiopia has been property of the state, with landowners holding 99-year leases on their land. For most private land, including farmland and grazing land, the state grants full usufruct rights subject to the payment of a small land-use tax. However, the state keeps much tighter legal control over forest land, in the name of environmental protection. Smallholders are restricted from engaging in logging or exploiting many non-timber forest products, including frankincense in Amhara province, and many productive forestlands are leased to state-owned or private companies on one- to two-year concessions (Kassa et al., 2011).

Despite the government's onerous restriction of forest usage rights, however, it has little enforcement power, and essentially no ability to differentiate between legitimate farmland and illegally deforested cropland once the land has been cleared. As a result, many farmers burn or clear forests adjacent to their land to secure stronger usage rights over the land. Beyond promoting environmental degradation, the concession system has greatly hindered the development of frankincense-producing cooperatives (Dejene et al., 2013). Thus, few cooperatives have emerged, and concession-holding resin companies have enjoyed a virtual absence of regional competition, allowing them to drive prices for raw frankincense down to a fraction of the market price in Addis Ababa.

However, the government has made recent progress on this front. In 2018, the Ministry of the Forest Sector issued new regulatory guidelines governing forest resources, extending concession rights to communities and private associations (such as cooperatives) while greatly increasing legal penalties for illegal deforesting and allocating additional funding toward enforcement.<sup>28</sup> The impact of the new policy has not yet been studied, but such regulatory overhaul is clearly a step in the right direction.

<sup>28</sup> <https://forestsnews.cifor.org/57465/ethiopias-new-forestry-law-a-win-for-landscapes-and-livelihoods?fnl=en>

*Key constraints on Frankincense production and exports*

By far the most significant constraint to Ethiopia's consolidation of the raw frankincense market is the ecological threat of deforestation, destructive grazing, and insect attacks on over-tapped trees. Ethiopia's output has increased in recent years to meet world demand, but its current mode of production cannot be sustained for more than a decade without heavy declines. Three factors underly the ecological threat to *Boswellia*. Firstly, barriers to entry into frankincense production prevent individual collectors and cooperatives, which have a strong stake in sustainable management, from effectively competing with private enterprises. The primary barrier is the concession system for forestry, which effectively allows the government to award monopolies over production in large areas to private enterprises.

Despite the general trend of over-tapping, Ethiopia may be able to shift toward a sustainably managed production system without significant loss of output. As the privately employed collectors are centrally managed, they generally work in fairly close proximity to each other, and cannot cover the entire area leased by their employer each season (Hassan et al., 2013). Thus, while most *Boswellia* forests are over-tapped, some areas are left relatively untouched. If leased to nearby collectors or cooperatives, these areas could offset much of the lost productivity from sustainable management of forests currently targeted for production. Granting individual collectors and cooperatives stewardship over nearby forest resources would also allow for community policing against deforestation and aggressive grazing, providing additional conservation benefits. Greater government regulation and oversight, in coordination with donors and NGOs is necessary.

Secondly, skewed price incentives for collectors fail to internalize negative externalities stemming from over-tapping. Although negative externalities stemming from natural resource extraction are notoriously hard to correct, the promotion of producer cooperatives offers an efficient, laissez-faire solution. As cooperatives harvest within a relatively small geographic area, the over-tapping of stands within that area directly harms future production by reducing yields and regeneration. Thus, many cooperatives mandate relatively strong conservation practices, and compensate workers by wage or share of total profits rather than payment on a per-unit basis. The Ethiopian government has recognized the importance of cooperatives in conserving scarce forest resources and has begun to extend forest leases to communities and cooperatives, but more remains to be done on this front.

Finally, although Ethiopia's Agriculture-Led Development Industrialization (ADLI) strategy has achieved high growth rates, its focus on farming and livestock rearing through favourable land tenure, input subsidies, agricultural extension, and marketing support has come at the expense of its forests. Although there is some inherent tension between farming and forest protection, the combination of Ethiopia's enthusiastic support of farmers and lack of enforcement of many forest-related environmental protections has left its woodlands in a dire state. Since 1990, more than 2.6 million hectares have been cleared in the country, nearly 20 per cent of the country's total forested area.<sup>29</sup> Deforestation in Ethiopia is a complex issue, with no easy solution, but its impact on *Boswellia* has been more devastating than either over-tapping or insect attacks. The Ministry of Agriculture could sidestep the problem for some time by extending credit, extension and/or training for the production of non-timber forest products like honey, frankincense and gum Arabic to help equalize economic returns between farmland and forests, but ultimately it must develop effective enforcement mechanisms to curb the country's rampant deforestation.

*Conclusion and recommendations*

Frankincense is a fast-growing global market which Ethiopia is well-positioned to dominate. Both production and prices are on the rise, and only Ethiopia's war-torn neighbor Somalia has a greater wild stock of *Boswellia papyrifera*. Ethiopia has the market infrastructure, agricultural support network, and focused national leadership to become the world's leading producer of raw frankincense. However, the sector faces a number of pressing challenges. The country's *Boswellia* stock is under great stress and is

<sup>29</sup> <https://www.nytimes.com/2019/07/30/world/africa/ethiopia-tree-planting-deforestation.html>

nearing a tipping point – once the mature stock begins to die off, regeneration of the species will fall, and even with better management the population will shrink greatly (Bolgers et al., 2019). Collectors receive only a small share of the final sale price and have over-tapped vulnerable stands to make ends meet. Deforestation continues to grow, and neither government agencies nor communities are currently able to protect forest resources. Following from our analysis of the sector, the authors offer four recommendations to overcome these challenges.

- Liberalize forest land tenure. For many communities, forests are a valuable economic resource worth protecting, and the Ministry of Environment, Forests and Climate Change should empower them to take conservancy into their own hands. Specifically, the Ministry should expand upon the 2018 National Forest Law to explicitly set aside a significant portion of the country's forestland for "participatory forest management" to be excluded from land concession bidding. Although the law correctly addresses the need for community management of forest resources, much of the language is symbolic and does not foreclose the possibility of concession to private enterprises.
- Promote frankincense producer cooperatives. Cooperative production of frankincense solves many of the sector's thorniest problems: collectors can easily be taught optimal tapping and management techniques, cooperative stewardship offers a stopgap vehicle for decentralized environmental enforcement, and competition for collector labor against large, oligopolistic private enterprises will likely drive up producer prices. The Ministry of Agriculture has driven up cooperative participation rates in other sectors by leveraging its agricultural extension program to organize farmers, offering trainings and seed capital to purchase storage infrastructure, and extending tax holidays to newly formed cooperatives. Similar policies could work for frankincense, but officials should first meet with prospective collectors and determine how best to meet their needs.
- Create extension services specifically for forestry targeting prospective producers and farmers near lucrative forests. Although Ethiopia has one of the best agricultural extension services in Africa, with a farmer-to-agent ratio of 8:1, its services for forest-based sectors like apiculture and resin-tapping are conspicuously lacking. Farmers are often unaware of the potential economic value of forest land, which can exceed even that of cash crops like cotton or sesame in many cases (Dejene et al., 2013). Keeping farmers informed about the value of nearby forest resources could both boost rural incomes and reduce deforestation, making forestry extension a worthwhile investment if done well.
- Redouble efforts to reduce deforestation. Prime Minister Ahmed has recognized deforestation as a serious threat to Ethiopia's prosperity and future growth and has advanced an admirable reforestation and conservancy agenda. However, at present Ethiopia simply lacks the enforcement capability to prevent illegal deforestation by farmers. Expanded agricultural production is one of the primary drivers of deforestation in Ethiopia, and while Ethiopia's agricultural growth across the past several decades has been impressive, the government has dragged its feet on developing enforcement mechanisms to keep farmers in compliance with laws governing land degradation. To preserve its biodiversity and mitigate the impact of climate change on the economy, Ethiopia's government should take a hardline stance on deforestation and crack down on offenders. Ethiopia's forests are one of its most important resources, and present investment in preserving them will surely pay off as the country progresses toward middle-income status.

## Teff

### *Teff's promise as a nutraceutical*

Cultivated for some 3,000 years, teff is one of Ethiopia's signature crops. The grain is found only in Ethiopia and Eritrea, but it functions as a dietary staple across the Horn of Africa. Especially popular in Ethiopia's rugged highlands, teff is primarily used to make *injera*, a spongy flatbread eaten alongside the spicy stews that characterize Ethiopian cuisine. As the primary domestically consumed grain, teff dominates Ethiopian

agricultural production, accounting for nearly 20 per cent of all cultivated area in the country and more than US\$500 million in total production (trailing only coffee, Ethiopia's primary cash crop). However, although Ethiopia produces more than 90 per cent of the world's teff, exports remain quite low despite robust foreign demand (Fikadu et al., 2019). Teff's export underperformance is due in large part to government intervention in the sector: in 2006, the Ethiopian government banned exports of raw teff over concerns that rising prices would price poorer domestic consumers out of the market.<sup>30</sup> Although processed exports increased following the ban, overall teff export revenues (and prices) declined significantly as the country's few processing facilities struggled to accommodate the artificial surplus of raw teff. The ban was partially lifted in 2015, following yield increases of more than 40 per cent since 2010 stemming from heavy investment in mechanization and improved agricultural extension (Fikadu et al., 2019). However, after the imposition of the ban, a number of US and Dutch firms began cultivating the crop in an attempt to capture Ethiopia's lost market share. Currently, Ethiopian firms still hold the edge in traditional processed products like *injera* popular among the Ethiopian diaspora, but the niche market of teff-derived health foods is being rapidly captured by smaller foreign firms.

Although its potential as a nutraceutical has only recently come to light, teff has several attributes which render it an attractive health food. The grain sports high levels of calcium, protein, vitamin C, iron, and fibre, but unlike most other grains it contains no gluten, meaning that teff-derived health foods can cater to the quickly growing gluten-free market. Furthermore, teff has long been a dietary staple among elite Ethiopian runners, whose success at the international level has lent the grain a measure of popularity among runners worldwide. In the US, entrepreneurs have begun to use teff in traditional grain-based foods like bread, pasta, pancakes, and even mainstream ethnic foods such as naan and tortillas (Reda, 2018). The health food market, and particularly the ancient grain-based segment, has grown rapidly over the past ten years, and Ethiopia's teff is poised to become a major new entrant if properly managed.

Despite the Ethiopian government ban on raw teff exports, the grain has begun to emerge as a major global commodity since 2010. Three market segments in particular have driven the rising demand. Firstly, following Ethiopia's economic emergence onto the world stage, the Ethiopian diaspora has emerged as a major source of demand for traditional food products, particularly *injera*. The US, Israel, Bahrain, and the United Arab Emirates all have large Ethiopian populations, and exporters in Ethiopia have emerged specifically to target Ethiopian families in developed countries. Ethiopia's export ban excludes processed teff products, so *injera* has become the country's main source of teff-derived export revenue. Secondly, the recent proliferation of Ethiopian restaurants in the US and Israel has created a steady stream of demand for teff-based products, both pre-made *injera* and teff flour that can be used to make fusion dishes like teff pasta and *injera* tacos (Fikadu et al., 2019).

Ethiopian immigration to the US in particular has risen noticeably across the past decade, driving up sales, while Ethiopia's increasingly positive international reputation may be a contributing factor to the uptick in consumption of Ethiopian cuisine among non-Ethiopian consumers.<sup>31</sup> Finally, as teff's reputation as a healthy grain or even an emerging "super-food" has solidified, a number of American health food companies have attempted to capitalize on media coverage of teff by creating and selling teff-flour versions of traditional American staples like pancakes, waffles, lasagne, sandwich bread, and even "veggie" burger patties. These products are sold as healthier, gluten-free alternatives with a distinctive flavor, and have increasingly become a fixture of the American gluten-free market.<sup>32</sup>

However, much of the aforementioned consumption has been sustained through production outside Ethiopia. Countries like the US and Australia with similar climactic zones and significant Ethiopian

<sup>30</sup> <https://www.weforum.org/agenda/2019/03/ethiopia-needs-to-improve-production-of-its-golden-crop-teff-heres-how/>

<sup>31</sup> [https://www.washingtonpost.com/lifestyle/style/as-americans-embrace-ethiopian-cuisine-its-farmers-grow-more-teff/2012/07/29/gJQAvml4IX\\_story.html](https://www.washingtonpost.com/lifestyle/style/as-americans-embrace-ethiopian-cuisine-its-farmers-grow-more-teff/2012/07/29/gJQAvml4IX_story.html)

<sup>32</sup> <https://well.blogs.nytimes.com/2016/08/16/is-teff-the-new-super-grain/>

communities have begun to experiment in teff production to meet growing domestic demand. For instance, Ethiopian restaurants in Washington, DC (home to a large community of Ethiopian immigrants) source mainly from farms in Boise, Idaho rather than Addis Ababa. Several factors limit the competitiveness of Ethiopian processed teff products: the labour-intensity of both teff harvesting and traditional *injera* production drives prices quite high, and mechanized harvesting and processing in the US can deliver similar-quality *injera* at a significantly lower price point. Further, many brands selling teff-derived products in developed countries (particular in the health food sector) emphasize organic, sustainable, pure production of ingredients. At present, the Ethiopian teff sector is ill-prepared to meet such criteria: the sector relies heavily on government-distributed industrial fertilizer, meaning that few teff farmers would even qualify for organic certification, and the crude threshing process employed by many teff farmers (walking herds of livestock over the harvest) introduces foreign contaminants which can be difficult to remove.

### *Teff production in Ethiopia*

Given Ethiopia's low export volume of teff, the teff value chain is predominately structured to meet the needs of domestic consumers. Following the imposition of the export ban on raw teff, the value chain collapsed into roughly a four-level pyramidal model comprised of primary producers, rural wholesalers, urban wholesalers, and urban retailers. Primary producers sell around 70 per cent of their crop to rural wholesalers, with most of the remainder consumed on a subsistence basis. Rural wholesalers in turn sell a little less than half to urban wholesalers, with the rest being purchased in bulk by rural consumers. Although urban retailers are nominally at the top of the teff value chain, they significantly outnumber urban wholesalers, and as a result intense competition between mills, cereal shops and consumer cooperatives for raw teff has emerged in many urban areas (Minten et al., 2013). Prior to the 2006 ban on raw exports, foreign buyers relied primarily on rural wholesalers, as transportation and distribution networks were not yet well-developed enough to centralize supply.

Although much of Ethiopia's population is still rural (around 80 per cent), teff is disproportionately consumed in urban areas. Despite its popularity, the grain's low yields make it comparatively more expensive than substitutes like maize and sorghum, and as a result teff is mostly consumed by middle- and upper-class households. Ethiopia's rapid urbanization and rising incomes in urban areas over the past decade has left many urban wholesalers unprepared for the rapid uptick in demand, but the increasing centralization of demand in urban areas (particularly Addis Ababa) has led to economies of scale in the sector. Transportation costs have been greatly reduced by a combination of better road infrastructure in the country's central provinces and the widespread usage of high-capacity trucks to transport teff from production centers to Addis Ababa, and the declining share of marketing and distribution costs in final retail prices implies a more efficient marketing structure within the city (Minten et al., 2013). Should Ethiopia further liberalize the teff sector and remove the remaining constraints to export, Addis Ababa would likely emerge as a distribution hub for foreign buyers.

Ethiopia's teff production is generally grouped into four quality categories. The crop naturally comes in two varieties: red and white teff. Although red teff generally has higher productivity, white teff is the more expensive variety because of its distinctive flavour, which red teff somewhat lacks because of its significantly higher iron content. Red teff is sometimes mixed with other, less expensive grains to lower its costs, which is marketed as "mixed teff." Finally, increasing consumer demand for teff has led to the development of "super-white" teff, which has become the standard for Western markets. Upper- and middle-class households in Ethiopia generally buy white teff, while poorer rural households tend to consume red and mixed teff. Although the two varieties have historically been consumed in roughly equal proportions, Ethiopia's rapid growth over the past 20 years has led to a marked shift toward the production of white teff. The proportion of white and super-white teff has risen from around 50 per cent in 2000 to 64 per cent in 2006 and nearly 80 per cent in 2013 (Minten et al., 2013). Further, prior to the imposition of the export ban, foreign demand focused almost exclusively on white teff. Liberalization of the teff sector will likely lead to the phasing out of red teff, which may lower productivity somewhat but will likely lead to an overall increase in the sector's value.

*Key constraints on Teff production and exports*

Although Ethiopia could obtain a large global market share if its export ban is lifted, it faces two serious constraints to market consolidation. Firstly, Ethiopia's teff productivity is far below that of its few competitors. The primary factor inhibiting the sector's productivity is the lack of mechanization at any stage of production. Since no mechanized harvesting equipment has been developed specifically for teff grains (which are too small to be caught in the blades of wheat and barley harvesters), harvesting is largely done manually using sickles. As many as 50 laborers per day are required to harvest one hectare of teff, meaning that even small family farms must hire large groups of workers during harvest season. This hired labor accounts for much of teff's wholesale price, yet the use of custom harvesters could reduce the man-hours required to harvest a hectare of teff by as much as 80 per cent (Reda, 2015). However, harvesting inefficiency is only a part of Ethiopian teff's low productivity. Lossage, particularly during the threshing stage, is also significant. As teff is too small to be fed into most electric threshers, farmers are forced to lay down their harvests and use herds of livestock to crush the grains. Estimates of pre- and post-harvest lossage range between 8 per cent and 30 per cent, far higher than any other crop produced in Ethiopia (Lee, 2018). (*Teff* is derived from *teffa*, the Amharic word for "loss," suggesting that yield loss is a long-standing issue for the crop). To be competitive on the world market, both the labor cost and yield loss issues will likely have to be addressed.

Secondly, teff producers are somewhat ill-equipped to serve their most promising international markets. Although Ethiopia certainly has sufficient supply to meet current international demand, rapid scaling-up of exports may run into quality control issues, both on the regulatory level and as a competitor to other high-price, healthy grains. To supply large wholesalers and supermarket chains in the US and Europe, teff farmers must obtain a number of certifications, including HAACP. HAACP is generally regarded as the most exacting of the international quality standards. For many teff farmers, compliance with HACCP would likely require some restructuring of the production process, particularly the threshing step (CBI, 2019). Given the especially stringent nature of EU product safety regulations, exporters may do well to focus instead on other markets. Further, even if formal quality control barriers are overcome, some buyers may have concerns about the purity of Ethiopian teff. Quality control is a major issue for teff, which has been largely sheltered from the shift toward stringent standards across the past decade and may require extension support to ensure that requirements are met.

*Conclusion and recommendations*

Teff is a crop with enormous potential as a flagship export. As a gluten-free ancient grain with proven medical and health benefits, teff stands at the convergence of several rapidly expanding global markets. Ethiopia's effective genetic monopoly on teff ensures it the lion's share of world demand, and upon liberalization exports could skyrocket to become one of the country's best performers. However, the sector faces a number of challenges to expansion. Harvesting and processing is artisanal, owing to low levels of mechanization, and the resulting lack of efficiency and quality control threaten to make the grain uncompetitive with potential substitutes like amaranth and quinoa (Lee, 2018). The traditional nature of production also raises quality control concerns, as the crop has been protected from world standards for more than a decade. To support the expansion of teff into a high-performing export while maintaining its place as a staple of domestic consumption, the authors offer four recommendations.

- Liberalize teff exports. Ethiopia's government seems to be moving in this direction, creating a pilot export program in 2015 for a select group of farms. Given the political sensitivity of teff production and exports, this may be the most sensible path to liberalization. However, owing to the success of the pilot thus far and the rapid encroachment of foreign firms on the global teff market, the Ethiopian Ministry of Trade should remove all export restrictions on both processed and raw teff. Concerns about food security, while understandable, are likely overblown given that food-insecure households generally consume red teff, the price of which is unlikely to be greatly affected by liberalization given the affinity of foreign consumers for white teff (Fikadu et al., 2019). If political backlash against rising teff prices is a major concern, the Ministry of Trade could replace the export

ban with a duty on exports, raising revenue to invest in extension and equipment for teff farmers to increase yields and bolster domestic supply while discouraging over-exportation of the crop.

- Improve mechanization where appropriate. The lack of specialized equipment for teff harvesting and threshing has hamstrung the sector, and the government ban on exports has removed any incentive for foreign companies to help develop such equipment. In conjunction with liberalization, Ethiopia's Ministry of Agriculture should solicit grants from international actors such as the UN's Food and Agriculture Organization (FAO) or the US Department of Agriculture for research and development. Joint production ventures with foreign teff-producing firms could also prove beneficial in this regard, as several US firms have developed makeshift harvesters that can handle the tiny grains.<sup>33</sup> At this early stage of Ethiopia's export industry, investment in improved technical efficiency, as well as seed improvement and certification, will certainly pay off as the sector grows.
- Overhaul extension for teff. Agricultural extension services in Ethiopia generally have two central objectives: distribution of fertilizer and improved seed varieties. Unlike many crops in Ethiopia, however, fertilization rates are comparatively high (particularly in the country's central provinces), and the principal variety of improved teff, *quncho*, reached a respectable adoption rate of 32 per cent in 2013 (Minten et al., 2013). Although adoption of *quncho* should still be an objective of extension, the primary constraints for most teff producers are inefficient planting and harvesting technique and lack of access to mechanized equipment. Agricultural extension functions as a primary point of access to most industrial inputs, including harvesting and processing equipment, and the government should leverage its formidable extension capacity to help improve mechanization rates for the teff sector.
- Add teff to the Ethiopian Commodities Exchange (ECX). The ECX has proven its worth as a means of coordinating supply, instituting quality control, and eliminating middlemen from export supply chains for crops like coffee and sesame. Marketing of teff through the ECX would ease the transition of teff from a domestically consumed staple to a high-powered export crop and would act as a means to ensure that teff farmers retain their high cut (nearly 80 per cent) of present market prices for teff.
- Develop organic teff. There is a substantial overlap between the health-grain market and organic market, and organic certification could prove a strong asset to teff producers who can substitute toward natural fertilizers.

## Sesame

### *Sesame's promise as a nutraceutical*

The international demand for sesame was previously discussed in the Burkina Faso chapter and will not be repeated here except for some aspects which are specific to Ethiopia. Although, like Burkina Faso, Ethiopia is also situated within the global sesame market sharing a similar harvest season, the demand segment for Ethiopian sesame is somewhat different from that of Burkina Faso. Ethiopia's deepening economic ties with China have funnelled most of the country's sesame product to China.<sup>34</sup> Exports to China account for around 70 per cent of Ethiopia's sesame production, up from just 55 per cent in 2015 (OEC, 2017). The other significant avenue of demand for Ethiopia's sesame is Israel. From 1967 onward, the Palestinian *tahini* dish became quite popular in Israel. However, as a result of ongoing regional instability, the Palestinian supply of *tahini* quickly became unavailable, and Israel began turning to Ethiopia as a source for sesame to make *tahini* instead.<sup>35</sup> Ethiopia's high-quality *humera* sesame caught on quickly, and Israel quickly became Ethiopia's second largest importer of sesame, comprising nearly 13 per cent of total production. Following

<sup>33</sup> [https://www.swarthmore.edu/sites/default/files/assets/documents/user\\_profiles/sgolub1/Nutraceutical%20final.docx](https://www.swarthmore.edu/sites/default/files/assets/documents/user_profiles/sgolub1/Nutraceutical%20final.docx)

<sup>34</sup> <https://www.theguardian.com/global-development/poverty-matters/2013/jul/10/ethiopia-sesame-seed-trade-china>

<sup>35</sup> <https://www.worldcrunch.com/world-affairs/open-sesame-tahini-spreads-from-ethiopia-to-israel-and-beyond>

Ethiopian-derived *tahini*'s rise to popularity in Israel, Turkey began importing similar volumes of sesame, with China, Israel and Turkey together accounting for more than 90 per cent of Ethiopia's sesame exports.

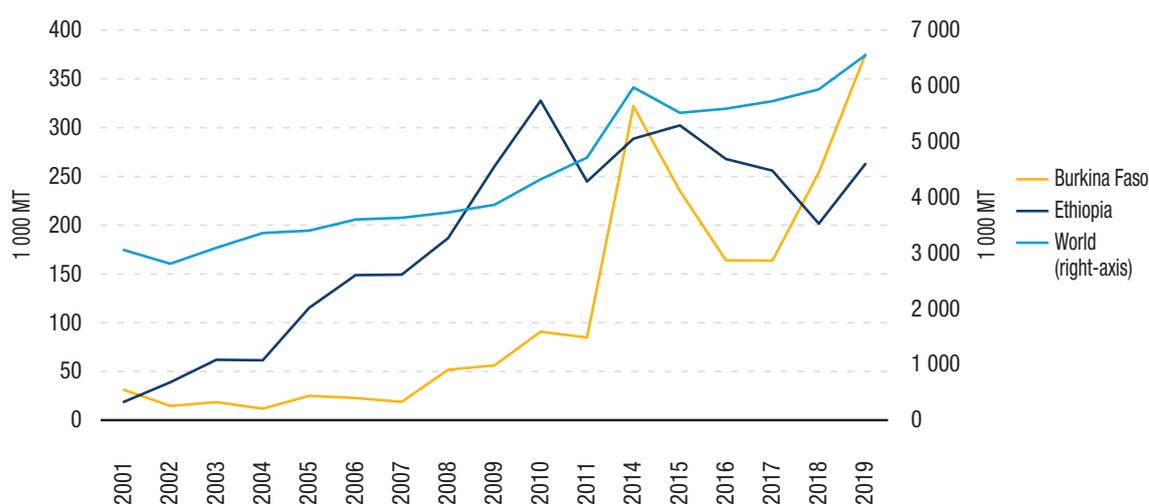
*Sesame production in Ethiopia*

Although sesame was introduced to Burkina Faso fairly recently, it has been an Ethiopian staple crop for centuries. Originating in the Ethiopian highlands, the sesame plant is one of the country's main export crops, accounting for 14 per cent of the country's export value. Sesame grown in Ethiopia has unusually high genetic diversity, stemming from the crop's long history in the region, and several varieties of sesame are found nowhere else in the world. One such seed, *Humera*, has become the gold standard for the sesame world market, especially the high-end confectionery market (Ayana, 2015). However, although Ethiopia produces and exports large quantities of sesame seeds, it is a net importer of sesame oil, and has little downstream processing of sesame in any form.

Three varieties of sesame seed dominate Ethiopia's exports. The first, *Humera*, is a large, sweet, white seed with fairly high oil content. *Humera* seeds dominate the confectionery and *tahini* markets, as the seeds tend to be pure and retain the nut's distinctive flavour. As the most versatile of the three seed types, *Humera* generally commands a slight but noticeable premium over world prices for sesame seeds. The second variety, *Gondar*, is found only in Ethiopia, and carries a similar seed profile to *Humera*, differentiated mainly by its golden hue and slightly higher yield. *Gondar* seeds are generally used for *tahini* and baked goods, at a slightly lower price-point than *Humera*. The final variety, *Wollega*, is smaller, more bitter, and has a higher oil content than *Humera* and *Gondar* sesame. *Wollega*'s comparative unsuitability for the bakery and *tahini* market render it a natural choice for oil processing, with nearly all *Wollega* sesame produced in Ethiopia exported to China for processing (Ayana, 2015). Since the quality of seeds intended for processing matters little, the price of *Wollega* seeds is noticeably lower than that of *Humera* and *Gondar*.

Ethiopia's sesame value chain does not follow the traditional pyramid structure, mostly because of the outsize role played by the Ethiopian Commodity Exchange (ECX) in pricing and distribution. Created in 2008, the ECX is the largest commodities exchange in Africa, with annual revenues of more than US\$1 billion.<sup>36</sup> The exchange functions as a marketing board for coffee, sesame, haricot beans, wheat, and maize, with spot prices pegged to global commodity prices for the respective goods. International buyers of sesame are required to buy through the ECX, meaning that the ECX effectively operates as a

Figure 5.11 Sesame production (World, Burkina Faso and Ethiopia)



Source: FAOSTAT.

<sup>36</sup> <https://www.ibm.com/case-studies/ethiopia-commodity-exchange>

marketing board with pricing tied to global commodity prices (Kedir, 2017). Farmers deliver their crops to warehouses spaced across the country, where the goods are assessed and subjected to quality control.

Although the ECX acts as a convenient mechanism for farmers to bring their produce to market, two distinct problems arise in the sesame sector. Firstly, the ECX has struggled with traceability since its inception, and the sheer genetic diversity of Ethiopia's sesame seedstock renders regional quality difference between seeds rather significant. Upscale importers are often unable to differentiate top-notch, pure *Humera* and *Wollega* seeds from lower-quality genetic mixes, leading to reduced sales and lowered prices due to buyer uncertainty (Abebe, 2016). Though few empirical studies have been conducted, an element of adverse selection may also be at play – larger cooperatives with high-quality seed-stocks and the ability to negotiate directly with foreign importers would have a price incentive to sell their highest-quality seeds to importers and dump lower-quality seeds onto the exchange, diluting the overall stock and heightening ECX buyers' quality concerns (Zerihun, 2012). To address these concerns, the ECX's board of directors should investigate implementing an electronic tagging system for sesame, similar to the IBM platform rolled out in 2015 to provide traceability for coffee traded through the ECX. Secondly, the ECX's monopsony on smallholder and small cooperative production inhibits the development of multinational initiatives into the country.

Like Burkina Faso, Ethiopia undertakes little processing of its sesame. In part because of China's lock on the majority of Ethiopian exports, and in part because returns to any processing of sesame beyond hulling are fairly low, the country has undertaken little investment in the development of processing facilities. Such capacity as does exist is provided mainly through public-private partnerships, such as that with Selet Hulling PLC. A subsidiary of a Dutch organic trader, Selet Hulling operates one dry-hulling factory outside the city of *Humera*, which it uses to process the crops from a nearby 300-hectare company farm. Despite operating only one factory, Selet is a major player in Ethiopian sesame processing. China undertakes the processing of the vast majority of the country's *Wollega* seed, as industrial oil processing is beyond the technical capacity of the Ethiopian manufacturing sector at present (Abebe, 2016). Were Ethiopia to expand into large-scale sesame processing, de-hulling of *Humera* seeds bound for Turkey, Jordan and Greece would likely make the most sense. However, these sales together constitute only a small portion of Ethiopia's overall sesame exports (less than 3 per cent), so the impact of downstream expansion into de-hulling may not be justified by the costs (UNCTAD, 2018b).

### *Constraints on Sesame production and exports*

Several structural factors remain that hamper export growth. First and foremost, foreign buyers seeking to ensure a pure, high-quality supply encounter mixed and ill-documented sesame as a result of the ECX's opaque sourcing process. Producers in outlying regions such as *Humera* cannot easily access warehouses and major marketplaces, forcing them to rely on village traders and wholesalers and decreasing the efficiency of the supply chain. Sesame lacks the institutional support given to major sectors like coffee and sorghum, resulting in suboptimal planting techniques for many smallholders and constrained access to quality seeds and fertilizer (Abadi, 2018).

### *Conclusion and recommendations*

Ethiopia's sesame sector has, on the whole, been a model performer. Buoyed by strong global demand and close relationships with trading partners, particularly China, it has grown into one of the country's strongest performing sectors. Barring unexpected climate or demand shocks, Ethiopia's sesame exports have great potential to expand. With these challenges in mind, the authors offer three recommendations to capitalize on the full potential of the sesame sector:

- Improve marketing efficiency in districts with weaker ties to the ECX by expanding the warehouse network and perhaps implementing an extension program targeting areas with lower levels of direct sales by producers to the ECX. The northern region, especially, would benefit from the construction of several additional warehouses, and a dedicated extension service for underserved areas piloted by the Ministry of Agriculture (as has been tested with coffee production) could pay dividends in improving smallholder yields.

- Prioritize traceability within the ECX by implementing a version of the electronic tracking system used in the coffee sector. Large foreign buyers are increasingly relying on high-quality and ethical sourcing to augment their brands, and the complete lack of traceability in the sesame sector impedes the efforts of ethical sourcing multinationals to expand into the Ethiopian market. Improving traceability may boost sales and could also eliminate adverse selection stemming from the large cooperatives that can deal directly with foreign buyers. Further, using such tracking information to implement a separation system to strictly sort seeds by variety and prevent intermingling could have beneficial effects on prices and sales.
- Maintain the current focus on road development in outlying areas. Although significant progress has been made over the past decade, provinces outside the central highlands and politically powerful Tigray region still face significant transport costs, stemming in part from insufficiently developed rural transportation infrastructure. Maintenance of roads to major production regions, such as *Humera*, carries a significant return on investment, and should be prioritized as a matter of national spending.

## 5.3 The Latin American Region

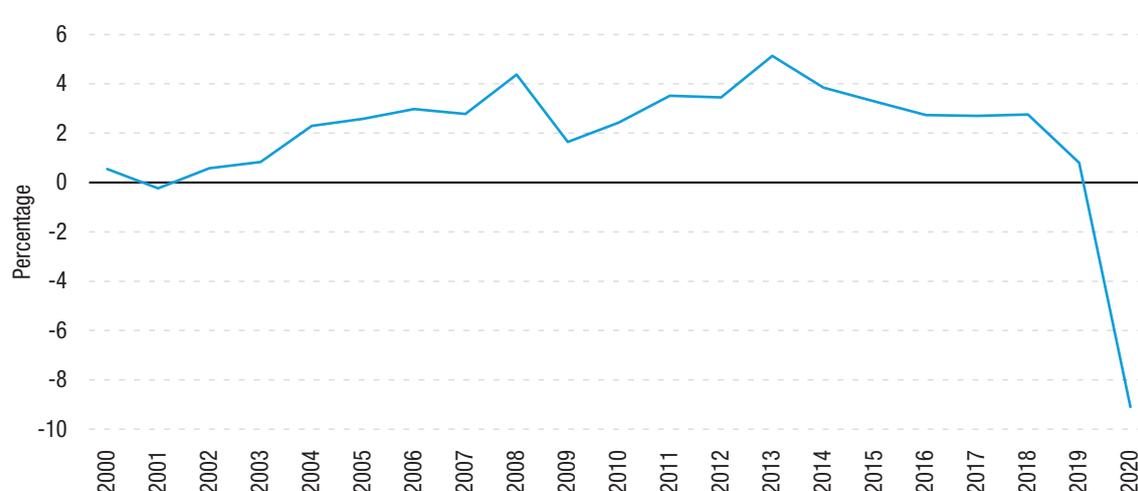
### 5.3.1 Bolivia

#### Overview of the export structure and constraints to diversification

Bolivia is a landlocked country located in South America between Peru, Brazil, Paraguay, Chile, and Argentina. The country is split into three major geographic regions: the western and mountainous Andean Region, the temperate sub-Andean region, and the Llanos region, which is covered by the Amazon rainforest. The Llanos region receives significant rainfall and has a tropical climate. The Andean region is a polar-desert that experiences high solar radiation due to its high altitude. The Andean region is also home to 20 per cent of the world’s tropical glaciers. The population of Bolivia is around 11 million people. The official language is Spanish, but Bolivia boasts having 36 indigenous languages with official status. The economy of Bolivia relies heavily on extractive industries, mainly natural gas and minerals. Between 2013 and 2017, Hydrocarbons represented 43 per cent of public sector revenues (Beverinotti, 2018).

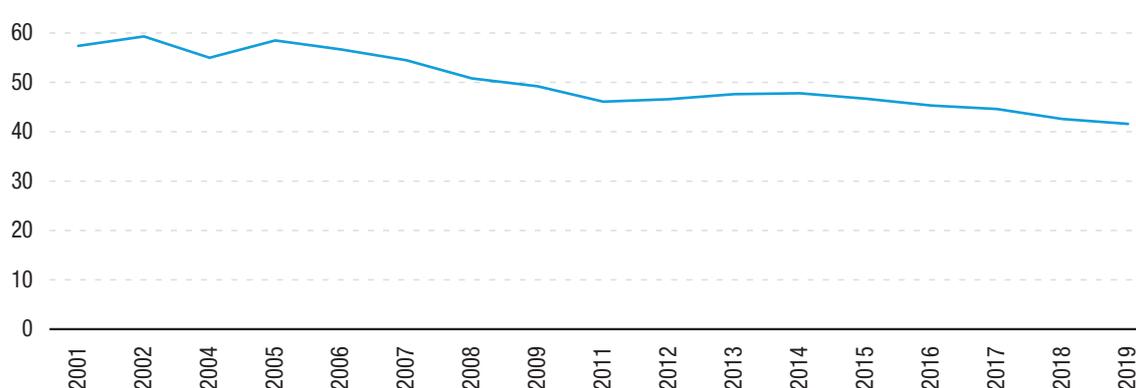
The country has seen strong economic growth: GDP per capita grew on average 3.25 per cent between 2006 and 2017 (Figure 5.12). The country’s Gini coefficient has dropped from 58.5 in 2005 to 44 in 2017 (Figure 5.13). Bolivia’s impressive growth and increased social spending has been reliant on high commodity prices, and future downturns in commodity prices threaten to reverse these gains.

Figure 5.12 Bolivia’s GDP per capita annual growth rate (2000–2020)



Source: World Bank, *World Development Indicators*.

Figure 5.13 Bolivia Gini coefficient (2001–2019)



Source: World Bank, *World Development Indicators* (no data for 2003 and 2010).

The last five years have seen a collapse of global commodity prices, which has sharply lowered Bolivia's exports and government revenues. Fortunately, Bolivia built up strong buffers of foreign currencies and savings during the boom, which enabled the government to run counter-cyclical policy to dampen the effect on the economy. As a result, inflation remained at 2.7 per cent in 2017 and GDP growth was 4.2 per cent in 2017 (Beverinotti, 2018). However, reserves dropped from 40 per cent of GDP in 2014 to 22 per cent in 2017 (Figure 5.14). Furthermore, external debt has risen from about US\$5 billion in 2005 to over US\$9 billion in 2017. Although external debt was a moderate 25.3 per cent of GDP in 2017, public debt is rising fast, estimated by the IMF at 53 per cent of GDP at the end of 2018. The primary fiscal deficit ballooned to 6.5 per cent of GDP in 2017, far above the IMF's estimate of the sustainable primary deficit of 2.5 per cent of GDP (IMF, 2018).

Bolivia has also maintained a fixed exchange rate of around 6.90 Bolivianos to the dollar. So far, this exchange rate has been supported by Bolivia's foreign currency reserves. However, this exchange rate could collapse if the foreign currency reserves continue to drop. If the Boliviano were to depreciate sharply, Bolivia would face difficulties in servicing foreign debt.

Fortunately, commodity prices have started to recover. This should help alleviate pressures on the balance of payments and fiscal balance. In the longer term, it is imperative to reduce dependence on mining to reduce volatility of revenues. Exports of agricultural products, including nutraceuticals can play an important part in this diversification effort.

In 2018, 75 per cent of Bolivian exports were mineral and metal products). As of 2018, out of a total US\$9 billion exports, mineral fuels accounted for US\$3.1 billion, ore and ore products for US\$2.3 billion, and precious metals for US\$1.4 billion. Most of their remaining exports (16.7 per cent) were animal and food products. Their two major export partners are the neighbouring countries of Brazil (21.2 per cent) and Argentina (16 per cent). In total, South America received 45.5 per cent of Bolivian exports. While China has been a major source of imports and direct investment (US\$2.8 billion of imports in 2018), Bolivia only exports US\$460 million of goods (4.5 per cent of exports) to China.

Boosting export diversification to reduce dependence on primary products requires a conducive business climate. In this regard, Bolivia faces challenges. The country still has infrastructure issues to address. In the context of agriculture, electrification and irrigation are of great importance. Furthermore, overall productivity per capita of the country has not been increasing. These are all issues that the country is currently addressing through efforts to ensure that all citizens have access to essential public goods.

Bolivia will also need to focus on developing government agencies and programs to support the exportation of agricultural goods. In addition, the government needs to focus on maintaining strong and amiable relationships with different stakeholders in Bolivian society. Finally, Bolivia is facing a tough macroeconomic environment at the moment due to weak commodity prices.

Figure 5.14 Bolivia's stock of international reserves (2000–2019)



Source: International Monetary Fund.

As the middle-income country (MICs), in 2018, Bolivia's performance on the UNCTAD Productive Capacities Index (29.08) is far better than the average score of LLDCs (26.11), although lower than the average for other developing countries (32.63), Bolivia particularly performed well as compared to its peers on energy and structural change but its scores on ICT, transport, institutions and human capital categories requires continued efforts to catch-up. Regarding private sector categories, although the country has improved a lot given its state-centric ownership of means and instruments of production, the role of the sector in export diversification is low and has a long way to go.

The bureaucratic obstacles for creating a business in Bolivia impose both large temporal and financial costs. The creation of a business takes 43.5 days in Bolivia, compared to 28.5 days for Latin American countries, and 9.3 days for OECD high income countries. Furthermore, the procedural costs for creating a business total to 46 per cent of per capital yearly income in Bolivia. For an OECD high income country, the cost is 3.1 per cent, and for Latin American and Caribbean countries the cost is 37.8 per cent (World Bank, 2019f). These high costs are especially restrictive for indigenous and peasant populations, one of the demographics most involved in agricultural development.

94 per cent of businesses are microbusinesses, and of those microbusinesses, 90 per cent are informal. These smaller businesses have only 30 per cent of the productivity of large enterprises (Inter-America Development Bank, 2016). Simplifying business creation and creating programs to support entrepreneurship would allow the expansion of the formal economy and a rise of productivity.

**Infrastructure:** One of the major impediments to growing exports in Bolivia is poor infrastructure. In 2018, Bolivia ranked 114<sup>th</sup> out of 140 on the quality of their roads (Global Competitive Report). In addition, rural electrification has not yet been completed and as of 2014, only 62 per cent of rural Bolivia had access to electricity. The weak infrastructure hinders the movement of goods across the country as well as the ability to produce. Fortunately, Bolivia has made strides in improving their infrastructure in recent years (Plurinational State of Bolivia, 2015).

The electrical grid of Bolivia has made great progress over the last 15 years. Rural electrification rates have risen from 46.6 per cent in 2006 to 79.1 per cent in 2016 (*World Development Indicators*). In addition, overall access to electricity has reached 93 per cent of the population (*World Development Indicators*). Electricity is a vital public good for efforts to support the development and modernization of agricultural industries.

Irrigation, waste treatment, and water are other systems in need of further improvement. In 2015, only 46 per cent of citizens had access to adequate sanitation, and 12 per cent still lacked access to safe drinking water (WHO, 2015). Furthermore, as of 2016, less than 10 per cent of agricultural land was irrigated, while 41 per cent of the country suffered from water deficits.<sup>37</sup>

Irrigation is a major contributor to agricultural productivity. The government has begun to prioritize the development of irrigation systems and started to invest in irrigation projects. The initial returns from irrigation projects have been quite promising. A 2016–2017 IDB loan supporting irrigation development resulted in household income increases of 35 to 45 per cent. The loan also increased the value of agricultural production on targeted farms by 70 per cent (Salazar, 2017).

Climate change makes the need for more robust water systems urgent. During the dry season, over 2 million Bolivians rely on glacier melt for potable water. The glaciers have shrunk over 43 per cent since 1986 due to global warming, and the trend is likely to continue.<sup>38</sup> Furthermore, many farmers in the Altiplano region have already experienced climate change-induced droughts and erratic rains that impede agriculture.<sup>39</sup> While irrigation systems will not prevent all the threats of climate change, taking action now will help mitigate the risk.

**Export restrictions:** Trade facilitation costs are low relative to the region (WTO, 2019b). However, the Bolivian government has a policy of “food sovereignty,” which ensures that the Bolivian people have a secure source of food that they regulate. This is enforced through export controls (WTO, 2015). Certain protected goods also need to get a domestic supply and fair price certificate (CAIPJ) prior to exportation to ensure that the country has surplus to export. In addition, certain food stuffs, such as sugar require licenses to export (Garcia-Lembergman, 2017).

As the Bolivian government focuses on diversifying exports, the role of export restrictions should be reconsidered. There has been new research that suggests that quantitative restrictions on exports can reduce domestic production, which results in decreased food availability to domestic consumers (Garcia-Lembergman, 2017). The Bolivian government should critically reexamine the long-term strategic value of export restrictions.

### Overall assessment and implications for nutraceutical exports

Bolivia aims to achieve “food sovereignty,” which was defined by La Via Campesina in 1996 as “the right of nations and peoples to control their own food systems, including their own markets, production modes, food cultures, and environments” (Kerssen, 2015). As a result, any effort to increase exports through agricultural products will have to engage and cooperate with the local peasants and indigenous communities in Bolivia. Such a focus is consistent with rising demand in developed countries for products from indigenous farmers, such as quinoa. However, the challenges of maintaining food sovereignty and “buen vivir” were demonstrated during the quinoa boom during the early 2010s. During the boom, many former residents of peasant villages returned to their old communities to farm quinoa. This influx of people into villages strained both land distribution and local resources (Inter-America Development Bank, 2016). The solution to this problem must take many stakeholders into consideration. Large plantations are likely difficult to establish without severe social disruptions. A less disruptive path to agricultural export growth is through co-op models at the local community level. This solution will be explained in more detail in the product case studies.

Land ownership is another constraint to agricultural diversification. 32 per cent of the land, which is 35 million hectares, has yet to be titled (IDB Country). One consequence of lacking land titles is illegal use of land by corporate entities in the forested and rural areas of Bolivia. This illegal land usage strains

<sup>37</sup> <https://www.thesourcemagazine.org/bolivia-boost-farm-productivity-irrigation-improvements/>

<sup>38</sup> <https://www.climatechangenews.com/2016/10/24/rapid-glacier-melt-threatens-bolivia-water-supplies-safety>

<sup>39</sup> <https://www.bbc.com/news/business-44398472>

relations between the government and local communities. Finishing the deeding of land should be a priority of the government.

Furthermore, large swaths of land in Bolivia are held under Communal Lands of Origin titles (TCOs). These titles deed the land to indigenous communities and state that the lands will be managed according to long standing practices of stewardship and use in the particular indigenous community that holds the individual TCO (Larson, 2015). TCOs further accentuate the fact that agricultural development must engage with local communities that are compatible with TCOs.

Bolivia lacks export promotion agencies. For example, Azerbaijan has an agency called AZPROMO dedicated to developing and assisting the “Made in Azerbaijan” brand. AZPROMO assists Azerbaijani companies in the development of foreign trade relations. In the agricultural field, Bolivia is currently reliant on the research and development of foreign NGOs. A priority should be the development of domestic research capabilities in agriculture. PROINPA is one of the few Bolivian support organizations for agriculture, and they utilize several laboratories for testing. The Bolivian government should support the further development of PROINPA.

One of Bolivia’s competitive advantages in the health foods and nutraceuticals sector is its primarily organic and biodiversity-protection-based agriculture. This is especially important, since the use of sustainable production methods by source countries is a determinant of demand by developed country consumers (Ditlevsen, 2019). The success of quinoa, discussed in the next section, is the leading example. Bolivia should continue to focus on developing their agricultural exports within the framework of organic, biodiverse, and sustainable production. Focus on sustainability is all the more important given that some recent research suggests that, due to its reliance on water from tropical glaciers, Bolivia will be one of the countries most rapidly affected by climate change.

### **Selected products with export potential as nutraceuticals**

#### **Quinoa**

##### *Quinoa’s promise as a nutraceutical*

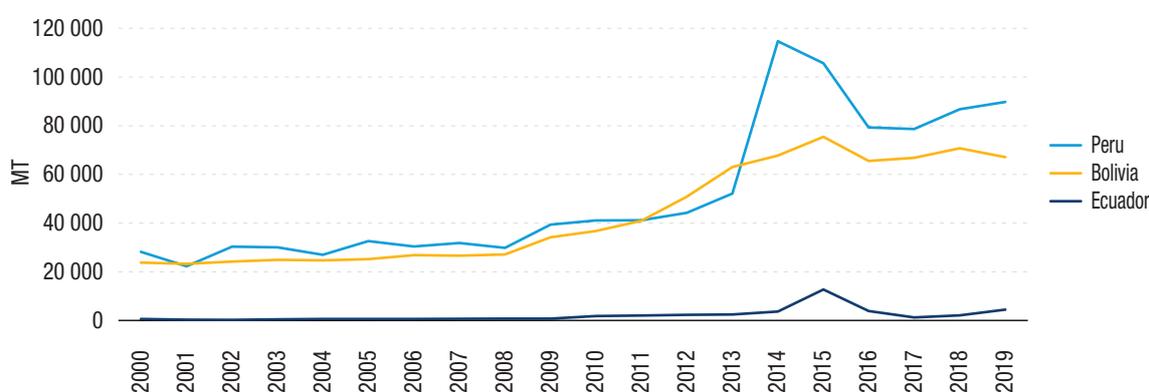
Quinoa is a crop native to the Andes mountains, grown on the hillsides of the highlands and well adapted to the harsh weather conditions of the Andes (Bazile, 2015). Despite very little modern research on quinoa, the indigenous knowledge passed on by farmers in Bolivia has contributed to the longstanding successful cultivation of quinoa (Padulosi, 2014). Quinoa is a crop with a value chain that allows a large portion of the profits to accrue to the farmers, and the crop has contributed importantly to poverty reduction in Bolivian rural areas (Bazile, 2014).

Quinoa was a staple food for the Bolivian indigenous population. Rural farming communities still heavily rely on it today, with many families consume it paired with several meals per day. Following the Spanish conquest, quinoa was stigmatized in urban areas. In recent years, however, urban attitudes have become more favourable towards indigenous cultures and have seen a reversal of the stigma against quinoa, which is noticeable in the rising consumption levels of quinoa in such areas.

In recent decades, Bolivian cooperatives, NGOs, and the Bolivian government have worked to develop and promote quinoa production. These efforts were bolstered by the United Nations declaration of the International Year of Quinoa in 2013. This declaration contributed to a massive boom for quinoa. While prices have dropped from their peak, demand and overall profits from quinoa remain higher than prior to 2013. Demand is rising rapidly in developed countries, as quinoa has developed a reputation as a superfood. In addition to being a nutritious grain, quinoa is a complete protein. This means that it provides all 17 amino acids that humans require. In addition to its general health benefits, quinoa is a gluten free product, which is a dietary trend especially popular in developed countries. Bolivia’s quinoa is also organic and GMO-free. These qualifications will further help Bolivian quinoa penetrate the health food market.

During the 2013 boom, some were concerned that high quinoa prices would prevent indigenous farmers from including quinoa in their own diets. While it is true that the quinoa boom has reduced quinoa consumption among farmers, it has contributed to considerable rises in farmers’ income. This increase

Figure 5.15 Quinoa production of Bolivia, Peru and Ecuador (2000–2019)



Source: FAOSTAT.

has enabled farmers to send their children to school, to transition from solely subsistence farming, and to buy more fruits, vegetables, and meats from markets (Bazile, 2015).

The quinoa market has cooled somewhat since the 2013 boom, but long-term prospects remain favorable. Due to a supply glut in 2017, world prices fell. One kilogram of quinoa went from US\$6.74 in 2014 to US\$1.66 in 2017. Since then, prices have begun to recover, with one kilogram going for US\$2.32 in 2018. Furthermore, quinoa has now established itself as an alternative to wheat and other grains in developed countries, and demand for quinoa should further increase over time.

Currently, the two largest quinoa producers in the world market are Bolivia and Peru. Since the quinoa boom of 2013, over 40 other countries around the globe have sought to enter the quinoa market. However, countries outside of the Andes have been stymied by lack of knowledge and experience growing quinoa. As a result, in 2017 Bolivia produce 66,700 MT, Peru produced 78,700 MT, and Ecuador produced 1,300 MT. All other countries produced negligible amounts.

Peru has embraced a style of production focused on bulk, using synthetic fertilizers and cultivating quinoa across the country. Peru produces two harvests a year at times, while Bolivians engage in one harvest of quinoa a year. In contrast, Bolivia has focused on maintaining a high-quality product using organic and traditional methods.<sup>40</sup> While Bolivia's quinoa output has fallen below Peru's (Figure 5.15), Bolivia can obtain a higher price based on its organic and non-GMO status. The country has attempted to distinguish its product through the Royal Quinoa and Quinoa Real brands.

#### *Quinoa production in Bolivia*

Bolivian quinoa cultivation has been rising for the last 30 years, accelerating with the 2013 quinoa boom. However, yields have been dropping recently due to soil degradation and over-farming. Most of the quinoa production and distribution is organized through cooperatives. Cooperatives provide a mechanism for disseminating standards and managing land usage within local communities. Cooperatives also facilitate access to the global market with fewer outside intermediaries. Cooperatives can sell to multinationals under an organic label, which is much harder for individual farmers to do (Tschopp, 2018). However, cooperatives have been strained by the pressures to raise output following the quinoa boom.

Since global demand exploded, production of quinoa has been rising. Farmers have devoted more land to the cultivation of quinoa in the Altiplano region. The country has avoided using GMOs or synthetic fertilizers, but this has inevitably resulted in failure to raise yields (Figure 5.16). Furthermore, the push to shift land use to quinoa production has created social tensions. Land that was previously used for

<sup>40</sup> <https://www.aljazeera.com/indepth/inpictures/2017/08/quinoa-harvesting-bolivia-superfood-170809095217225.html>

Figure 5.16 Quinoa land yield in Bolivia (Hectograms per acre)



Source: FAOSTAT.

communal llama grazing has transformed into private quinoa patches. Furthermore, sustainable farming practices have been abandoned, leaving soil degraded from overuse. Some producers have reduced fallow times by claiming more communal land and reducing vegetation borders around land.

Mechanization has also begun to affect quinoa production. Through the mid 2000s, most quinoa production was done by hand with the help of some rudimentary tools. In the late 2000s and early 2010s, Bolivian workshops and focus groups developed some prototype machines to help with the production of quinoa. One threshing prototype managed to reduce the time for threshing from 6 hours to fifteen minutes.

Due to the quality control and organization provided by cooperatives and the focus on organic and non-GMO production, Bolivian quinoa can demand a premium for its quality. A major processor and exporter of high-quality Bolivian quinoa is Andean Naturals. Andean Naturals is a United States based company with headquarters in Yuba City, California and a major quinoa processing plant in Bolivia. The company's dedication to the Bolivian community lies with its founder and Chief Executive Officer Sergio Nunez de Arco, who is Bolivian born. Andean Naturals facilitates the diffusion of skills to Bolivians and fosters high-quality quinoa. Their product is then exported, mainly to the United States.

Andean Naturals is also proving that there are areas for further development in quinoa products. Andean Naturals is developing a protein powder created from processed quinoa. Other potential opportunities for quinoa are also in the works. Quinoa is being used as an ingredient in cereals, granola bars, and other health foods. The development of quinoa as a substitute for wheat across food manufacturing should increase the demand for quinoa in the long run.

#### ***Key constraints to Quinoa production and exports***

**Land Management:** Local communities must figure out how to allocate collective lands for quinoa farming without breaking down the integrity of local communities and land management practices. The Altiplano region, where most of the quinoa production currently is undergoing a process that has been dubbed "repeastization." In many of the areas of quinoa production, land is managed using indigenous methods. These methods normally split a collective set of communal land into two categories. One category is communal grazing area for llamas, and the other is private plots controlled by individual farmers. Increasingly, urban residents return to their family villages to turn communal land into quinoa production while also maintaining their livelihoods in the city. While this can boost production, these part-time farmers may not be invested in the local community management. They also contribute to overuse of the communal lands designated for private quinoa production.

There are two forms of local-level land management in the Andean highlands: village and cooperative. There are also the cooperatives for quinoa production that set rules for how the quinoa is produced.

However, neither prove adequate to address recent difficulties. Many quinoa farmers have reported that the level of conflict over land has surged since the quinoa boom.

**Soil degradation:** Quinoa producing areas are facing serious land degradation issues due to overuse following the boom. Altiplano soil is a relatively fragile system to begin with. Previously, local populations maintained soil fertility by leaving fields fallow and using llama manure as bio-fertilizer (Bazile, 2015). However, the reduced availability of land for grazing animals has resulted in the reduction of llama farming, and therefore, the production of llama manure. Furthermore, farmers are reducing the time land is left fallow, as they are eager to produce more quinoa for the market. However, this impatience will only result in further declining yields. In 2013 alone, yields fell from 0.64 TM/Ha in 2000 to 0.47 TM/Ha (Bazile, 2015).

**Mechanization and modernization:** Bolivian farming has historically been handicapped by low productivity. While representing 30 per cent of employment, the agricultural sector only produced 13 per cent of the country's GDP (World Bank, 2017b). The modernization and mechanization of farms would help increase yields and hopefully reduce the effect of climate change on quinoa production.

Mechanization can increase productivity. NGOs have helped Bolivian farmers develop machines that have greatly reduced labor requirements. For example, one NGO helped develop a threshing machine that reduced what used to be 6 hours of labor to 15 minutes (Bioversity International, 2015).

However, mechanization and modernization, if done poorly, can also be harmful. For example, the rapid implementation of tractors has contributed to soil degradation. Also, tractors enable large-scale farming but could increase unemployment (Bazile, 2015).

Furthermore, mechanization should not undermine the organic status of Bolivian quinoa. Bolivian quinoa is seen as the gold standard on the global market at present, and as a result, Bolivian farmers can demand a price premium. It is imperative that Bolivia's reputation as a source of sustainable and quality-conscious production be maintained and upgraded.

### *Conclusion and recommendations*

Quinoa has helped establish Bolivian agricultural products as synonymous with organic and high quality. There is room to expand quinoa exportation; however, Bolivia needs to ensure farmers continue to grow the crop in a sustainable manner and maintain the stability of their producing communities. Mechanization and modernization remain a key focus point as well. The Bolivian government should invest in development and cooperate with cooperatives and companies in this area. In the future, Bolivia should also look to use the expertise of Andean Naturals and Andean Valley to develop food manufacturing industry in Bolivia.

Overall, the country already has a strong quinoa industry. However, the country has by no means reached its full potential. The country should focus on increasing yields and processing output, while also developing in a manner that will ensure larger scale farming is sustainable and continues to return profits to the farming communities. In addition, the country has long term potential to grow domestic food processing through cooperation with Andean Naturals.

- Yield rates have begun to recover in the past few years, as cooperatives and quinoa processing companies have taken steps to address soil degradation. Bolivia should work to support the efforts of cooperatives and companies to develop more sustainable farming practices. The country's National Institute for Innovation in Agriculture and Forestry will be vital for this process. The institute has already begun to support agricultural development, and Bolivia should prioritize the development of this institute (World Bank, 2017b). Further steps can also focus on moving away from quinoa monoculture. The adoption of intercropping and the development of other cash crops in the Altiplano area is a necessary step. In addition, the long-term role of llama manure should be examined. While it is the traditional way of fertilizing the soil, if the farming communities do not continue to raise llamas, alternative organic and sustainable fertilizers should be explored.

- Communities should focus on rebuilding the robustness of their community management strategies surrounding land usage. Cooperatives are one of the most trusted institutions in the area (Tschopp, 2018). Hence, cooperatives should focus on developing local rules that will help maintain proper ratios of land usage between grazing and quinoa production.
- Furthermore, communities should ensure that “repeastization” occurs in a manner that does not undermine the fabric of the community. While people returning to villages should be allowed to farm there as well as maintain their urban ties, steps should be taken to ensure that the returners are also invested in the success of the village community at large.
- The Bolivian government should support the work of NGOs, companies, and cooperatives to create machines that will assist the farmers in the production of quinoa. Furthermore, the Bolivian government should support educational programs that will train farmers to use these tools in effective and sustainable manners.
- The government should also focus on the development of irrigation systems for the Altiplano highlands. Climate change has already generated harmful droughts in 2016–2017, and the glaciers, the traditional source of potable water, are rapidly disappearing. Hence, the development of irrigation will be vital to mitigating the risk climate change-induced droughts will pose to the quinoa crops.

### Amaranth

#### *Amaranth's promise as a nutraceutical*

Amaranth is an ancient grain that was a staple of Meso-American diets for thousands of years. It is a pseudo-grain that is known for being highly nutritious and beneficial to health. Like quinoa, amaranth is considered a complete protein due to the fact that it contains all 17 amino acids. Furthermore, the leaves of the crop are also consumed as a leafy vegetable. The pseudo grain still holds a marginal market share in the global market. However, it is starting to gain traction in Mexican cuisine and among health-conscious consumers around the world. With a marketing campaign similar to the quinoa marketing of the early 2010s, amaranth could be positioned as a prominent alternative to traditional grains.

Amaranth has the potential to develop into a gluten-free alternative to wheat flour in Europe and North America. Amaranth products are also seen as strong sources of protein, iron, and vitamin B6. These key ingredients will continue to support its entry as a health food. In addition, amaranth is seen as having anti-cancer and anti-aging properties; it is also considered an anti-inflammatory food. Buyers either market the seeds to consumers directly, process it into flour, add it into health foods, or process it into amaranth oil.

Amaranth is considered a Neglected or Under-Utilized Species (NUS). NUS crops have been identified as potentially beneficial crops that could be used to enrich the global food system (Padulosi, 2014, 2015). Bioversity International is one of the many non-profits that has worked on promoting NUS crops such as amaranth. Given the interest of NGOs to develop NUS crops, the Bolivian government should reach out to organizations such as Bioversity International for support in developing their amaranth production and processing infrastructure.

#### *Amaranth production in Bolivia*

Amaranth is a traditional crop of Bolivia grown for subsistence farming. There have been some steps taken to help Bolivian farmers access the amaranth global value chain as well as efforts to develop domestic demand in Bolivia by NGOs.<sup>41</sup> Bolivia has significant potential to scale up amaranth production. Their farmers have experience and knowledge with the crop, even though it is currently limited to small-scale production. Furthermore, amaranth is a hardy crop that can thrive in marginal lands.

<sup>41</sup> <https://www.auri.org/2003/07/amaranth/>

### *Key constraints on Amaranth production and exports*

**Lack of market demand:** The biggest obstacle to increasing exports of amaranth is the limited global demand. If Bolivia was to raise production for export, they would risk driving down prices with a supply glut. Amaranth does have a strong reputation among the intelligentsia of the global food system but is not widely known beyond that.

**Research and development:** Due to its historically fringe place in food systems, amaranth needs more research and development in order to make a mark in the modern world. First and foremost, amaranth needs a variety that is appealing to the global market in both flavor and appearance. Furthermore, research needs to be conducted on the implementation of amaranth in Bolivia in particular. The challenges that Bolivian farmers will face will not necessarily be the same as the challenges faced by the research conducted for US farmers.

**Sustainable development:** As previously mentioned, the development of quinoa production has strained the soils of the Altiplano region. Hence, the development of amaranth farming will have to ensure that the use of amaranth will not further strain the fertility of the region. In addition, amaranth harvesting requires further mechanization to be effectively farmed in Bolivia. Bolivian farmers will soon be finding themselves in competition with developed Western economies for the market of their Andean crops.

**Entering the value chain:** One of the benefits of quinoa is that the Bolivian farmers claim a large share of the profits derived from quinoa sales. A priority for amaranth development should be to focus on claiming a large segment of the income from amaranth for the Bolivian people. Unlike quinoa, amaranth shows a lot of potential to be processed into several types of products. These products include, but are not limited to, seeds (to be cooked in a similar fashion to quinoa), amaranth flour, amaranth and wheat flour mixes, an additive to cereals and other processed foods (including energy bars), and amaranth oil (Paludosí, 2014, 2015; Orona-Tamayo, 2016). Effectively, anywhere that flour is used, amaranth is a potential substitute.

### *Conclusion and recommendations*

While amaranth currently is a marginal crop on the global market, it has potential to grow its market share as quinoa did. The strategy for doing so should focus on the health benefits of the crop alongside the ways in which amaranth will strengthen the global supply chain.

In terms of scaling up amaranth production, the stakeholders of Bolivian agriculture have displayed strong competence in their efforts to popularize quinoa around the world. Bolivian agriculture and value chains have been steadily improving due to the work and cooperation of farmers, coops, NGOs, private companies, and the Bolivian government. There is no reason to think these stakeholders will not be capable of undertaking the necessary work and innovation to successfully farm amaranth at a large scale in Bolivia.

Quinoa is the first success story for an “ancient grain” from Latin America. Through intelligent brand development, Bolivia and Peru in cooperation with farmers and other stakeholders were able to bring quinoa to the global market. The results of those efforts were strong rises in income for farmers in some of the most rural and impoverished areas of Bolivia. The path to success for amaranth should follow the model that quinoa established.

When reaching out to NGOs and global institutions such as the World Bank and the Inter-American Development Bank, the Bolivian government should stress the degree to which amaranth could bring greater security to the global food system. It has been the focus of several reports, which have noted its ability to thrive in challenging geographical conditions (Joshi, 2018; Padulosi, 2015).

Amaranth offers market opportunities beyond developed countries, as the crop lends itself to emerging markets as well. Many Latin American countries are having a revival in their cuisine with a growing focus on their indigenous foods. For example, amaranth is becoming a prominent ingredient in a new wave of

Mexican cuisine.<sup>42</sup> Furthermore, amaranth has a reputation in China and other Asian countries that Bolivia can leverage to boost exports.

The 2013 “International Year of Quinoa” is what catapulted quinoa to the global spotlight. Creating a similar event with amaranth should be the target of the Bolivian government. It is important to note that the key points mentioned in that UN Declaration was that quinoa offered a way to bring food security to populations around the world in the face of climate change.<sup>43</sup> Furthermore, the UN made the declaration “in recognition of ancestral practices of the Andean people, who have managed to preserve quinoa in its natural state as food for present and future generations, through ancestral practices of living in harmony with nature”.<sup>44</sup> While achieving a similar PR event for amaranth will be difficult, Bolivia can definitely offer the same arguments for amaranth that were vital for the UN support for quinoa.

Several organizations have already demonstrated interest in supporting the development of Bolivian amaranth production. These organizations include the IDB and Bioversity International. The Bolivian government should continue to promote work with these organizations, as the work from these organizations has been incredibly helpful in the past.

PROINPA has supported the development of Community Seed Banks (CSBs) in Bolivia for crops such as quinoa, canahua, and potatoes (Camida-Fuentes, 2017). These seed banks have shown incredible potential and should be expanded to include amaranth. CSBs tend to support biodiversity and shun monoculture; they also tend to place more power over food systems in the hands of the indigenous and local farmers (Camida-Fuentes, 2017). That tendency aligns with Bolivia’s desire to support inclusive development. The expansion of CSBs will also address one of the key concerns about the R/D of amaranth, which is the lack of infrastructure and seed collections for crop development (Paludosi, 2014).

- In line with previous recommendations, a priority for Bolivia should be the continued development of cooperation with NGOs, global institutions, corporations, and farmers. Some of the key organizations for the successful development of quinoa are PROINPA, CABOLQUI, Andean Valley Company, and Andean Naturals. These companies should be included in discussions on the development of amaranth. The creation of conferences for quinoa helped spur innovation, and Bolivia should look to push similar conferences for amaranth.
- As with quinoa, the National Institute for Innovation in Agriculture and Forestry will need to continue to grow its institutional capabilities. The institute should work with NGOs to further develop best practices that will allow for agriculture to operate in a sustainable manner.
- Mechanization remains a top priority for all food production in Bolivia. There has been some work to develop threshing machines and other cheap machinery suitable for production (Paludosi, 2015). These issues should continue to be pursued. The Bolivian government should also explore ways to help provide the necessary capital for farmers’ associations to invest in mechanization.
- The Bolivian government should focus on expanding Bolivian food processing capabilities. Companies like Andean Naturals and Andean Valley Company have the expertise and experience on developing food manufacturing that is necessary for further development in Bolivia. They should be consulted for the feasibility and scope of amaranth processing in Bolivia.
- Cooperatives should also focus on maintaining an organic-certified process for amaranth production. Organic amaranth demands a strong price premium over non-organic amaranth. Maintaining organic amaranth production should not be that strenuous of a task, given that cooperatives have already developed the expertise for organic quinoa farming.

<sup>42</sup> <https://www.npr.org/sections/thesalt/2017/05/01/526033083/why-mexican-chefs-farmers-and-activists-are-reviving-the-ancient-grain-amaranth>

<sup>43</sup> <http://www.fao.org/quinoa-2013/en/>

<sup>44</sup> <http://www.fao.org/quinoa-2013/en/>

- Steps should also be taken to maintain a diverse range of cultivated amaranth varieties. Part of quinoa's appeal is that quinoa has, overall, maintained a large amount of diversity. Amaranth is quite diverse, and when Bolivia starts to market their amaranth, sellers should try to maintain the diverse selection.
- Peru currently produces a decent amount of amaranth. While Peru does not maintain the same strict level of GMO-free and organic standards that Bolivia tends to, Peruvian institutions can still provide advice on how to successfully bring amaranth to market. Bolivian should attempt to reach out to Peru for cooperation on amaranth development.

### Tropical Fruits

#### *Tropical Fruits' promise as nutraceuticals*

Global production of tropical fruits has been steadily rising for the last several years, driven largely by exports. World tropical fruit exports rose 18 per cent in 2018 (Altendorf, 2018a). The drivers of increasing demand for tropical fruits are derived from both developed and developing economies of the world. Until recently, most tropical fruit went for domestic consumption in developing countries (Altendorf, 2018b). Also, a lot of the increasing exports of tropical fruits happened through developing countries. In developed economies, one of the primary drivers of increased tropical fruit consumption has been the desire for healthier diets (Altendorf, 2018b).

While Bolivia already has a footprint in major tropical fruits, particularly bananas, it could also gain from exporting some of the more minor tropical fruits that are experiencing high growth in demand (Altendorf, 2018b). This should be an especially attractive opportunity, as the prices of these minor fruits are generally higher. The reported prices for bananas hovers between US\$0.8 to US\$1.6 for a kilogram in the USA wholesale market.<sup>45</sup> In contrast, minor tropical fruits have reported wholesale prices of US\$4.8 to US\$15 per kilogram on the USA wholesale market (Altendorf, 2018b).

Achachairu is one potential tropical fruit to investigate for global export. While almost all production is intended for domestic consumption in Bolivia, one Australian company attempted production in Bolivia with moderate success. The fruit has proven popular in Western markets upon exposure. In addition, the harvested fruit does not require constant refrigeration. Achachairu also has the advantage of being an indigenous crop that farmers in Bolivia have experience working with. Hence, exporting achachairu seems feasible for Bolivia.

Guava is another crop with potential for development in Bolivia. Guavas are grown globally, ensuring that there is a constant supply. It is the most widely produced of the secondary tropical fruits, with a production of around 6.8 million MT per annum. Its international popularity would make it easy for Bolivia to find buyers. Furthermore, research and development on guava production is robust. However, Bolivia would be entering a market that has several strong suppliers, the most prominent being India.

Passion fruit is another good opportunity to increase tropical fruit exports. The crop is currently selling at very high prices of around US\$12 per kilogram (Ditlevsen, 2019). The crop is native to the tropics of South America. Passion fruits also offer an area with strong diversity that Bolivia may be able to focus on. Other close relatives to the passion fruit that are native to Bolivia are granadilla and banana passion fruit (also known as curuba and tumba). Passionfruit production has reached over 1.4 million MT; most production is currently destined for the Brazilian market.

Minor tropical fruits represent about 10 per cent of the total tropical fruit production. While most export has traditionally targeted migrant communities in developed countries, consumption is expanding to other sectors of the developed market (Altendorf, 2018b). The sector experienced growth of 3.8 per cent a year for a decade until encountering a brief slump between 2016 and 2017 (Altendorf, 2018b).

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<sup>45</sup> <https://www.fao.org/economic/est/est-commodities/oilcrops/bananas/bananas/en/>

*Tropical Fruit production in Bolivia*

In 2017, Bolivia exported US\$42 million worth of bananas (Observatory for Economic Complexity, 2017). Banana production has been suffering recently due to dropping prices on the international market.<sup>46</sup> Overall, it is difficult to pin down the details of Bolivian tropical fruit production; however, the country does produce for the domestic market. In terms of potential expansion of production, the country has large amounts of arable tropical land in the Amazon region of the country.

*Key constraints on Tropical Fruit production and exports*

**Volatility of output:** Tropical fruits, especially niche tropical fruits, have issues with constant supply. A vast majority of tropical fruits come from developing countries, and the production tends to be seasonal for some of the more niche fruits (Altendorf, 2018a). While major tropical fruits have developed year-round supply due to their cultivation in several different areas, more minor tropical fruits are plagued by seasonality. These supply chains for the minor tropical fruits are often handicapped by poor logistics and inadequate refrigeration, which hinders consistent supply to global markets (Altendorf, 2018b). Hence, expanding the market penetration for fruits outside of the domestic market can be quite difficult.

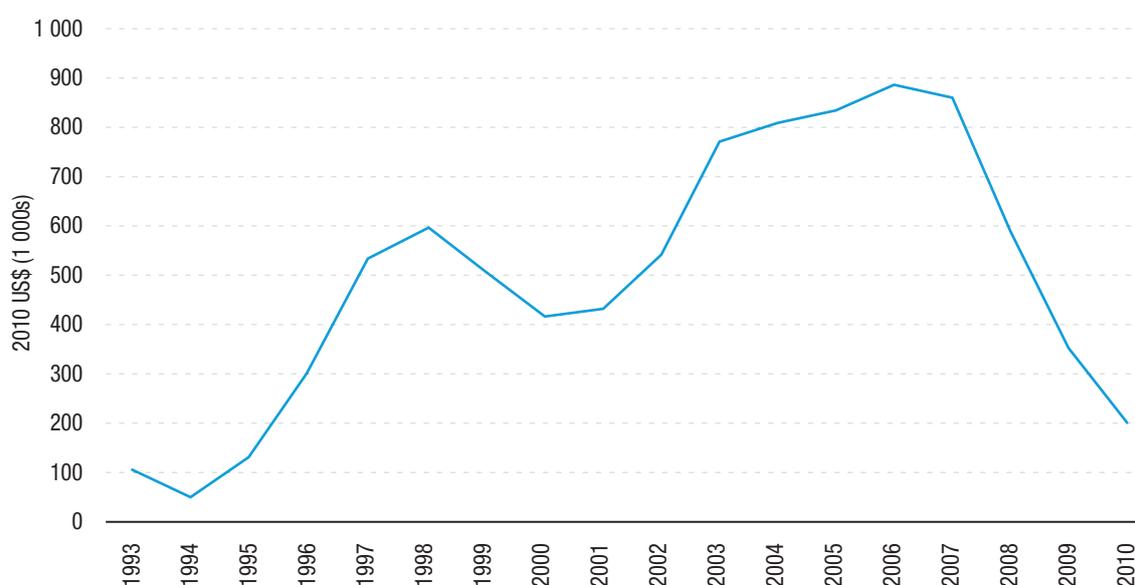
**High costs:** One of the draws of minor tropical fruits is higher prices on the wholesale market. However, costs on some of these fruits are so high that they are driving down demand (Altendorf, 2018b). Furthermore, even if prices of niche fruits are significantly brought down, farmers can still find strong profitability advantages within staple tropical fruits like bananas.

**Organic production:** An important consideration for the tropical fruit exports will be organic certification. Organic certification helps sellers get higher prices. Furthermore, organic certification helps sellers enter high end consumer markets in developed countries (Altendorf, 2018b).

*Conclusion and recommendations*

Bolivia is a major exporter of bananas. It has unexploited comparative advantage in several other, lesser-known tropical fruits that have potential markets in health food stores in developed countries, such as achachairu, guava and passion fruit.

**Figure 5.17 Estimates of bolivian Tropical Fruit exports (HS 8040)**



Source: FAOSTAT.

<sup>46</sup> <https://www.freshplaza.com/article/2194284/bolivia-banana-producers-declare-an-emergency/>

- Bolivia will need to develop stronger logistical networks to support minor tropical fruits. Electrification in production and distribution areas will be a requirement in order to build the necessary refrigeration infrastructure to preserve the fruits for export. Cooperation with the IDB would be a good way to acquire the funding to support the necessary capital investment into roads and infrastructure.
- Efforts to increase market penetration should focus on niche health stores and boutiques. Trying to enter major supermarket chains will be a much harder task due to the larger chains' desire to have year-round and constant supply. Furthermore, NGOs such as Global Facilitation Unit for Underutilized Species and Bioersity may be able to help offer the capabilities to market these products and access buyers in these niche markets. Domestic companies in quinoa production may also be able to offer expertise and experience on how to enter niche health markets.
- There is potential to drive down prices on all stages of production and distribution of minor tropical fruits (Altendorf, 2018b). Bolivia will have to develop institutions that can support intelligent reform of tropical fruit production.
- Developing cooperatives would be a good first step for supporting cost reduction and higher productivity in minor tropical fruit production. Cooperatives, in the case for quinoa, have been effective at disseminating new technical training to members (Tschopp, 2018). Cooperatives also enable members to purchase with economies of scale and gain access to the necessary capital to make investments for their farms (Wanyama, 2014).
- The Bolivian government should work on cooperating with NGOs that have been strong partners in developing the agricultural sector in the past. Furthermore, the government should look into developing or strengthening organizations such as PROINPA that focus on supporting the development of certain regions of Bolivia. Either PROINPA should expand its services to the Santa Cruz department and other tropical regions or the Bolivian government should help with the formation of a similar organization for the Santa Cruz and tropical regions.
- While developing organic farming, considerable thought should be given to the design and implementation of sustainable production. While organic production was implemented for quinoa, it was still not in a sustainable way that increased yields. Bolivia should pre-emptively deal with soil degradation in the case of tropical fruits. The country should develop relationships between the farmers and key NGOs and organizations that can support and research sustainable farming of tropical fruits.

## 5.4. The East European Region

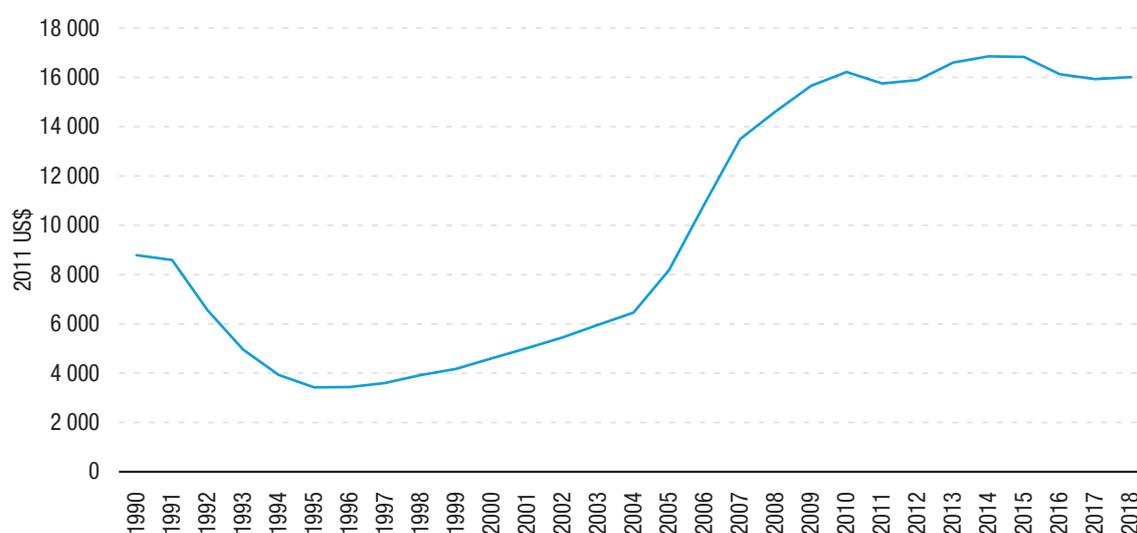
### 5.4.1. Azerbaijan

#### **Overview of export structure and constraints to diversification**

Azerbaijan has a total population of 10 million and it is located on the western coast of the Caspian Sea. To the north, its neighbours are Georgia and Russia, to the south is Iran, and to the west lies Armenia. Azerbaijan also has an enclave of land separated from the rest of the country to the southwest that is bordered by Armenia, Iran, and Turkey. A defining geographical feature of the country is its mountainous terrain. Around half of the country is covered by the Greater Caucasus Mountains, Lesser Caucasus Mountains, and the Talysh Mountains. Climate areas in Azerbaijan range from subtropical to cold, semi-arid.

The country regained independence from the Union of Soviet Socialist Republics (USSR) in 1991 with the dissolution of the Soviet Union. Azerbaijan's independence was marred by the Nagorno-Karabakh war with Armenia, which started in late 1988. Formal independence for both countries led skirmishes to evolve into full-blown war. The economy of Azerbaijan has become highly dependent on oil since gaining independence from the USSR. The completion of the Baku-Tbilisi-Ceyhan pipeline supported very strong GDP growth in the early and mid-2000s with a peak rate of 34.6 per cent in 2006. Recently, growth has slowed as oil prices have slumped (Figure 5.24). Azerbaijan's government has sought to reduce dependence on oil. There is large agricultural potential, and Azerbaijan has nascent defense

Figure 5.18 Azerbaijan's per capita GDP (1990–2018)



Source: World Bank, *World Development Indicators*.

and telecommunication industries. However, as of 2018, the oil industry still produced 45 per cent of Azerbaijan's GDP.<sup>47</sup> In 2017 the GDP per capita was US\$7,117, and the purchasing power parity was US\$17,449 (*World Development Indicators*). Higher oil prices might support further GDP growth. Furthermore, the country has focused investment in improving human capital, with 13 per cent and 44 per cent increases in the budgetary allocations for education and healthcare respectively.<sup>48</sup>

About 90 per cent of exports consist of mineral fuels, of which crude petroleum in turn constitutes 90 per cent. Minerals such as gold and aluminium account for another 2 per cent of exports. The level of exports has consequently fluctuated widely with ups and downs of world commodity prices, mainly oil. Fresh fruits, vegetables, and nuts account for only 2.8 per cent of exports (Observatory of Economic Complexity, 2017). Despite the fall of exports since 2015 due to the downturn in world oil prices, Azerbaijan has maintained a trade surplus; in 2018, exports were valued at US\$19.5 billion, well above imports of US\$11.5 billion.

Azerbaijan has strong potential to diversify its exports through agriculture and food products. However, there are several issues that stymie efforts to diversify. The country needs to continue major reforms that will bring more transparency and efficiency to the government bureaucracy so as to foster private sector enterprise that can compete in global markets. Furthermore, Azerbaijan lacks human capital, which holds back productivity. Lack of access to finance is another constraint on private sector development. Finally, agriculture requires modernization and reform. Azerbaijan has taken many important steps in most of these issues, resulting in significant improvements in the business climate.

Azerbaijan has also continued to improve its productive capacities and had a score of 30.22 well above the average score of LLDCs and as equal as the score of other developing countries. The country's scores on energy, ICTs and structural change categories are better than the scores of LLDCs in these categories of the PCI. However, its performance on institutions and human capital categories is weak and it remains much to be done. Weakness in institutions category of the PCI reflects the country's challenges in ensuring political freedoms, although it has taken significant reforms in addressing these and improving transparency in governance. Linked to institutional challenges, are the tax and customs system of Azerbaijan which are

<sup>47</sup> <https://www.reuters.com/article/azerbaijan-budget/azerbajians-gdp-seen-up-36-pct-in-2019-budget-draft-idUSL8N1X35VB>

<sup>48</sup> <https://www.worldbank.org/en/country/azerbaijan/overview>

viewed as a concern by foreign investors. The European Union is a vital source of investment and an important potential market. Many EU investors cite lack of transparency in taxation and customs as major problems for working in Azerbaijan. Furthermore, many investors complain about double taxation, and that in many cases the tax rebate incentives were effectively impossible to obtain. Fortunately, progress is being made. In 2018 only 33 per cent of EU investors viewed the Azerbaijan tax system as effective; that number rose to 45 per cent in 2019 (German-Azerbaijani Chamber of Commerce, 2019).

The Azerbaijani government also needs to continue to improve its judiciary system. Most companies that work in Azerbaijan see the e-courts for business filings as a sign of progress. However, 41 per cent of EU companies operating in Azerbaijan still do not have faith in the court system. Concerns centred around inefficiency in the courts, a lack of transparency and objectivity, and insufficient education and training of those operating the judiciary (German-Azerbaijani Chamber of Commerce, 2019). The Presidential decree “On Deepening Reforms in the Judicial-Legal System” of 3 April 2019, which intends to ensure financial security of judges, is a worthwhile step towards building a judicial system with independent judges (van Berkum, 2017).

Azerbaijan’s performance on private sector category of the PCI (72.21) is lower than best performers in the scores of its regional LLDCs (pears) such as Armenia (78.71) Moldova (76.1) and North Macedonia (81.54). To diversify Azerbaijani exports, the private sector, particularly small and medium enterprises (SMEs) of Azerbaijan will have to become more competitive. In many robust economies, SMEs are the backbone of the economy; in the EU 99 per cent of enterprises are SMEs and provide 2/3 of employment and 57 per cent of value added (Bayromav, 2017). In Azerbaijan, SMEs contribute a mere 10 per cent of the country’s value added and 19 per cent of non-oil sector employment (OECD, 2019b). These numbers lag behind the average of Eastern Partnership countries, where SMEs contribute 40 per cent of value added and 60 per cent of employment. SMEs contributed only 4 per cent of GDP in 2016, with the target for 2020 being 15 per cent of GDP.<sup>49</sup> Furthermore, only 3 per cent of SMEs currently export products. The country’s SMEs are lagging peer nations, such as Kazakhstan, where 9 per cent of SMEs export, and Georgia, where 15 per cent of SMEs export. These numbers suggest that Azerbaijani SMEs are facing structural challenges in the business environment.

A World Bank study on financial practices found that most SMEs in Azerbaijan lack financial records and financial reports; a large majority also do not have a business plan or strategic vision (OECD, 2019a). The lack of financial training or strategic planning deters banks from lending to SMEs in favor of larger established enterprises (Bayromav, 2017). While the government has started reforms that will assist SMEs, the SMEs will need greater technical support and training.

A relatively better performance of the country on infrastructure category of the PCI is a reflection of the Government’s efforts to boost investment in infrastructure in recent years. These investments have shown results, particularly in telecommunications. Today, the majority of Azerbaijan’s citizens have access to telephones and internet (van Berkum, 2017) another evidence of the better than average performance of the country on the ICTs category of the PCI, which have allowed the development of the country’s e-governance system.

The Port of Baku supports trade from neighbouring countries such as Kazakhstan, and it is considered one of the most vital ports on the Caspian Sea. The country has further developed the Baku-Tbilisi-Kars railroad, which will enable greater freight transportation to Turkey and Georgia. The road network of Azerbaijan needs further improvements notwithstanding recent investments in roads. Rural road networks remain poor, hampering access to markets (van Berkum, 2017). Improving rural roads is a key to supporting agricultural exports and integration into global value chains.

### **Financial stability and credit to the private sector**

The 2016 recession shocked the Azerbaijan financial sector and demonstrated the sector’s fragility. The recession caused interest rates and inflation rates to spike to 15 per cent and 14 per cent respectively.

<sup>49</sup> <https://www.azernews.az/business/128630.html>

As of 2019, inflation had recovered to 2.3 per cent and interest rates were cut to 8.75 per cent in April of 2019. While the financial sector has recovered, Azerbaijan should take steps to build a more robust financial sector that will be able to help the country cope with future recessions.

The country has already taken steps to help make the sector more stable. After the recession, the Central Bank of Azerbaijan closed several banks and had others merge. The Financial Market Supervisory Authority of Azerbaijan (FIMSA) was created in 2018 to streamline regulatory oversight of the financial sector. FIMSA should help stabilize the Azerbaijan financial sector. The banking system provides insufficient credit to the private sector. Domestic credit to the private sector in 2016 was 26 per cent of GDP, below the Eastern Partnership average of 40 per cent and OECD average of 140 per cent (OECD, 2019a). SMEs have particular difficulty in accessing credit, with 51 per cent of SMEs saying access to credit was one of the biggest challenges they faced. SMEs in particular cannot access credit or must pay very high interest rates, as lenders view them as high risk (OECD, 2019b). The Azerbaijan government is focusing on efforts to support credit lines to SMEs in the coming years (Center for Analysis of Economic Reforms and Communication, 2019; Bayromav, 2017). The Azerbaijan Mortgage and Credit Guarantee Fund has recently begun operating, and it helps SMEs access credit. Furthermore, the government is trying to address the numerous loans that are not performing. In April, the government announced that it would help relieve debt of individuals with “problem loans”.<sup>50</sup> These efforts should remain a top priority.

Leasing has not recovered since the 2016 recession and in 2018 remained about 60 per cent below its 2015 level (OECD, 2019a). FIMSA is currently working with the Ministry of Economy and Association of Leasing Companies of Azerbaijan to draft legislation that will facilitate leasing (OECD, 2019b). Despite the financial sector issues that Azerbaijan is facing, the government has made considerable reforms to the sector, as indicated by the high score in the Doing Business Getting Credit category. The Strategic Roadmap for Development of Financial Services in Azerbaijan demonstrates that the country is continuing to address finance.

### Overall assessment and implications for nutraceutical exports

After the collapse of the Soviet Union and Azerbaijan's independence, the country embarked on land reform. The land was parcelled out in 2–5 acre segments. Many of the people who received land do not have modern agricultural training (van Berkum, 2017). As a result, agriculture is fragmented into small farms, and many lack the skills, knowledge, and capital necessary to be efficient. The sector currently accounts for 37 per cent of the work force but only 6 per cent of the GDP output, and the country is still a net importer of agricultural goods (van Berkum, 2017).<sup>51</sup>

The current state of the agricultural sector also has negative ramifications on the food manufacturing sector, including the nutraceutical industry. The small farms have a hard time establishing contractual relations with agricultural manufacturing companies due to their inconsistent yields. Instead, a lot of transactions happen on an ad-hoc basis. This issue in turn impacts the ability for the food manufacturing sector to function on a large and cost-effective scale (OECD, 2019b). In addition, the small farms do not comply with international food standards. This fact keeps Azerbaijani products out of large swaths of the modern food retail sector (van Berkum, 2017).

Azerbaijan has begun to address these constraints to agriculture's export competitiveness. Agroleasing, a state company, allows farmers to lease and access modern farming equipment. The country will need to address quality standards, supply chain issues, and farming techniques if it wants to increase agricultural exports.

Quality control is a major concern in exporting to developed countries as section 2 discussed in detail. The first point of failure in quality control is on the farms themselves. Most farms do not meet international safety

<sup>50</sup> <https://www.azernews.az/business/149384.html>

<sup>51</sup> <https://www.export.gov/article?id=Azerbaijan-Agriculture>

standards. Furthermore, most domestic packaging does not meet quality control standards. As a result, Azerbaijani companies looking to export need to import foreign packaging. The Food Safety Agency, which was launched in 2018, intends to bring Azerbaijan's food standards in line with international compliance. However, as of 2018 only 17 per cent of EU investors see the initiative as effective (German-Azerbaijani Chamber of Commerce, 2019). The Azerbaijan government should continue to develop the Food Safety Agency, as its work will be essential for exporting products to the EU.

Agricultural education and skills will be especially important for export diversification through agriculture. External reviews have found that Azerbaijani agricultural schools are not providing modern facilities, techniques, and education (van Berkum, 2017). The Azerbaijani government should prioritize the improvement of agricultural schools. Soil erosion and rising salinity are important concerns that Azerbaijani agrobusinesses will need to address (Streef, 2017). The country is already seeing dropping yield rates for several crops such as pomegranates, persimmons, and hazelnuts. Pomegranates dropped from 96.7 100 kg/ha to 74 100 kg/ha between 2005 and 2016. Likewise, persimmon yields dropped from 184.6 100 kg/ha to 150.2 100 kg/ha (Streef, 2017). While aging orchards may account for some of the yield drop, some of the yield drop has undeniably been due to soil decay.

The Azerbaijani government has started to invest in institutions that support research and education to modernize their agriculture. Projects like the Illinois-Azerbaijan Agricultural Forum will help bring the expertise and knowledge into Azerbaijan. Furthermore, the country's Agriculture Training and Development Centre should continue to develop and build its capabilities. However, it is important that the Azerbaijani government and Ministry of Agriculture take the necessary steps so that the expertise being developed by these institutions is successfully diffused to the many small farmers around the country. More projects such as the Agrarian Employment Enhancement Project (AMAL) should be implemented to help diffuse expertise.<sup>52</sup>

Major projects to increase irrigation, fight soil erosion, and treat salinification of the land are needed. For these projects, the Azerbaijani government should look to work with international organizations such as FAO which have the necessary expertise and experience.

Azerbaijan has been heavily relying on industry associations for the development of agriculture. Overall, these associations have had salutary effects on modernized supply chains that can compete on the global market. A danger, however, is that the associations tend to develop into cartels that could impede competition. The Azerbaijani government should monitor the activities of these associations and strive to ensure a level playing field for new entrants.

Furthermore, the agricultural sector is characterized by a preponderance of small farmers selling to a select group of processors and exporters. These processors and exporters appear to have significant power and control over these associations. As a result, the farmers, a major stakeholder in the sector, seem to lack a strong voice in the decision-making processes of these associations.

Azerbaijan's economy is currently heavily reliant on the capital-intensive hydrocarbon industries. While these industries have been vital to the booming growth in Azerbaijan, capital intensive industries tend to be less conducive to inclusive growth. Agriculture has historically been a disproportionately large portion of employment despite making up a small part of GDP in Azerbaijan. Increasing agricultural exports and investing for the sake of modernization will ideally increase productivity of the agricultural sector. Cooperatives offer a way to ensure that the growth of the agricultural sector will happen in an inclusive manner.

The economic advantages of cooperatives involve pooling of resources to mitigate risk and increase productivity. Agricultural cooperatives have been found vital to assisting farmers' access to the inputs to modernize their farming. (Wanyama, 2014). The section on quinoa production in Bolivia in this paper details how agricultural cooperatives have enabled Bolivian farmers to produce quinoa for export. In

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<sup>52</sup> <https://azerbaijan.un.org/index.php/en/95298-fao-trains-young-farmers-azerbaijan-support-their-business-ideas>

the case of Bolivia, the cooperatives have been incredibly helpful in ensuring organic standards and sustainable farming practices are implemented (Tschopp, 2018).

Beyond production improvements, cooperatives have also been helpful in increasing the quality of life across the board in rural communities. The cooperative model is based off democratic decision making among the small farmers in the cooperative. This cooperative model results in an institution that is directly tied to the local communities. As a result, cooperatives tend to invest back into the communities that their members are from (Wanyama, 2014).

Also, the cooperatives can serve as a countervailing force to the associations. The associations appear to primarily be controlled by the processors and focus on boosting exports. The cooperatives can help facilitate the diffusion of modern techniques and practices for small farmers as well as promote competition.

### **Selected products with export potential as nutraceuticals**

#### **Hazelnuts**

##### *Hazelnuts' promise as a nutraceutical*

Due to the rising incomes of the Asian Pacific region and the increasing consumer focus on healthy food options, the global market share of hazelnuts is expected to see strong growth over the coming decades. Hazelnuts are currently primarily used in the production of chocolate products such as Nutella and hazelnut flavoured chocolate bars. In addition to the chocolate market, hazelnuts are used in cuisines across Europe and Asia. The most significant health claims about hazelnuts are that these nuts have antioxidants that supports healthy bowel movements while supplying a strong source of vitamin E, protein, and healthy fats. The use of hazelnuts outside of chocolate is also predicted to grow rapidly in the coming years in areas such as yoghurt, cereals, and milk substitutes.<sup>53</sup>

Further opportunities for hazelnuts exist as alternative flours. A currently growing sector of nutraceuticals are alternatives to wheat flour. Hazelnut flour already is stocked in the premium and organic aisles of some grocery stores in the United States; with growing concerns about gluten consumption, hazelnut flour should continue to grow. In addition to flours, hazelnuts are currently being investigated as a potential ingredient for dietary supplements. Both of these potential avenues would also give Azerbaijan to develop their food manufacturing sector.

The global supply of hazelnuts is around 1 million MT as of 2017 (FAOSTAT). Turkey is the largest producer of Hazelnuts, producing between 60–75 per cent of the global hazelnut supply depending on the year (FAOSTAT). Italy is the next largest producer, producing approximately 10 per cent of the global supply; however, Italy's hazelnut production is almost exclusively for the domestic market. Azerbaijan's production has been rising faster than other major producers, making it the third largest producer with about a 6 per cent market share.

Turkish supply is reaching capacity.<sup>54</sup> Beyond production constraints, a recent expose by *The New York Times* detailed systematic labour violations on effectively every hazelnut farm in Turkey.<sup>55</sup> While many processing companies would like to source hazelnuts from producers with good labour and environmental practices, they find often find themselves purchasing from the primary producer of hazelnuts, Turkey. Hence, with growth in global demand and production limitations hindering the primary producer, the hazelnut market will need new suppliers in the coming years, which would create additional opportunities for Azerbaijan to further raise its market share.

<sup>53</sup> <https://www.foodnavigator.com/Article/2017/12/20/Olam-diversifies-hazelnut-sourcing-to-meet-rising-global-demand>

<sup>54</sup> <https://www.foodnavigator.com/Article/2017/12/20/Olam-diversifies-hazelnut-sourcing-to-meet-rising-global-demand>

<sup>55</sup> <https://www.nytimes.com/2019/04/29/business/syrian-refugees-turkey-hazelnut-farms.html>

*Hazelnut production in Azerbaijan*

Azerbaijan is one of the key producers of hazelnuts in the global market with strong potential to increase their production in coming years. The production of hazelnuts mainly occurs in the foothills of the Caucasus Mountains.<sup>56</sup> In 2017, the country produced around 43,000 MT of hazelnuts, a drastic increase from 2016 production of around 34,000 MT (Figure 5.19). Although production data was reported for 2018 at the time of writing, market reports pointed to further increasing production in 2018, and the Azerbaijan Hazelnut Exporters Consortium reported that it expected output of 60,000 to 65,000 MT of hazelnuts in 2018.<sup>57</sup>

About 20,000 MT of the 2017 production went to domestic use, while the rest of the crop went to export.<sup>58</sup> The Azerbaijani government and private sector have aggressively opened “Trade Houses” in countries around the world to market their products. Their efforts so far have been successful. Azerbaijan Hazelnut Exporters Consortium reported that their hazelnuts would start to penetrate Middle Eastern and African markets in 2018.

*Key constraints on Hazelnut production and exports*

**AHEC monopoly:** The Azerbaijan Hazelnut Exporters Consortium (AHEC) holds a *de facto* monopoly on Azerbaijan hazelnut exporting. It is composed of the five major companies involved in the processing and exporting of Azerbaijani hazelnuts.<sup>59</sup> The consortium works to support greater market penetration for the exportation of Azerbaijani hazelnuts. Furthermore, the hazelnuts processed by the five exporters are grown by over 12,000 small, Azerbaijani farms. The consortium also promotes modernization of production techniques and food safety standards that meet the norms of developed countries.

AHEC has a near monopoly over hazelnut processing and exporting in Azerbaijan. At present, the government has no reason to be particularly worried about the consortium. The consortium has been acting to ensure a strong and safe supply of hazelnuts. Furthermore, the consortium has been investing in developing a stronger Azerbaijan brand in foreign markets. All these developments are the right steps for the development of hazelnuts. However, the Azerbaijani government should monitor the practices of the consortium to ensure that it continues to support small farmers and pays them a fair price for their hazelnuts.

**Market penetration:** One of the key factors in increasing hazelnut exportation will be the continued maintenance and development of trade relations foreign countries. Azerbaijan is not the only country developing their hazelnut industry; the United States has also begun to increase hazelnut production.

**Figure 5.19 Azerbaijan’s production of Hazelnuts**



Source: FAOSTAT.

<sup>56</sup> <https://www.azernews.az/business/130014.html>

<sup>57</sup> <https://www.azernews.az/business/135959.html>

<sup>58</sup> <https://www.azernews.az/business/130014.html>

<sup>59</sup> <http://ahec.az/>

While Azerbaijan does have a strong comparative advantage over most countries due to its climate, it is vital that Azerbaijan takes the necessary steps to develop a strong reputation and market share.

**Organic production:** As mentioned, organic production demands a strong price premium on the global market. Furthermore, the demand for organic products is expected to grow with rising incomes. However, hazelnuts face a variety of pests and diseases that can be difficult to manage with organic production. Pests can reduce hazelnut yields by as much as 20–50 per cent (Tuncer, 2016). Hence, increased costs of production can quickly eat up the price premium offered for organic production.

**Limited local processing:** Currently, most hazelnuts are sold after the initial shell removal process. The shelled hazelnuts are then sold to food processors who use the hazelnuts in chocolate products. However, the current growth of hazelnuts has been in part as a health food. Here, hazelnuts are being used in novel products such as hazelnut milk, yoghurt, and ice cream.

### *Conclusion and recommendations*

Azerbaijan has seen strong growth in hazelnut production, but the market is highly competitive. Upgrading the quality of hazelnuts would help Azerbaijan continue to raise its global market penetration.

- The Azerbaijani government should investigate the scope for processing hazelnut food products in order to claim a larger part of the global value chain for hazelnuts. This would involve working with AHEC and reaching out to companies currently engaged in food processing in Azerbaijan. Other logistical issues would include developing the ability to produce packaging that meets EU and USA standards for processed foods. Entering the hazelnut food processing industry may require working with foreign multinationals.
- The Azerbaijani government should review the role of the Azerbaijan Hazelnut Exporters Consortium. The focus of the investigation should be potential anti-competitive behavior undertaken by the consortium. Specifically, the government assess whether the consortium is artificially suppressing prices paid to small farm producers. In addition, the government should investigate whether the consortium is preventing other firms from entering the processing and exporting business. Given the highly beneficial actions of AHEC in increasing hazelnut production and exporting, it would be advisable to approach such an investigation carefully.
- The Azerbaijani government has actively promoted Azerbaijani products in foreign countries. So far, the focus has mainly been in China and Russia. In addition, the government should promote Azerbaijani hazelnuts in other countries as well as consolidate the position of Azerbaijani hazelnuts in China and Russia.
- Much of the growth expected in the hazelnut industry is among high quality and health-conscious consumers. Among these consumers, certifications such as organic provide a strong price premium. There are currently several hurdles to organic production of hazelnuts in Azerbaijan. However, the successful production of organic hazelnuts would help differentiate Azerbaijani hazelnuts from its competitors.
- The Azerbaijani government should examine the feasibility of organic hazelnut production. Partnering with AHEC would be beneficial in this regard. AHEC has technical expertise on hazelnut production and will be a vital partner in trying to understand the technical barriers to organic production. Furthermore, the Azerbaijani government should try to establish market interest in organic hazelnuts. Nevertheless, reaching out to companies such as Ferrero would be an important step to ensure there is a strong enough market demand before investing heavily in developing organic production.

## Pomegranates

### *Pomegranate's promise as a nutraceutical*

Pomegranates have a long and rich history in cultures across Eurasia and Northern Africa. As a result, the production and consumption of the fruit spans a large number of countries. The key producers

of pomegranates are Iran, India, China, Turkey, and the United States. The primary harvest season of the fruit begins in September and can extend as late as January. However, India does manage to produce pomegranates year-round. As of 2016, the expected global production of the fruit was around 3 million MT.<sup>60</sup>

The demand for pomegranates is strong and growing in Europe, the United States, Asia, and the Middle East. The current average price for pomegranates is US\$1.7 per kilogram, but that number varies highly by country and region (Tridge, various years). The fruit is consumed both for its taste and the perceived health benefits. The health benefits of the fruit include its antioxidant and anti-inflammatory properties. In addition to being consumed raw, pomegranates are often processed into juices and juice extracts. The juices are favoured by many consumers as a more efficient way to gain the health benefits of the fruit.

### *Pomegranate production in Azerbaijan*

Azerbaijan is one of the historical homes of the pomegranate and currently produces for domestic use and exportation. In 2018, Azerbaijan produced around 60,000 to 70,000 MT of pomegranates, of which around 10,000 MT were exported. Production and exports of pomegranate in Azerbaijan have increased rapidly in the past years. The Association of Producers and Exporters of Pomegranates hopes to increase exports to around 12,000 to 15,000 MT.<sup>61</sup> As of 2017, pomegranate exports were valued at US\$12 million and this figure has been rising for the last two years.<sup>62</sup>

The production of pomegranates in Azerbaijan is similar to that of other agricultural products. Small farms own and manage the orchards. Then, larger producers and exporters buy the crops from the small farmers and prepare the pomegranates for the marketplace. Azerbaijani companies bring raw fruit to marketplace as well as juices and other pomegranate-based products.

In its push to diversify exports, Azerbaijan has established associations to support the development and exporting of key agricultural products. The Association of Producers and Exporters of Pomegranates (APEP) is one of these associations. Established in 2016, the APEP provides technical support to farmers, processors and exporters. Membership includes most of the key pomegranate processing companies alongside some of the farmers. As a result, the Association has an effective monopoly over the pomegranate sector in Azerbaijan.

### *Key constraints on Pomegranate production and exports*

**Market penetration:** Azerbaijan still remains a minor player in the global pomegranate market. The Middle Eastern market has been growing in the past years at annual rates of 20–30 per cent, and the Azerbaijani government should focus efforts on penetrating this market as well as raising its share of the European market.

Organic produce can demand a price premium, especially in Western markets. Developing organic pomegranate brands could allow Azerbaijan to differentiate their pomegranates on a relatively competitive market. Organic certified produce would be particularly useful for increasing access to the European market.<sup>63</sup> The country produces some organic pomegranate products, but these products may not satisfy stringent EU regulations.

**Processing:** Processing pomegranates into other products allows the Azerbaijani companies to claim more of the pomegranate global value chain. The country has demonstrated a fledging food manufacturing industry; however, their products have yet to penetrate Western markets. The industry has had issues

<sup>60</sup> <https://financialtribune.com/articles/economy-domestic-economy/53155/pomegranate-production-estimated-at-over-1m-tons>

<sup>61</sup> <https://www.azernews.az/business/148571.html>

<sup>62</sup> <https://en.trend.az/business/economy/2908782.html>

<sup>63</sup> <http://www.fruitnet.com/eurofruit/article/176960/azerbaijan-eyes-europe-for-pomegranates>

around meeting packaging requirements for EU markets. In general, packaging has been a systemic gap in all Azerbaijani food manufacturing (O'Connell, 2018).

### *Conclusion and recommendations*

Overall, the pomegranate industry in Azerbaijan is thriving. The government should focus on maintaining its growth. The government must ensure that the growth induced by pomegranate exports is inclusive and benefits small farmers. In addition, the country should take steps to support processing and access to new markets.

- In a similar vein to the Hazelnut Association, the Azerbaijani government should focus on fact finding and monitoring of the Pomegranate Association. There is no evidence or reason to believe that the Association has acted out of self-interest in ways that would be detrimental to the health of the Azerbaijani economy. However, all cartels need to be monitored.
- The APEP has been working to establish more trade relationships around the world to increase exports. The government export promotion AZPROMO should collaborate more with APEP to boost exports to the Middle East and Europe.
- The Azerbaijani government should focus on developing domestic capabilities to create packaging that will meet modern international standards. This advancement will allow them to export products beyond the raw fruit. Doing so will most likely require cooperation with foreign companies and expertise.
- Overall, the government should reach out to food manufacturers and the Association of Producers and Exporters of Pomegranates to understand what the other major impediments to increasing manufacturing and exporting are. Azerbaijan does have a relatively strong track record of working with foreign corporations and utilizing FDI to modernize. The California-based POM company is the leading distributor of pomegranate products on the world market, so efforts to attract POM investment into Azerbaijani pomegranates could also be a potential way to increase Azerbaijani capabilities.

### **Persimmons**

#### *Persimmon's promise as a nutraceutical*

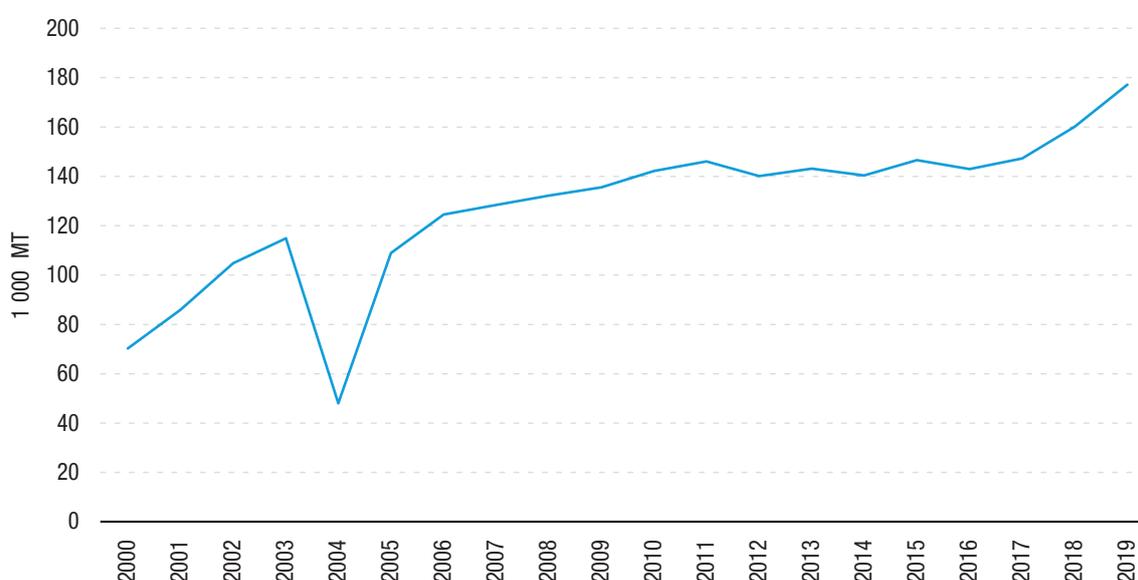
Persimmons are fruits with a growing market on the world stage. The fruit is most often consumed fresh or dried; people also turn persimmons into jellies and jams. Persimmons are a strong source of vitamins and minerals, and in addition to their strong nutritional content, they are an antioxidant and believed to be beneficial to the health of the heart. In addition to its nutraceutical potential as a raw fruit, the fruit could be processed into a variety of nutraceutical products. Pomegranates have been processed into juices and other nutraceutical products. Similarly, persimmons could follow many of the steps taken by pomegranates. Global persimmon production is estimated at around 5.75 million MT (O'Connell, 2018). Around 70 per cent of that production is in China with a domestic production of over 4 million MT; however, China exports less than 100,000 MT of persimmons a year. The major exporter is Spain, which exports around 400,000 MT of persimmons annually. Azerbaijan is the second largest exporter of persimmons with most of its exports going to Russia (O'Connell, 2018).

#### *Persimmon production in Azerbaijan*

Azerbaijan is the fifth largest producer of persimmons in the world with a production of around 200,000 MT in 2018 (Figure 5.20). The country exports the preponderance of their overall production; only 10 per cent of their crop is sold on the domestic market. The income from persimmon exports is just over US\$100 million as of the 2017 fiscal year.<sup>64</sup> The persimmons are primarily exported to Russia, Moldova, Ukraine, Kazakhstan, and the Baltic States.

<sup>64</sup> <https://www.azernews.az/business/135816.html>

Figure 5.20 Azerbaijan's production of Persimmons (2000–2017)



Source: FAOSTAT, Azernews.

The country formed the Azerbaijan Persimmon Exporters and Producers Association in 2017. The Association is intended to support both the production and exporting of persimmons. So far, the Association also aspires to promote persimmon processing plants.<sup>65</sup> At present, the country largely exports unprocessed persimmons. The association is developing plants to process and export frozen persimmons.<sup>66</sup> The country has begun exporting dried persimmons to some European countries; two new plants have opened for the processing of dried and semi-dried persimmons in the last two years.<sup>67</sup>

#### *Key constraints on Persimmon production and export*

While Azerbaijan has successfully gained a large market share over the raw persimmons market in much of Eastern Europe and Central Asia, Spain is still the primary exporter to high end Western European markets. Azerbaijan should take steps to gain a stronger foothold in the European market.

The Azerbaijan Persimmon Exporters and Producers Association was established in 2017 to support the development of the production and exportation of persimmons. Similar associations have been established for pomegranates and hazelnuts as described above. The persimmon association is the least developed of the three and needs to further develop its institutional capabilities.

Most of Azerbaijan's exports in the persimmons sector are raw persimmons. Value added persimmon products could assist in increasing exports by entering the high-end health food market. As in the case of hazelnuts and pomegranates, organic certification would also be a boost to accessing Western European markets.

#### *Conclusion and recommendations*

Overall, Azerbaijan has been relatively successful in the bulk production of persimmons. Improving quality, exploring opportunities for organic persimmons, and promoting processing would boost the returns provided by this sector.

<sup>65</sup> <https://www.azernews.az/business/146220.html>

<sup>66</sup> <https://www.azernews.az/business/146220.html>

<sup>67</sup> <https://www.azernews.az/business/147904.html>

- The Pomegranate and Hazelnut Associations have successfully created relationships with buyers in new markets. The Azerbaijan Persimmon Exporters and Producers Association (AZPROMO) should start forging relationships with buyers in Western Europe. AZPROMO can assist the association in developing the capabilities to build such foreign relationships. The association's international footprint is still quite small; almost all the information available about it is through *Azer News*. The Association should establish a website. Most organizations conducting international trade out of Azerbaijan build their websites so as to have versions in Azerbaijani, Russian, and English. The Association's page should likewise use those three languages. The Association should work on developing the capabilities to conduct business and trade relations with companies in foreign countries. This has been a vital capability for the success of pomegranates and hazelnuts' associations. As with all of the associations of producers and exporters, the Azerbaijani government should monitor the Persimmon Association to ensure it does not engage in cartel-like activity and anti-competitive practices.
- The Azerbaijan Association of Producers and Exporters of Persimmons should also assess the feasibility of greater local processing of persimmons. The government should help support research and development of domestic capabilities to produce high quality packaging for persimmon products.
- The government should explore selective conversion to organic persimmon production for the European market. Since a lot of Azerbaijan's production is exported to middle income countries, the organic certification is less crucial to persimmons than hazelnuts and pomegranates. Development of organic standards will require collaboration between the Azerbaijan Persimmon Exporters and Producers Association and the Azerbaijani government. The Azerbaijani government should try to connect the Association with researchers at their technical institutes and universities.

## 6. Market access constraints for exports of nutraceuticals

As already alluded above, there is currently little documented information on the potential markets for exports of nutraceutical products. However, there is a shift in consumption patterns of consumers in developed economies resulting in a growing demand for nutraceutical products or health/enhancing speciality products. This, in turn has provided opportunities for countries that have natural comparative and competitive advantages in nutraceuticals and other high-value natural products for the health, pharmaceutical and cosmetic industries to diversify exports. These non-traditional export goods will contribute decisively to export diversification and structural transformation of structurally disadvantaged countries such as LLDCs by enabling them to be part of the Global Value Chains (GVCs) for production and supply of nutraceuticals globally. However, enabling producers of nutraceutical products to link into the GVCs is not straightforward. It can be a considerably complex process both from the supply as well as demand sides.

On the supply side, producers in structurally disadvantaged economies often face many constraints when exporting to global markets due largely to high transaction costs, poor physical infrastructure, weak institutional capacities, limited skills and poor implementation of policies. However, the most critical constraint is the limited development of their productive capacities. By productive capacities, we mean the wide range of technological and production capabilities, financial resources, infrastructure, private sector development, institutions, energy supply, efficient market systems, and the skills and the policy-implementing capacities that a country needs to produce a wide range of goods and services that it can consume domestically or exports competitively. According to UNCTAD, these are the “productive resources, entrepreneurial capabilities and production linkages which together determine the capacity of a country to produce goods and services and enable it to grow and develop” (UNCTAD, 2006).

Ultimately, these are the capabilities that together enable a country to diversify its economy; add value and produce a wide range of products and services; create, well-paying and decent jobs; diversify its economy and export structure; promote technological learning; improve labour productivity; tackle environment-related challenges; kick-start the process of structural transformation; initiate the production

of new and dynamic products such as nutraceuticals. In other words, the most effective route to moving-up in the development as well as the value and technological-ladders and eventually out of dependency on commodity exports is to build productive capacities.

The point is, the more developed the productive capacities of a country, the greater also the probability for that country to manufacture and export more diverse range of products and catch-up with relatively more developed and high-income economies. For these reasons, the most desirable form of development and economic growth is one that is grounded on expansion of productive capacities/capabilities since it creates opportunities for structurally disadvantaged countries such as LLDCs enter into production of goods and services that they can export without the constraints that their structural impediments create.

In the literature on export promotion, a distinction is sometimes made between market access and market entry. Market access is a demand-related issues and refers to whether markets are open for imports from other countries. Many LLDCs, particularly those in the African continent and that are LDCs, do not have market access problems thanks to the Duty-free and Quota-free preferential market access opportunities offered by development partners for LDCs and by the US through the Africa Growth and Opportunity Act (AGOA) to African countries. However, having market access opportunities does not mean entry into these markets is easy or uncomplicated. In fact, the most serious constraint to LLDCs and LDCs is the capacity for market entry even into markets where access is easy and free due to preferential market access offers.

For exports of nutraceuticals and other health-enhancing products, the most binding constraint is the standards, quality control measures and health-related safety requirements that export destination countries impose to protect their citizens. These are the non-tariff measures that often create obstacles to exports from LLDCs and these measures tends to be strict for products that are marketed as health/enhancing or supplementary to modern medicines. Over the last decades, there has also been an increase in 'private standards' introduced by food distributing companies in developed countries. Therefore, increasingly, exporters from LLDCs will have to deal not only with public standards but also private standards, which tends to be more stringent.

These are the issues discussed in the next section focusing mainly on standards that affect exports of nutraceuticals, including fruits and vegetables that are known to have health-enhancing benefits, and certification requirements for organic production and environmental sustainability. As shown below, although the scope and degree of restriction imposed differs between countries and types of products, in general the trend is moving in the direction of more severe rules and standards and monitoring mechanisms. Understanding the standards and regulations governing the importation of nutraceuticals in major markets is critical for potential suppliers or exporters of these goods from LLDCs. In this respect, the discussion in the next section covering a sample of countries that are considered important markets for nutraceuticals and related products namely, EU, USA, Japan, China, Korea and India are highly beneficial for both exporters and those responsible for policymaking in exporting countries.

### 6.1 The European Union

The European Union (EU) common market is one of the largest economic areas in the world and is a major player in world markets, including for most fruits and vegetables. Since the late 1990's, the EU has steadily tightened the quality standards of most horticultural products, and consumer demand has shifted towards higher-quality and healthier produce. EU public and private standards include maximum pesticide levels, phytosanitary (plant health) measures, quality classifications, traceability of products, and contaminant limits. Many common fruits and vegetables, such as apples and pears, also face more restrictive, product-specific standards (HMI, 2017). While barriers to agricultural imports have historically been driven by the EU official regulations, private standards are increasingly superseding regulations as buyers mandate satisfaction of private standards such as GlobalGAP and BRC Global Standards. An additional food safety measure commonly required by buyers, Hazard Analysis and Critical Control Points (HACCP), requires intensive safety checks at each level of the value chain (CBI, 2019). Finally, many

large buyers have begun to allocate a significant portion of their purchasing power to agricultural goods meeting social and environmental standards like Rainforest Alliance, Fairtrade, and GRASP. Though meeting these social standards is certainly not a requirement to export into the EU market, the demand for products meeting such standards has increased.

Although public and private standards for agricultural imports are justified on the grounds of ensuring the safety and quality of imported produce to consumers, they are criticized as *de facto* non-tariff barriers on Landlocked which have difficulty meeting them. Some LLDCs have successfully become exporters to the EU, but many lack the institutional capacity to ensure compliance with the EU's stringent standards. Producers in sub-Saharan Africa, in particular, have struggled to access EU markets, with sub-Saharan market shares in most major agricultural imports declining after 2007 (FAO, 2013). This section explores the standards applied to horticultural products in the EU and their impact on LLDC, the standards applied to the adjacent nutraceutical sector, and the nature of non-quality certification such as Fairtrade and organic.

### Fruits and vegetables

The centerpiece of EU horticultural regulations is the General Marketing Standard (GMS). The GMS is generally quality-focused, with provisions on intactness, cleanliness and the absence of foreign chemicals or pests. It applies on every level of the export chain: in order to export to the EU, countries must first obtain approval from the European Commission, which reviews the state of compliance checks in the exporting country. Each producer exporting to the EU is entered into a central database, and each is checked yearly for compliance with GMS standards (European Council, 2008). Though this creates a number of hurdles for exporters, particularly those in countries with less-developed regulatory systems, the GMS creates a comparatively light burden for exporters of fruits and vegetables, and even lower for grain.

The GMS minimum quality requirements target six primary criteria to assess the quality of produce: intactness, cleanliness, the absence of pests, the absence of foreign contaminants, the absence of foreign tastes or smells, and the ability to survive transport in a satisfactory condition (EC, 2008). These standards cleave generally to the demands of domestic consumers even in LLDC's, and exporters rarely have trouble meeting them, with the occasional exception of the "foreign contaminant" criterion. Although the vast majority of foreign producers meet GMS minimum quality standards, other provisions of the GMS cause problems for some foreign producers. Produce is separated into three classes by quality: Extra Class (highest), Class I, and Class II. Extra Class produce must be entirely free of defects, with no detectible pesticides, contaminants, discoloration, or deviation from general appearance of the produce. Class I produce may contain only slight misshapeness, discoloration, and skin defects, and even trace amounts of pesticide or contaminants relegate the produce to Class II.

Though there is a robust market for Extra Class and Class I produce, Class II produce may only be sold for purposes of food processing, and clearly marked as such (CBI, 2019). A sizable portion of the produce exported from LLDC's clears the GMS minimum quality standard, but is evaluated as Class II produce, which effectively bars it from supermarkets and even wholesalers. Clearing the Class I produce hurdle has been central to LLDCs' efforts to expand into the EU market: although the standard is difficult for many countries to meet, it is roughly in line with the expectations of European consumers (EFSA, 2019). As agricultural sectors in many LLDC's and some LDCs have raised quality standard enforcement, the share of Class II produce imported into the EU has begun to drop.

Private standards, however, constitute the far greater barrier to agricultural imports. Supermarkets, which account for nearly 70 per cent of the produce market, have become increasingly attuned to their consumers' demands for high-quality, ethical, and sustainably sourced food products. This has led to the proliferation of standards requirements among European supermarket chains, including two "baseline" standards: GlobalGAP and British Retail Consortium (BRC) Global Standards. GlobalGAP is a modular certification system, requiring compliance with general standards, sector-specific certification (crops, livestock, or aquaculture), and product-specific certification. The general standard deals with overarching

concerns: site management and record keeping, pollution management, worker welfare, and product safety management systems.

The crop standard deals with farming-specific concerns: soil quality, phytosanitary conditions, fertilization and harvesting techniques with respect to crop quality and environmental impact, and post-harvest handling (ECPR, 2012). The crop standard relies on both announced and unannounced inspections, requiring constant vigilance on the part of producers. Finally, the product-specific certification deals with metrics relating to the final product: produce quality, contaminant levels, traceability of the produce, and handling of the produce across the value chain. The GlobalGAP standard has posed a challenge to exporters from LLDCs for decades and remains the main global standard for producers seeking to export into Western markets (Wahidi & Purnhagen, 2018).

The BRC standard, however, has emerged as a leading standard in the European market as well. BRC focuses on five criteria: food quality management, site standards, product control, process control (through HACCP), and personnel qualification. BRC is more process-oriented than GlobalGAP, and places heavy emphasis on compliance with best practices in the agricultural sector. Of these criteria, the HACCP requirement has caused the greatest share of difficulty to LLDC exporters. It requires detailed analysis of potential hazards, the establishment of maximum safe contaminant levels by producers, a concrete monitoring and corrective action system to ensure that these levels are not exceeded, and extensive validation and record-keeping by producers to demonstrate that such a system is indeed in place. Even for large commercial farmers in LLDCs, such detailed planning and analysis requires a significant investment in skilled labor and product infrastructure, both of which tend to be in short supply.

Many LLDC producers have chosen to target wholesalers and supermarket chains which lack the BRC standard, as meeting it is infeasible for horticultural producers in many LLDCs, particularly those in sub-Saharan Africa (USDA, 2017). BRC poses the most potent hurdle to expansion into the European market, and countries seeking to develop agricultural exports into Europe should work extensively with commercial farmers to ensure that this standard can be met. They should also seek out European partnerships to develop joint ventures, as institutional capacity is often needed to effectively overcome such hurdles. Although the BRC poses a tough challenge to LLDC exporters in the present, it can be overcome with proper cooperation between LLDC governments and producers.

### **Nutraceutical standards**

For purposes of exports to the EU, nutraceuticals are defined as “food supplements with concentrated sources of nutrients (i.e. mineral and vitamins) or other substances with a nutritional or physiological effect” (EFSA, 2019). This covers both dose-based nutrients, such as dietary pills or powders, and foods marketed for their nutritional or health benefits (functional foods). Importantly, the EU regulates nutraceuticals as food products rather than pharmaceuticals, though they are held to a higher standard than most food products. Thus, imported nutraceuticals tend to face regulatory scrutiny only when their active ingredients have the potential for adverse side effects, and are rarely held to account for unsubstantiated marketing claims about medical or nutritional benefits (Santini et al., 2018).

To export nutraceuticals, producers must first notify the European Food Safety Authority (EFSA), which cross-references the product against an internal list of nutraceuticals cleared for export. The EFSA operates on a ‘blacklist’ rather than a ‘whitelist’ basis, meaning that new exports are likely to be approved unless known to contain harmful compounds. This has been the case for many sub-Saharan African producers: bioprospecting for medicinally useful compounds has a rich history on the continent, and with increased European demand for naturally-derived health food products, African exports of nutraceuticals to the EU have increased significantly. However, the current (comparatively) laissez-faire state of nutraceutical regulation in the EU may not last.

Amid rising sales, the EU has faced calls for more comprehensive and stricter regulation of nutraceuticals, similarly to other large nutraceutical markets including the US and India described below, have tightened their restrictions on nutraceutical marketing within the past decade (Santini et al., 2018). Given the EU’s

history of careful scrutiny of major imports, there is a significant chance that EU regulators will tighten regulations of the nutraceutical industry within the next decade. LLDC producers should carefully monitor regulatory developments in the sector and be prepared to develop regulatory compliance measures. Even if the regulatory apparatus remains favorable, greater traceability of products and more robust impact studies would likely help win over more skeptical customer segments who might otherwise avoid nutraceuticals.

### **Organic and sustainability certification**

A fast-growing niche market, organic-certified produce has become a significant sub-sector of European horticulture. Over the past decade, many European grocers have shifted their purchases to largely or exclusively organic produce, and most large supermarket chains now allocate a meaningful percentage of their produce stocks to organic produce. The organic market presents a lucrative opportunity to producers in LLDCs, but organic certification is an intensive and time-consuming process. The largest organic certifier for European markets is Ecocert, which offers certification under the EU's public organic standard (originating in Denmark). Obtaining certification under Ecocert is a two- to three-year process, during which time the prospective organic producer must begin using organic seeds, cease any usage of artificial fertilizer and GMO-based crops or herbicides, and submit to annual inspections.

However, despite the increased costs and reduced yield associated with organic production, producers cannot sell under the organic logo during the “conversion” phase, and consequently many farmers struggle financially while waiting for certification (European Commission, 2008). Compared to the exacting HACCP process required of most agricultural export into the EU, the technical standards of Ecocert certification do not pose a serious obstacle, but the costs inevitably incurred during the conversion period are a notable deterrent to small farmers seeking organic certification for their products (USDA, 2018). The European Union offers limited financial support for farmers who are undergoing certification, but much of the funding is earmarked for prospective organic producers in the EU.

Organic-certified products comprise only a small part of the “conscious consumer” niche. As Western audiences have increasingly come to regard choice of food as a political act, social and environmental standards for all manner of agricultural products have flourished. Industry-wide standards have increasingly emphasized worker welfare and social responsibility, exemplified by GlobalGAP's GRASP sub-certification designed to ensure the fair treatment of workers, and once-niche certifications like Rainforest Alliance and Fairtrade have become standard fare for many cosmetic and health-food products.

In contrast to organic certification, many social and environmental certifiers (including both Fairtrade and Rainforest Alliance) offer significant institutional support to producers seeking certification. Rainforest Alliance, for example, is an established presence in large cooperatives across sub-Saharan Africa and Latin America, offering workshops on the certification process and selling farming equipment at below-market rates. In 2014, the company even piloted a certification training app, which it distributed on pre-loaded tablets to farmers across 27 countries, subsequently recording a modest uptick in certification rates (UNESCO, 2018). The global reach of such certifiers, combined with their willingness to offer material support to farmers beginning the certification process, makes social and environmental certification an attractive option for increasing agricultural export revenues.

The primary constraint for many smallholder farmers seeking certification is the difficulty of switching to non-pesticide-based pest management. A significant investment is required to deploy systems like integrated pest management, and if done improperly the entire harvest is put in jeopardy. Although cooperatives act as a skilled labor pool to help individual members make the transition, smallholders must make do with whatever help they can get from family members, neighbors or extension agents from the certifiers. Given the growing potential of ethically sourced produce, governments should work with certifying bodies to educate smallholders about the benefits of sustainable production and should extend targeted aid to farmers seeking to reduce their use of pesticides through sustainable pest management. Beyond boosting certification rates, a meaningful reduction in smallholder use of pesticides could have

spillover benefits for the economy as a whole. Pesticide overuse by farmers effectively constitutes a negative externality: across the globe, the effectiveness of chemical pesticides has dropped noticeably since the 1980's as pests of all kinds have begun to build up immunity to the most frequently used chemical agents.

The more smallholders rely on pesticides to keep their crops alive, the less effective it becomes, prompting still greater usage, which lowers the quality of the crops and devastates surrounding ecosystems. A meaningful shift toward non-pesticide-based pest management would alleviate this cycle, sparing the environment and bettering crop quality while also increasing market prices through sustainability certification premiums. Social and sustainability certification carry meaningful potential for boosting agricultural export value, while also offering a promising solution for one of the largest-looming problems of agriculture in the global South. Although a reduction in the use of pesticides would likely reduce yields to some degree, integrated pest management has proven to be nearly as effective for many crops as conventional pesticides.

In several Southeast Asian countries during the 1990's, particularly Indonesia and Vietnam, transitioning from heavy use of pesticides to integrated pest management yielded largely positive results within a decade, slightly increasing yields and reducing environmental harms (Yang et al., 2014). In the long run, as the effectiveness of common pest-control agents wane due to natural selection for resistance in pest populations, a gradual shift from heavy pesticide application to targeted application of pesticides alongside more sustainable practices such as integrated pest management should produce at least present baseline yields and may even exceed present yields.

## 6.2 The United States

The US federal food safety regulation has three major components. There are the Food and Drug Administration (FDA) regulations and the United States Department of Agriculture (USDA) regulations. These regulations specify the standards that food producers must follow in order to sell in the United States. The third component is Customs and Border Control (CBD) which helps enforce FDA and USDA regulations on imports into the United States. All food products, dietary supplements, and drugs imported into the United States must meet FDA and USDA regulations. The USDA regulates meat, poultry, and egg products. All other foods and supplements are regulated under FDA regulation. In addition, states can have additional compliance requirements for food products, dietary supplements, and drugs. The definition and certification of organic food is governed by the USDA. Foreign imports do fall under USDA regulation if the product is to be considered organic in the United States.

### General regulations on food and nutraceuticals

**FDA regulations:** The FDA has a broad mandate over what it regulates. It has the authority to regulate food, dietary supplements, vaccines, blood, human tissue, medical devices, radiation emitting electronic devices, cosmetics, animal food and feed, and tobacco products. Due to the federalist structure of the United States government, the FDA only has regulatory authority over goods involved in interstate commerce. However, the FDA has moved to extend its jurisdiction to all food commerce in America, intrastate or interstate. All imports are classified as interstate commerce and therefore subject to FDA regulations. FDA regulations cover both food and dietary supplements. While dietary supplements have to follow FDA regulations on safety, there is no required verification of health claims. However, dietary supplements cannot claim to be a treatment for a specific disease (Food and Drug Administration, 2015).

While very small businesses, those defined with revenues under US\$25,000 a year, are exempt from many FDA regulations, all exporters should attempt to meet regulations as doing so will make their products more desirable to US importers and reduce the risk of a disease outbreak and recall which would damage the reputation of their country's product.

**Food Safety Modernization Act:** The Food Safety Modernization Act (FSMA) was passed by the US Congress in 2011. The bill tightened food regulation in the United States. The bill in particular requires that food

producers and distributors ensure that their products are not contaminated. The bill signifies a shift in US food regulation towards prevention and risk management. The bill resulted in the overhaul of most Current Good Manufacturing Practices (CGMP) guidelines.

FSMA and CGMP require manufacturers to take specific measures to minimize risks to consumers and encourage compliance with strong hygienic and quality control standards. However, FSMA and CGMP are largely limited to issuing standards and guidelines, leaving the actual design and implementation of preventative measures to the producers and distributors. The FSMA has adopted the Hazard Analysis and Critical Control Program (HACCP), described above for the EU, which mandates producer audits of their production processes, identification of the points with the highest risks to food safety, and then implementation measures to reduce risk.

**Foreign Supplier Verification Program:** The Foreign Supplier Verification Program (FSVP) requires importers or the U.S. representative of a foreign company to ensure that imported products meet FDA regulations. Responsibilities include identifying the hazards in the manufacturing process, evaluating the risk of the product to consumers, planning and implementing supplier verification activities, and conducting corrective actions to reduce risk.

Furthermore, importers must establish written procedures to ensure that they only import food that comply with the FSVP standards. Importing of unverified foods is permitted if these foods are currently being verified through an FSVP. Every food product requires its own FSVP, and each product from an individual supplier also requires an FSVP. Requirements mandate that FSVPs be re-evaluated every 3 years or sooner if a new potential hazard is discovered or the performance of the supplier is degrading. There are some exceptions to the FSVP. These include importers who can provide documentation that another entity in the distribution chain will ensure that the product meets FDA standards. Importers with under US\$1 million of sales and foreign farms with exemptions or under US\$25,000 of produce sales also are exempt or fall under modified rules for FSVP (Food and Drug Administration, 2017b).

**Third party audits and VQIP:** Under FDA regulation, foreign food manufactures and producers may elect to have third party audits of their facilities. These audits can be conducted by either a government or private entity and are an efficient way to fulfil requirements of FSVP (Food and Drug Administration, 2017a). The third-party audits must be accredited if the producer or manufacturer wants to use the audit for eligibility into the Voluntary Qualification Import Program (VQIP) (Food and Drug Administration, 2017a). The VQIP program expedites the importation process. The program limits inspections and sampling of products to situations of “for cause”, which are times when the FDA has probable cause to believe the product may constitute a threat to public health (Food and Drug Administration, 2016). VQIP requires an established history of importing, and the importer must be in good standing with the FDA.

**Foreign facility inspections:** The FDA conducts inspections of facilities in foreign countries if they export to the United States. The intent of these inspections is to make sure that facilities are FDA compliant, and products meet safety standards in the United States. The foreign inspections prioritize food products with higher levels of risk and facilities with track records of failing FDA inspection upon arrival in the US. Inspections focus on compliance with all parts of FDA regulation including HACCP, GMP, and FSVP. The FDA specifies that these visits are intended to inspect the individual facility and are not an overall audit of a country's food safety systems.

The FDA alerts the competent authorities of the country where the business is located when a violation occurs. Furthermore, the FDA will alert the facility under inspection in communications written in both English and the official language of the country. A facility can deny an FDA inspection; however, in response the FDA may take steps such as putting an alert on the company's products or not allowing shipments of the company's products into the US (Food and Drug Administration, 2018a). The FDA takes in account the policies and findings of foreign food agencies. While the FDA still conducts its own verification of products entering the US, findings of foreign food agencies can affect rates of inspection, examination, and sampling (Food and Drug Administration, 2018a).

### Fruits and vegetables

The Produce Safety Rule (PSR) is a newer part of FSMA that is currently being implemented. The rule requires that all produce comply with a set of regulations and standards. The PSR requires farms to regularly test water for safety and low microbial numbers. Any water used for agricultural purposes must be tested, including water used to wash hands and untreated ground water sources. The PSR also sets regulations for the use of raw manure, draft animals on the farm, and preventative regulations to prevent wild animals from contaminating crops. PSR sets general guidelines for worker safety practices on farms. It expects that workers be educated in sanitation practices and be provided with the proper equipment to follow best sanitation practices. Furthermore, best practices should be developed to ensure that facilities and tools also remain sanitary. PSR allows exemptions for farms with under US\$25,000 of annual produce sales, produce that is not a raw agricultural product, produce that will undergo commercial processing that reduces microbial risks, and food grains. Inspections for PSR started for large farms in the Spring of 2019 and will continue to roll out to smaller farms in the Spring of 2020 (Food and Drug Administration, 2019).

### Nutraceutical standards

The Current Good Manufacturing Practices (CGMP) guidelines regulate the production of dietary supplements that enter the US market, including herbal, mineral, and vitamin supplements. Furthermore, CGMP applies to all producers of dietary supplements. The primary exception is a manufacturer who is selling a raw dietary supplement ingredient to another manufacturer who is producing a final product. CGMP requires manufactures to maintain extensive documentation and written protocols for stages of the manufacturing process. The documentation includes, but is not limited to, employee training, water quality, the conditions of a particular batch of product, and quality control.

CGMP regulations extend into almost every part of the production process. They require that employees be trained in the relevant skills to produce the supplement. Furthermore, it requires that manufacturers maintain a hygienic environment. Equipment and plant facilities must satisfy stringent hygiene standards. In addition, CGMP requires scientific testing of the product to ensure that it meets the specifications that it is marketed. The scientific testing must happen in a laboratory setting that passes quality control standards. If a batch does not meet standards, the manufacturer must destroy it (Food and Drug Administration, 2010). Although the FDA does not require proof of effectiveness for dietary supplements, the manufacturing practices are much more robust and comprehensive. Furthermore, the requirements are also a lot more restrictive and have less leeway than regulations on food. Manufacturers entering the production of dietary supplements should further examine the regulations and consider if they will be able to comply with the rigorous standards.

### Organic certification

The USDA has the responsibility of managing the use of the term “Organic” in relation to food products in the United States, through the National Organic Program. The National Organic Program sets out a set of standards that a producer must meet in order to label their food as organic. The program requires an organic production and handling system plan that is approved by an accredited certifying agent. Certifying agents tend to be third parties that have been accredited by the USDA to approve organic production and handling system plans. In addition to approving the plan, agents will also inspect the facility. Facilities need to be inspected annually by a USDA inspector after initial organic certification. Furthermore, the program sets out stringent guidelines for how the food can be grown and produced. Descriptions of how organic something is, such as “100 per cent organic ingredients”, need to be supported by documentation and proof of the validity of the claim (National Organic Program, 2019).

A primary way that the USDA certifies imports is by auditing the organic certifications of other countries. The USDA will examine and audit the procedures and regulations of the country’s organic standards, and if their standards meet or exceed USDA regulations, the USDA will label organic products from

the country as organic.<sup>68</sup> If a country does not have an organic certification that has been approved as equivalent to USDA standards, an individual producer can still acquire USDA organic certification. To do so, the producer must instead follow USDA regulations and have their facility approved by a USDA accredited certifying agent (USDA, 2016).

### Market standards

Due to the costs and damage to brands of recalls and maintaining their reputation, private companies also take interest in ensuring the safety and quality of food products on the US market. Private lobbying was a key influence to the creation of the Food Safety Modernization Act of 2011. Foreign companies exporting to the USA should be ready for the possibility that companies in the USA will have higher standards than those mandated by the FDA regulations, although to a lesser extent than in Europe.

Several lobbying bodies represent US food industry and can coordinate efforts to raise standards. The Grocery Manufacturers' Association is one such group. It played a prominent role in developing the Food Safety Modernization Act.<sup>69</sup> Furthermore, the Association also provides resources to assist companies in compliance. Other associations with similar objectives include the National Fisheries Institute, American Meat Institute, and the International Dairies Food Institute.

Given the importance of not only satisfying FDA regulations, but establishing a reputation for quality and safety in the US market, exporters from foreign countries should work with third party accreditors that are regarded as having high standards. For example, the Safe Quality Food Institute (SQFI) is a third-party accrediting institute that provides certifications for several different areas of food safety. In addition, the Institute provides resources to assist in compliance; it also has a database to help match buyers and sellers of food products. By working with an institute like the SQFI, foreign exporters can get the credibility needed to sell to major supermarkets and buyers in the United States.

There are legitimate concerns that US food regulations can act as a *de facto* trade barrier due to the regulations imposing prohibitively high costs. Of high-value food exports from low- and middle-income countries to the United States (LMICs), only 2 per cent came from low-income countries. In contrast upper-middle income countries accounted for 69 per cent of the high value food imports from LMICs (Jaffee, 2019). While LMICs have made headway with organic certifications, organic does not necessarily imply compliance with food safety. In addition, a significant portion of organic crops in LMICs come from crops that are considered "organic by default" (Jaffee, 2019).

The barrier that food safety standards represent can also be seen in the FDA's registry of companies. Of the 213,000 companies registered with the FDA, about 119,000 were foreign. Of that foreign company subset, only 30 per cent were upper-middle income, 10 per cent lower middle income, and 1 per cent low income (Jaffee, 2019). These figures suggest that FDA regulations represent a very real barrier to trade for lower income countries.

While the barriers are significant, countries can build the institutions and programs to overcome them and enter lucrative trade within the US market. In the past decade, there has been a global shift in food regulation from policing to facilitating. Instead of punishing violations, food safety agencies now focus on working with producers to prevent incidents. Developing countries can also focus on developing their own domestic food safety agencies. These agencies will help facilitate cooperation between different stakeholders in the agricultural industry. LMICs with an agency tasked with food safety have been much more successful in complying with food regulations (Jaffee, 2019).

The development of these institutions remains vital regardless of interest of trade with high income countries. Consumers in LMICs are becoming more concerned about food safety and discerning about the products that they purchase. Issues of food safety is seen to be a major impediment to agricultural

<sup>68</sup> <https://www.ams.usda.gov/services/organic-certification/international-trade/how-does-usda-assess-organic-equivalency-other-countries>

<sup>69</sup> <https://www.nist.gov/blogs/manufacturing-innovation-blog/food-safety-modernization-act-nutshell>

trade between LMIC countries (Jaffee, 2019). At this point, developing robust food safety is a vital step to any country interested in developing their agricultural sector.

### 6.3 Japan

Those looking to partake in the nutraceutical industry would greatly benefit from exporting to Japan, as an aging population brings with it hopes of a long, healthy life. Currently, most health foods are produced in Japan. However, for developing countries to successfully break into the Japanese market, they must first be able to meet the many regulations Japan has in place in order to protect its consumers. What least developed countries can export to Japan as a whole (or as a final product) nutraceutical (fruits and vegetables) or as an ingredient in nutraceuticals will be severely limited by countries' ability to comply with Japan's rules.

Japan's has quite stringent regulations on those looking to import. The importation process is similar to other developed countries' procedures, as one will see in China and Korea. Those looking to export to Japan must declare their goods to the Director-General of Customs and obtain an import permit (Customs and Tariff Bureau, 2019). Interested parties must also present an invoice, bill of lading or airway bill, a certificate of origin, packing lists and freight accounts (in some cases), and various applicable licenses and certificates for restricted goods. Those who benefit from preferential tariff rates must submit a Generalized System of Preferences Certificate of Origin to Japan Customs before import clearance, though this only applies to loads with total taxable value less than ¥200,000 (Japan External Trade Organization, 2011). Other necessary forms may include a statement on exemption from Customs duty and excise tax as well as a customs duty payment slip (importing to Japan). For those exporters who present the required forms, meet SPS requirements, and adhere to labelling specificities, exporting to Japan is a possibility.

However, a single violation can lead to strict restrictions on access to the market. Nutraceuticals can be broken down into two categories: whole fruits (vegetables, and grains), and specified "health foods." Additionally, to understand the preferences of the market, looking at Japan's definition of organic could indicate how highly valued environmentally friendly practices are. Exporters should keep in mind that their executive summary must be written in Japanese (United States Department of Agriculture, 2018a). Other documents may be written in English. Language may also be a barrier to entry into Japan, as many forms on the CAA's website are only in Japanese.

For those looking to export to Japan, companies must pay attention to the labeling and packaging standards as well as the quality and safety of their product. According to the USDA, U.S. exporters run into rejection by Japan for improper labeling (United States Department of Agriculture, 2018a). LLDCs should also take note of specific certifications and corresponding labels in order to properly discern whether or not Japan is viable market option. For those looking to export to Japan, it is worthy to note that most health foods and dietary supplements usually go through importers and companies such as Amway Japan and Neways Japan. Such companies conduct door-to-door sales in order to distribute health products.

#### **Fruits, vegetables, and grains**

This section will focus on food and agricultural import regulations and standards in Japan with an emphasis on fruits and vegetables, which could be taken whole or broken into an ingredient in nutraceutical production. Japan has seven major laws on food and agricultural products (United States Department of Agriculture, 2018a). These apply to both domestically produced and imported products. These include the Food Safety Basic Act, the Food Sanitation Act, the Health Promotion Law, the Japan Agricultural Standards Law, the Plant Protection Law, Act on Domestic Animal Infectious Diseases Control, and the Food Labeling Law. On top of this, violations of food additive regulations and the discovery of pesticides not listed on the positive list and other contaminants in products can lead to strictly enforced enhanced monitoring. Irradiated foods used for the purpose of safety and extended shelf-life are prohibited in Japan. Also, exporters must pay attention to Japan's packaging and container regulations.

Japan uses a positive list system for packaging materials. Resins, cans, glass, enamel, and rubber packages must meet Food Sanitation Act standards. Japanese importers must also take into account costs for recycling labels. Labelling requirements are standard for most countries. Labels must include the name of the product, its origin if fresh or using general engineering, and the use of food additives. Labelling of nutritional value is voluntary, but exporters and manufacturers may emphasize the nutritional value as long as the use of phrases “containing” and “less” or “no” and the like meet Food Labelling standards detailed on the CAA’s website (found only in Japanese). Importation documents include an import notification and export certificate, test results, documents on ingredients and additives, and a notification on manufacturing processes. A product’s safety is assured through food and beverage tests that measure maximum residue levels, meaning toxicity and pesticide residue data.

Some fruit and vegetable exports are banned from Japan. In general, Japan quarantines fresh apricots, bell peppers, chillies, eggplant, peaches, pears, radishes, sweet potatoes, and yams (Ministry of Agriculture, Forestry and Fisheries, 2017b). Frozen produce may also be subject to strict regulations. Grains are subject to import inspections and require a phytosanitary certificate to grain entrance. However, there are some plants that are outright banned from entrance into Japan because of noted pests associated with them. For example, citrus, apples, cashews, and avocados are notable crops Bhutan may be capable of cultivating and exporting. Unfortunately, Japan bans these fruits and many others from entering the country. Countries looking to export fruits, vegetables, and grains should address Japan’s list of banned imports before deciding whether or not to enter the market.

### **Organic certification**

For our purposes of foods, vegetables, grains, and their components used in nutraceutical production, Japan defines organic as having adhered to “cultivation management methods that reduce the load from agricultural production on the environment” (Ministry of Agriculture, Forestry and Fisheries, 2017a). Japan expects producers to avoid using chemical synthetic fertilizers and substances, especially as pesticide and insecticide. In general, producers should take advantage of natural recycling and use collection methods that preserve the ecosystem. They should also pay attention to runoff so as not to contaminate surrounding areas.

For countries to be eligible to organic certification, producers must have not used any prohibited substances (a positive list system is currently in place) for a minimum of three years. Producers and manufacturers should also be aware that Japan will only tolerate 5 per cent weight of additives to the final product, though a positive list exists for additives used in pH adjustment, drying fruits, and neutralization (Ministry of Agriculture, Forestry and Fisheries, 2018a). Finally, facilities used to store organic plants and processed foods must follow specific post-harvest processes (Ministry of Agriculture, Forestry and Fisheries, 2018b).

Standards for importers to Japan and domestic producers are the same. However, importers must have a certificate from an overseas government or semi-government organization and also apply for a Certification of Subdividers from Japan (Japan External Trade Organization, 2011). This certificate outlines the product and producers, as well as handles the technical standards and grading of the product. There are two ways to gain recognition as organic in Japan. First, producers can gain clearance from a Japanese Agricultural Standards registered certifying body. Another option for producers who originate from a country with a grading system equivalent to Japan’s is to present their home-country certificate. Once approved, products can include the JAS-certified organic mark.

### **Nutraceutical standards**

In Japan, foods claimed to have functional or nutritional benefits are those that fall between food and pharmaceuticals but are not general foods (Exportation, 2011). Also, dietary supplements may not claim misleading medicinal benefits. Those seeking to market their foods as health foods require certification as a Food for Special Dietary Uses (FOSDU) (United States Department of Agriculture, 2018a). Foods for specified health uses (FOSHU) fall under this category. A table of food labeling standards includes a section on (Foods with Nutrient Functional Claims (FNFC)). If processed or fresh foods have certain known supplemental nutritional benefits, there is no need for manufacturers or exporters to submit documents

to the government. For those who are looking for a more affordable and faster registration process, then they can register as a Food with Functional Claims (FFC). FFC registration allows companies to make claims about health benefits and an anatomical area of improvement, but the business operator bears the burden if claims are false. One should also note that under trademark laws, FOSDU are required to include geographic indicators that indicate specific owners rather than a common region. Manufacturers and exporters should consult the list of ingredients requiring Country of Origin Labeling.

It is difficult to gain approval as a FOSHU. Producers need approval from the Secretary General of the Consumer Affairs Agency, which can be costly due to the need for human clinical studies (Food Safety Commission of Japan, 2004). But that being said, foods specified as “health foods” are considered on a case-by-case basis. Health foods that have traditionally been safely consumed for a considerably long time and have not diverged from their original composition and intake method may bypass safety tests. However, if ingredients are added, the indicated intake level strays from traditionally consumed levels, or the dosage form (capsule, tablet, extract, etc.) changes, then in vitro and animal studies as well as human tests are required for product clearance. Tests are used to measure toxicity levels. Those looking to call their foods “health foods” must communicate the risks associated with chronic intake and/or excessive intake, and which populations may safely consume the product.

Particularly vulnerable populations of interest are infants, children, elderly, pregnant and lactating women, as well as women with childbearing potential. Health foods are usually meant for consumption by healthy individuals, but those who are pre-disease and at-risk are also typical consumers, so warning labels may be necessary. Manufacturers should be mindful of changes in potency or toxicity due to co-consumption with medicine. They should also pay attention to the change in composition after extraction and concentration and contamination throughout the process. All of this is necessary to ensure the safety of health food and determine a threshold dose of the functional component. For those proposing a functional component similar to a pre-existing one, the manufacturer must explain the difference between the new and existing FOSHU. For those looking to bypass the registration process, producers can apply for a FNFC permit. This permit allows products with components that meet approved standards to make health claims at the company owner’s discretion (United States Department of Agriculture, 2018a).

Packaging varies for those who have scientifically proven effectiveness and those that do not. Since the label differs for the two, it is advantageous for products to have the food mark that indicates scientific effectiveness, which is associated with the hefty FOSHU registration process (United States Department of Agriculture, 2018a).

### 6.4 China

China has a long history of using dietary supplements and herbal medicines. Even today, some prefer to use traditional methods and medicines over modern Western practices. Housing the largest population in the world, China is a prime market highly sought after by producers of all types. With its centralized location in Asia and its growing middle class, China could be a viable option for the exportation of nutraceuticals produced by LLDCs and least developed countries. However, it is up to the producers to research Chinese regulations and check in with established contacts in the country, as listed regulations differ for each port and ministry to ministry (United States Department of Agriculture, 2019b). China is currently in the middle of restructuring their food safety and agriculture regulatory bodies.

There is currently no accessible website on food and safety regulations because of the restructuring. For this reason, it is even more important for interested exporters to have an internal contact. After redistributing the roles of the previous Chinese Food and Drug Administration, China now has three food safety and agriculture regulators. These include the State Administration of Market Regulation (SAMR), the General Administration of China Customs (GACC), and Ministry of Agriculture and Rural Affairs (MARA).<sup>70</sup>

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<sup>70</sup> Due to the restructuring, many websites with up-to-date information are inaccessible. Therefore, the following information was acquired from the USDA’s report on Chinese regulations.

In addition to the creation of new regulatory bodies, China is also revising their laws (United States Department of Agriculture, 2019b). The Food Safety Law was revised in 2015 but had not been finalized as of 2017. It focuses on risk prevention, monitoring special foods, on-site evaluations, food recalls, and safety in the e-commerce chain. The USDA claims that the Law on Farm Product and Safety is in need of revision to better analyse agricultural products and input safety, though this has yet to happen. Besides these two laws under revision, there are two additional main laws surrounding food safety. The Consumer Rights Protection Law is in place to address problems relating to e-commerce, since it can be difficult to ensure companies meet standards and labelling requirements.

China has determined it would be most beneficial to announce food safety violators regularly and implement a “three-strike” system, where a company would no longer be able to do business after three violations. Also relevant is the Law on the Inspection of Import and Export Commodities, which outlines the procedure surrounding the declaration for and implementation of inspection and quarantine for animals and plants, as well as the issuance of certificates and release. Although exporters and domestic producers are held to the same standards and must both follow Chinese regulation, exporters should be sure of their product’s safety, since the regulatory bodies will keep track of and distinguish between “good and bad” producers and traders.

### **Fruits, vegetables, and grains**

Unlike Japan, China does not have a list of products banned from exportation. However, the country requires that all imported products must be accompanied by an official certificate (United States Department of Agriculture, 2019b). Specific products are also subject to traceability, set to begin by the end of the 13<sup>th</sup> Five Year Plan (2020). These products include rice, wheat flour, infant formula powder, edible oil, and Chinese liquor. To import a product, importers must submit their national standards, which will be reviewed to see if they comply with China’s. China has a positive list system for food additives and nutritional fortification substances meant for enhancing nutrition. If producers use an additive or fortification substance not on the positive list, the process becomes exponentially more difficult, so it is better to ensure compliance before production if China is a desired market. Pesticides and other contaminants are better low in toxicity and highly efficient, as there are residue limits for vegetables and special agricultural products. As for packaging, food for direct consumption must have small packaging using non-toxic and clean materials. Not to mention, post-production processes must also be safe and clean.

Some foods are subject to on-site inspection (United States Department of Agriculture, 2019b). These are foods used for infant formula, meat, seafood, rice, and bulk vegetable oil. Food used for special medical uses and health foods are included in this category and will be touched on later. These foods require facility registration as Overseas Manufacturers of Imported Food. Besides standard labeling such as product, ingredients, producer etc., labeling should follow product-specific regulations. For our purposes, we will focus on vegetable oil and grain regulations. If producers want to register vegetable oil, they must meet test report standards. If the product is a GMO derivative, producers must file for a GMO label and have an Agricultural Biotechnology Safety Certificate. Grains must also register for overseas production. These products are subject to on-site inspection, may have to verify documents, and may be detained by GACC. Also worth noting, soybeans, rapeseed, cottonseed, and tomatoes that have any way been tampered with through biotechnology are under strict oversight.

In 2014, the old regulatory body AQSIQ (pre-existing GACC) established the Cross Border e-Commerce (CBEC) import channel (United States Department of Agriculture, 2019b). Through the CBEC, China could import directly from foreign suppliers through certain ports of entry and sell CBEC goods for significantly less than the same goods imported through traditional means. Inspection procedures, collection duties, and national registration policies vary depending on the pilot zone. For LLDCs and least developed countries, exporting to China through the CBEC would be the least time and money intensive process. A “positive list” of 1,321 goods has existed since 2016. Of these goods, about 150 are good and agricultural products. Exporters through the CBEC may bypass certain regulations. They do not have to submit an import license to Customs, and they can keep the original packaging without translating to Chinese. However, if not on the positive list, products will not be granted entry.

### Organic certification

Foods hoping to have the title “organic” on the packaging and label must attain an Organic Certification (currently inaccessible) (United States Department of Agriculture, 2019b). To gain approval, the content of the organic ingredients must be equal to or above 95 per cent, and the producers must follow national standards for production, processing, labeling and distribution, as well as comply with food safety regulations.

### Nutraceutical standards

Health foods and foods used for special medical purposes are considered special foods in China. As previously mentioned, these products are subject to on-site inspection, may have to verify documents, and may be detained by GACC (United States Department of Agriculture, 2019b). Currently, there are 17,279 approved health foods, 785 of which are imported (CIRS). In order to be recognized as a health food, producers must obtain a Health Food Approval Certificate. If a producer wants to export to China through the CBEC, they must register the product prior to import (unique to special foods).

Currently, the registration process for health foods is inaccessible, so interested producers should consult a Chinese contact. There are currently 18 registered foods with special medical purposes as well. Though the list is currently unavailable, interested producers should look into the registration process and requirements for such a label. With the revised Food Safety Law in 2015, China has implemented a notification system of products that use approved domestic health food ingredients and imported vitamin and mineral products. Dietary supplement producers can apply for their ingredients to be added to both the health claim catalog and ingredient catalogue for dietary supplements (Binns, 2018).

## 6.5 Korea

Korea is quite similar to Japan and China in that it has a long history of medicinal plant and herb use and has a population interested in such products. Korea is known for marketing youth for cosmetics, so it is not such a stretch to believe health foods would also be desired. Korea is much more open to exporters than Japan and more organized than China, making it a desirable export destination. Although Korea has equally strict regulations, the Ministry of Food and Drug Safety has neatly outlined the steps for interested exporters (Ministry of Food and Drug Safety, 2019). For companies from LLDCs and Least Developed Countries looking to export to Asia, Korea’s openness to all processed foods and agricultural exports makes it a desirable option.

Korea holds both domestic and foreign producers to high standards. The Ministry of Food and Drug Safety expect domestic producers to run routine self-quality inspections and overseas manufacturers are subject to overseas on-site inspections when they high-volume importers or have defective products (Ministry of Food and Drug Safety, 2019). There are some additional standards for health functional foods and organic that will also be touched on here. Even after distribution, Korea has a commitment to its consumers. The government monitors exaggerated and false advertising that claims therapeutic effects or medicinal benefits. Also, Korea hopes to gain consumer participation in sanitation monitoring.

### Fruits, vegetables, and grains

Because all processed and agricultural products are allowed into Korea, there are many in-depth levels of clearance Korea uses to grade imports. Registration is required for all overseas manufacturers, as well as on-site inspections (Ministry of Food and Drug Safety, 2019). Grades are given based on these inspections. At Customs, producers and their products are subject to document review, field tests, lab tests, and random sampling. Korea follows a preliminary import inspection system using OPERA to categorize products into grades. It takes into account importer history and inspection results. Even after producers pass their inspection, products are still subject to traceability. This is especially the case for functional foods and other food selling businesses. Korea uses the HACCP system to analyse management of harmful substances found in raw materials, though only some foods like frozen foods must go through

this. The final step is distribution. However, the Korean government is constantly looking for ways to quickly locate unsafe foods. For this reason, 85 inspection facilities conduct annual collections. To protect consumers, the Korean government has also worked on blocking recall foods at store checkouts.

### Organic certification

Korea's idea of organic is the same as the United States' standards. Currently, Korea has an US-Korea Organic Equivalency Agreement, so those products coming from the U.S. may use the organic label without any additional certification (United States Department of Agriculture, 2018b). For those non-equivalent countries, that being most LLDCs and least developed countries, certification is necessary. The New Organic Act requires all domestic and imported organic products to gain clearance from a MAFRA/NAQS-accredited certifying agent. As of today, there are 16 certifying agencies in Korea and two foreign certifying agencies. Producers must first submit their food item manufacturing report, application, and organic handling plan. If there are no issues during the document review, then two inspectors conduct an on-site inspection.

It is important to note that on-site inspections happen regularly even after companies receive organic certification. Korea has two available certifications for organic produce, these being organic and no-pesticide. Finally, trademark registration in Korea follows a "first to file system" (Korea Organic). Country of origin labelling and origin verification investigations are common and should be expected if exporting to Korea, whether the product may be food, agricultural products, or dietary supplements.

### Nutraceutical standards

Korea is very adamant about Health Functional Foods meeting predefined standards. Those looking to produce functional foods must submit their products for review against the standards by the Health Functional Food Deliberation Committee (Ministry of Food and Drug Safety, 2019). If the business operator receives recognition, then they are free to move forward with using their ingredient within the regulatory means. Korea has a list of functional food products already on the market produced by domestic and foreign (importing) manufacturers. The Excellent Health Functional Food Manufacturing Standard is not mandatory application. However, the Korean Ministry of Food and Drug Safety states that those who meet the standard can "manufacture on commission from health functional food venture companies or health functional food distributors and sellers" (Ministry of Food and Drug Safety, 2019). Producers should also keep in mind that their health functional foods with sales exceeding a certain level are subject to traceability and should therefore be diligent in following regulations.

## 6.6 India

Dietary supplements make up over 65 per cent of nutraceutical products sold in India and demand is growing at circa 17.5 per cent per year and is likely to increase to 22 per cent per year (Rajat Yadav, 2010). The COVID pandemic is further driving growth in this nutraceutical sector having benefits to immune system or having health claims. The current nutraceuticals and functional food imports into India are reportedly US\$2.7 billion which represents 65 per cent of the current US\$4 billion Indian market. This could provide an US\$11.5 billion market by target 2025 (Rajat Yadav, 2010).

India has a policy-led functional food growth as the government is focused on improving the nutritional status of the population. For example, the Integrated Child Development Services (ICDS), National Health Mission (NHM), and the mid-day meal scheme are all focused on improving the nutritional status of the Indian population. The allocated Union budget was increased by 35,600 crores (US\$547,750 million) for the nutrition related programmes. The drive by the Indian regulators to increase the awareness of healthy products is resulting in the increased growth of nutritional additives/supplements as a category. Moreover, there is a move to include nutraceuticals alongside normal medical treatment in a combined treatment plan. Functional foods/nutraceuticals may be used as part of a range of interventions e.g., paediatric, geriatric and pregnant women. An alternative market for the medicinal plants to consider may be healthcare professionals through the same channels that promote pharmaceuticals.

Based on current trading partners, India appears to be the most accessible to LLDCs. Multiple regulatory agencies in charge of import regulations and food standards exist in India. It is up to those exporting companies to check regulations that pertain to their specific product and follow-up with the relevant regulator. The main law is the Food and Safety and Standards Act of 2006, which was updated in 2011 (United States Department of Agriculture, 2019a). The law now specifies packaging and labelling requirements, lab and sampling analyses, food additives, product standards, licensing and registration, and maximum residue levels of contaminants. India is still in the process of updating its laws.

Unlike domestic producers and importers who must have a FSSAI license to do business in India, foreign companies do not require a license to export food products to India (United States Department of Agriculture, 2019a). This has been beneficial for Land Locked and least developed countries like Bhutan and Nepal, who mainly export to India. It is up to importers to register with DGFT. However, although there is no requirement to register products formally, exporters should be aware that once their product hits India's market, products are subject to random monitoring at the retail and wholesale levels.

India's import regulations and labelling requirements are similar to Japan, China, and Korea in import procedures and requirements. Importers must present import declarations, a license and phytosanitary certificate, sales invoice, and freight and insurance certificates (United States Department of Agriculture, 2019a). Product sampling and lab tests may be necessary for some products. If such testing leads to approval, then labelling becomes the next barrier. Insufficient labeling could lead to immediate rejection. India adheres to general labelling requirements, which include product name, country of origin, including the manufacturer's name and complete address, and nutritional information is necessary (United States Department of Agriculture, 2017). Additional mandatory labelling includes a vegetarian/non-vegetarian distinction symbol. These documents and any package labelling should be in the official language English or Hindi. India has a list of suggested packing material for certain products, but only requires that materials are food grade quality, tamperproof, and generally safe for distribution. Wholesale packaging must include a FSSAI logo and license number. The only exceptions to these rules are imported loose or unbranded products sold for retail.

India states that it has a duty to protect well-known trademarks, service and collective marks. They have extended the period of protection from seven to ten years and have increased the penalty for trademark infringement. However, in India, implementation and enforcement of trademark protections remains a challenge. India is moving towards improving its enforcement of intellectual property rights, which at the moment is considered very weak. Foreign firms can register their trademarks by applying at the Office of the Registrar of Trademarks but should be mindful that approval takes three to five years. Also, despite the existence of the existence of the Intellectual Property Rights (Imported Goods) Enforcement Rules of 2007, protection is not guaranteed.

### **Fruits, vegetables, and grains**

No plants or plant products may enter India without meeting phytosanitary conditions. India does have a list of countries banned from exporting certain varieties (*The Gazette of India*, 2019). Some of these banned regions are as broad as Africa and South America. India also has categories of restricted imports that require recommendation of authorized institutions. Such products include banana, cassava or tapioca, citrus, cocoa, coconut, coffee, walnut, groundnut, potato, rice, sugarcane, and sweet potato. Other food products are permitted but require additional declarations and special conditions. These plant products require a phytosanitary certificate from the country of origin, and a permit from the Director of the National Bureau of Plant Genetic Resources for those exporting GMO products.

Like other Asian countries, India has a list of banned or restricted pesticides and food additives that manufacturers looking to export to India. Raw agricultural products are the only commodities exempt from nutritional labelling, but they should still follow all other labeling specifications.

### **Organic certification**

Foods that meet organic standards must have an FSSAI organic logo on all primary labeling (United States Department of Agriculture, 2019a). The organic-certified foods must also have a certification or quality

assurance mark of the National Programme for Organic Production of Participatory Guarantee System for India. India considers the National Programme for Organic Production and the organic standards of some countries equivalent to India's standards. Those that meet equivalency do not require recertification. Producers should be aware that India mandates traceability up to the producer level, so any violations could lead to repercussions.

### **Nutraceutical standards**

India has differentiated between nutraceuticals, fortified foods, health supplements, food for special dietary uses, etc. in the Food Safety and Standards (Health Supplements, Nutraceuticals, Food for Special Dietary Use, Food for Special Medical Purpose, Functional Food and Novel Food) Regulations of 2016 (Agarwal, 2016). These regulations went into effect as of January 2018. India specifies that plants and botanicals in their whole or juiced form do not count as health foods. However, those botanicals that have been concentrated into capsules, tablets, pills, sachets, jelly or gel, and semi-solids or from which extracts are taken do count. Concentrates are considered health supplements, while nutraceuticals are those products that "provide a psychological benefit and help maintain good health" (Agarwal, 2016).

Other health foods may have dietary uses taken under medical advice. In general, these health foods can make health claims as long as they contain "NOT FOR MEDICINAL USE" on the packaging and include side effect warnings along with words specific to the kind of health food, such as "NUTRACEUTICAL". Nutritional claims may also appear on the label, but such claims cannot falsely advertise medicinal benefits. India has a specific list of ingredients that can be considered and used in health food production, which interested manufacturers should consult if they wish to export to India. Nutrients for which manufacturers make claims must account for more than 15 per cent of the recommended daily allowance and also meet acceptable daily usage levels.

## **7. Conclusions and recommendations**

The objective of this study is to explore the potential of exports of nutraceutical products, which are basically health foods (more technically known as "functional foods") and food supplements, generally known as nutraceuticals, from LLDCs. The expansion, diversification and upgrading of exports has proven to be a crucial dimension of economic development and structural transformation. While the East Asia economies relied on manufactured exports to push their industrialisation and economic development agenda, research conducted by UNCTAD over the last decade has shown that agriculture can also similarly be an important driver of growth and industrialisation (e.g., UNCTAD, 2008; 2009; 2017). More recently, the potential of "Industries Without Smokestacks" to spur economic development has become more widely acknowledged (Newfarmer, Page. and Tarp, 2018).

As explained in Golub, O'Connell and Du (2007), in many ways, agricultural exports resemble manufacturing much more than mining or petroleum extraction. The latter are capital-intensive, rely on the existence of mineral deposits, and do not involve much learning-by-doing. On the other hand, agriculture, like manufacturing, is generally labour-intensive, and depends on maintaining quality standards to attain global competitiveness and provides scope for technological upgrading by improving quality and meeting stringent sanitary and phyto-sanitary requirements of developed country food markets. By participating in agricultural value chains, LLDCs can create similar linkages into the global economy to those formed by industrial value chains. Moreover, LLDCs may have or can develop competitive advantages in agriculture that they lack in manufacturing, stemming from favourable climates and geographies for growing some products. Improving the quality of their produce or moving up the value chain into agro-processing provides opportunities for developing countries to boost incomes and employment. This is true of both health foods and nutraceuticals.

This report has focused on a particular sector that features elements of both agriculture and manufacturing: the production of health foods and nutraceuticals. As discussed in this report, the demand for health foods is rising rapidly in developed countries, and LLDCs are often well placed to supply them. However, more than other agricultural products, quality control and reliability are essential for products claiming

health benefits beyond their nutritional content. This poses both challenges and opportunities for LLDCs to upgrade their production and marketing capabilities. Furthermore, high-income consumers of health foods increasingly prioritize not only the quality of the product but also the social and environmental conditions of the production process. This includes the living standards of the workers in developing countries and the environmental sustainability of growing practices.

For example, Young Life, one of the largest producers of Essential Oils, presents on its website the farms in which some of its oils are produced, including Ecuador, South Africa, Oman, the Philippines and China. It claims that “our quality standards are prioritized at each of our corporate-owned farms, partner farms, and Seed to Seal-certified suppliers” and “our commitment to creating pure, potent essential oils and products through environmentally conscious methods also continues to grow”.<sup>71</sup> Thus, successful exporting of health foods and nutraceuticals can create a virtuous cycle of rising product quality and high earnings of developing country farmers and processors.

Fostering economy-wide productive capacities and addressing gaps and limitations observed in the UNCTAD PCI should be given a priority in the formulation and implementation of policies. This is critically important to harness the potential of nutraceutical products for trade diversification, jobs creation and poverty reduction. As explained in the introduction of this report, LLDCs typically face both natural and institutional challenges to joining agricultural value chains. In terms of geography, they are often far from the nearest port and they also have poor transport network. Climate change is exacerbating these difficulties as seen in the case studies, by altering levels or increasing the volatility of rainfall and temperatures. On the domestic institutional side, these countries often have fragile governance system with lack of accountability and poor infrastructure and public services. Roads in particular emerge as a major obstacle for agricultural exports in the case studies. At the global level, the high and rising regulations, and standards for food products in developed countries and even emerging markets are difficult to attain in most LLDCs. These natural and social obstacles often inhibit are foreign and local investment.

Yet the case studies also showcase the considerable potential in these same countries for developing or expanding exports of specialty foods and nutraceuticals. Some LLDCs are the best or only location for growing certain specialty foods or the ingredients in them. Examples include quinoa in the Andes, cardamom in mountainous South Asia and frankincense in Ethiopia. Further, indigenous populations are often repositories of information about growing and using products that they have used for centuries such as quinoa in Bolivia. Furthermore, well-to-do and globally informed consumers in developed countries are increasingly seeking alternatives to standard medicine. They also often want to help alleviate poverty, preserve traditional cultures and promote environmental sustainability in the most vulnerable countries in the world.

That is, they are seeking ways to promote their own health while also contributing to the well-being of people in producing countries. Relatedly, social entrepreneurship is a rising area of interest to students in business schools and there has been a burgeoning of NGOs and private investors who aspire to assist poor countries while creating successful enterprises. These social entrepreneurs may be from LLDCs themselves but have experience with international firms and have cutting-edge management skills and networks. The French cosmetics firm L'Occitane's role in developing and using shea from Burkina Faso was mentioned above. Another example is Andean Naturals, one of the main companies exporting quinoa from Bolivia. The company was founded by a Bolivian who attended the University of California business school. It is based in California with offices and processing operations in Bolivia.

What can LLDCs do to overcome the obstacles and take advantage of the opportunities? The case studies provide several avenues that are summarized below:

### **Attract foreign direct investment and global buyers**

The demanding quality requirements for nutraceuticals and the ingredients therein require state of the art growing and processing techniques. Foreign companies have these skills. They will pay premium

<sup>71</sup> [https://www.youngliving.com/en\\_US/company/about/younglivingfarms](https://www.youngliving.com/en_US/company/about/younglivingfarms)

prices to farmers for high quality produce. For example, L'Occitane, the pioneering cosmetics firm in the shea butter market, requires all cooperatives it works with to adhere to the Ecocert sustainability and quality standards. L'Occitane pays roughly double the local market price per kilogram of butter, more than offsetting the costs of annual certification, advanced processing equipment, and hiring experienced managers. It is essential to attract and partner with such companies. This does not mean large subsidies which are often misused and unaffordable for LLDCs. Instead, the most important consideration is to create a hospitable environment for entrepreneurship, both international and domestic. Barriers to FDI such as limits on the share of companies owned by foreign investors should be removed except perhaps for a few strategic sectors.

### **Improve the overall business climate**

To foster both FDI and local entrepreneurship—and collaboration between them—the overall business climate should be improved. While it is unreasonable to expect the quality of infrastructure and public services to be as high in LLDCs as developed countries, reducing the complexity and cost of registering businesses and handling containers need not be expensive. Investment in infrastructure is costly and governments must prioritize. The case studies show that roads connecting agricultural areas are a high priority. A reliable supply of electric power is also essential for all facets of production including cold storage facilities. Foreign investors usually can source in alternative locations and will go where they feel most welcome and are most productive. A case in point is the departure of Lotus Foods from Bhutan where they were sourcing red rice production in favor of Madagascar.

### **Technical assistance from NGOs and international organizations**

The product case studies discussed in this report have revealed numerous instances where beneficial collaboration between international aid agencies and farmers and governments have led to winwin outcomes. For example, the regional research center International Centre for Integrated Mountain Development (ICIMOD) and Environment Conservation and Development Forum (ECDF) in conjunction with the Rural Livelihoods and Climate Change Adaptation in the Himalayas (Himalica) Program have been helping farmers in Bhutan and Nepal adapt to the changing climate and properly manage their cardamom plantations. In Bhutan, the Himilaca program has developed 12 pilot demonstration farms to teach by example through on-site coaching and training in crop management. These demonstration farms emphasize the use of weather tolerant crops and best management practices. The program encourages farmers to use intercropping to maintain soil nutrients and diversify into nitrogen-fixing beans. Keeping with Bhutan's commitment to minimal environmental impact, the Himalica program promotes the use of improved dryers that require less fuel wood. By using less wood, farmers can shrink their carbon footprint.

### **Environmental preservation**

As noted above, most LLDCs have the crucial advantage of propitious natural environments for some specialty foods. In many cases, however, the trees or plants that are the source of nutraceutical products are under severe stress due to neglect or overuse, exacerbated by climate change. Frankincense has sturdy drought resistant bark and its ability to grow and prevent erosion in rocky, steeply sloped where few other trees can thrive. Frankincense is thus well suited to Ethiopia's landscape as well as highly prized for its medicinal properties. Yet frankincense production in Ethiopia is threatened by illegal conversion of forests into farmland and over-tapping of trees. It is imperative that governments take steps to preserve the sustainability of the soil and forests. At a local level, cooperatives can help implement better practices but oversight by a central authority is also required.

### **Support cooperatives for small farmers**

Cooperatives have proved to be very positive forces for organizing smallholder farmers and providing local public goods. The economic advantages of cooperatives involve pooling of resources to mitigate risk and diffusion of knowledge to improve productivity and quality. Agricultural cooperatives have been particularly vital to informing farmers about the importance of quality inputs and facilitating their access

to inputs. Cooperatives played a large role in enabling Bolivian farmers to produce quinoa for export by raising standards and adopting sustainable farming practices. Beyond production improvements, cooperatives have also been helpful in increasing the quality of life across the board in rural communities. The cooperative model is based on democratic decision making among the small farmers in the cooperative and, consequently, it results in an institution that is tied directly to the local communities. As a result, cooperatives tend to be responsive to the communities' needs. In addition, cooperatives often serve as a countervailing force to government agencies and processors. Indeed, in Bolivia and elsewhere cooperatives are structured like unions. The cooperative headquarters supports interactions at the multinational level and secures fair prices leaving the local village cooperatives to conduct the day-to-day activities of cooperatives.

### **Leverage trade associations**

Trade associations can help organize production and distribution. As shown above, the Azerbaijan government has prioritized this approach, notably in hazelnuts. The Azerbaijan Hazelnut Exporters Consortium (AHEC) is composed of the five major companies involved in the processing and exporting of Azerbaijani hazelnuts. The consortium organizes collection of hazelnuts from 12,000 small Azerbaijani farms and promotes greater market access for the export of Azerbaijani hazelnuts. The consortium also promotes modernization of production techniques and food safety standards that meet the norms of developed countries. A possible downside is excessive market power of associations.

### **Develop competent government extension and quality control services**

LLDCs should build the institutions and programs necessary to assist local firms in raising productivity and meeting quality norms. Many small farmers lack the knowledge and capabilities required for enhancing-productivity and managing sanitary-improving technologies. Information about quality inputs, notably seed and fertilizer is important. In the past decade there has been a global shift in food regulation from policing to facilitating. Instead of punishing violations, developed country food safety agencies now focus on working with producers to prevent incidents. LLDCs can move forward by developing their own domestic food safety agencies that could partner with developed country counterparts. These agencies can help facilitate cooperation between different stakeholders in the agricultural industry. Of course, it is not sufficient to create more of the underfunded agencies that unfortunately have proliferated in some LLDCs. Agencies must be staffed by professionals with up-to-date expertise in agriculture and be shielded from political favouritism.

### **Greater mechanization**

While developing countries should take advantage of their abundance of labour wherever possible, in some cases artisanal cultivation and processing technologies have very low productivity and provision of equipment for harvesting, washing, and threshing can make the products more competitive, as demonstrated in the case of teff in Ethiopia.

### **Marketing assistance**

Some LLDCs, depend heavily on one or a few foreign markets. For example, Bhutan and Nepal both depend very heavily on India. This is due in part to the dominance of Indian traders in handling Bhutanese produce. This partly reflects lack of information available to farmers and cooperatives on alternative markets. Foreign companies from developed countries are well placed to assist diversify market access. Establishing trade offices abroad may be useful, as in the case of Azerbaijan.

### **Develop organic production**

A fast-growing niche market, organic-certified produce has become a significant sub-sector of the produce market in developed countries. Over the past decade, health food stores have shifted their sourcing to largely or exclusively to organic produce, and most large supermarket chains now allocate a meaningful percentage of their produce stocks to organic produce. Many traditional small farmers do not use chemicals,

so they are already organic *de facto*, but not certified as such. The organic market presents a lucrative opportunity to producers in LLDCs, but organic certification is an intensive and time-consuming process. The primary constraint for many smallholder farmers seeking certification is the difficulty of switching to non-pesticide-based pest management. A significant investment is required to deploy systems like integrated pest management, and if done improperly the entire harvest can be put in jeopardy.

### **Expand processing where appropriate**

The extent to which processing of produce into nutraceuticals is feasible for LLDCs varies by country and product. Countries should only promote local processing where the processes are not overly complex and capital-intensive. For example, sesame hulling provides a viable value addition with noticeable price premiums and little capital-intensity unlike the production of sesame oil. In general, successful processing requires partnerships with foreign companies with specialized expertise. For Burkina's sesame processing, the country is assisted by the NGO Lutheran World Fund and the vegetable oil company Olivera. Processing of frankincense in Ethiopia is not a high priority given the high prices the country can obtain from unprocessed exports; the main priority is to preserve the frankincense trees, as noted in this report.

### **Facilitate the participation of women in the development, production and sales of nutraceuticals**

Access of the poor and women to productive assets such as land and capital are critically important for effectively and fully harnessing the potential of nutraceuticals for jobs creation, poverty reduction and sustainable growth and development. Deliberate policies and concrete actions are necessary to promote, particularly gender equality, improve the productivity and growth prospects of nutraceuticals development and value-addition across the countries discussed in this study. Gender-based obstacles highlighted through the Burkina Faso case study on the shea sector are typical for the agriculture sector in developing countries more broadly, while gender-based obstacles can be found in all sectors and all countries. To move towards a level playing field it is necessary to remove such gender-based obstacles and entry barriers to the poor. These should include legal reform of land tenure; bans on gender-based discrimination in marketplace settings; establishment of well-resourced funds to address gender inequality, including providing capital funding for female-led projects; creation of land-purchasing cooperatives for women; subsidies for female farmers to reduce dependence on male family members; targeted training offer for women, adjusted to their time-poverty and schedules dependent on reproductive and care responsibilities; creating platforms and networks supporting linkages and provision of market intelligence for female entrepreneurs, among other actions. These actions are also necessary to target poor households and other vulnerable sections of the society who lack productive assets due to unequal distribution of land and capital.

### **Consider registering geographical indications or trademarks**

LLDCs should consider the use of Geographical Indications or trademarks to support the branding and marketing of their nutraceuticals.<sup>72</sup> In doing so, LLDCs should weigh the potential costs of implementing Geographical Indications or trademarks (including supporting the collective organization of producers and processors, setting up Codes of Practice, establishing marketing and surveillance mechanisms) with the potential benefits in terms of greater economic profits, fostering quality-production, strengthening collective action, as well as improved management of biodiversity resources. Ideally, efforts to register Geographical Indications or trademarks should be part of a broader marketing and sustainability strategy. This requires establishing a reputation for quality and reliability and, very likely, partnering with foreign firms who have the marketing expertise and connections to successfully establish a brand. An example is the US-Bolivian company Andean Naturals in Bolivia which has established brands for quinoa such as Royal Quinoa. LLDCs can also request technical assistance from a range of United Nations bodies for the implementation of Geographical Indications.

<sup>72</sup> For more information on the potential of Geographical Indications for agricultural products in LDCs see UNCTAD, 2015b.

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