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MORE AND BETTER JOBS FROM CROPS AND TREES IN MOZAMBIQUE

Christopher Delgado, Carlos Costa, and Federica Ricaldi



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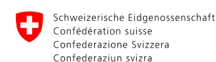
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The present volume updates the figures in the original studies, puts the 3 studies in the context of other recent work on factors affecting rural livelihoods in Mozambique including trade developments and climate events such as cyclones Idai and Kenneth, and synthesizes insights for advising Mozambican policymakers going forward. The authors would like in particular to acknowledge the cheerful and careful help received from Jorge Cesar Ramirez Mata, consultant in the World Bank Jobs Group, who updated the figures in the report from the most recent relevant surveys in Portuguese available in Mozambique and helped ensure consistency across the document. They also gratefully recognize excellent editorial assistance from Aldo Morri.

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FOREWORD

Good jobs are the surest pathway out of poverty. Over the last decade, rising labor incomes directly accounted for 40 percent of the drop in poverty worldwide; and much of the rest was due to falling dependency ratios, which are also causally linked to better jobs. The scale of the challenge is enormous. Sub Saharan Africa has almost 250 million of youth aged 15-24 in the labor force, mostly in bad jobs. So, creating better jobs is the number one policy preoccupation.

Mozambique is no exception. Almost half of Mozambicans are living below the poverty line, so increasing the return to their labor is a major challenge. In addition, there are around half a million new labor force entrants looking for jobs every year. These school leavers are likely to want better remunerated and more formal types of employment. Much hope has been generated by the prospects for rapid growth from massive investments in the oil and gas sector. Yet these investments will be very capital-intensive, so only a small number of new job seekers will directly benefit.

Meanwhile, agriculture accounts for 70 percent of jobs in Mozambique. These are mostly low productivity activities on smallholder farms. However, agricultural and food value chains also account for roughly one-quarter of total formal sector employment. It is inescapable that agriculture and agribusiness, including processing and marketing, will need to provide a large share of new jobs in Mozambique for the foreseeable future. The challenge will be to ensure that a rapidly growing share of those new agricultural jobs are better jobs, with higher remuneration and greater stability.

This book focuses on entry points for creation of better jobs through agricultural value chains and lays out the policy implications, using cassava, cashew, and plantation forestry as examples. It is based on case studies carried out in 2018-2020 by the World Bank Jobs Group as part of the multi-stakeholder Let's Work Program in Mozambique. Let's Work is a global partnership encompassing over 25 private sector organizations, international financial institutions, multilateral development banks, and bilateral donors focused on supporting private sector-led job growth.

The study documents opportunities for creating more and better jobs, often in formal employment, linked to the cassava, cashew and plantation forestry value chains. Cassava in Mozambique is currently a traditional subsistence food crop; cashew is a struggling traditional export crop; and plantation forestry is a relatively new sector. However, the study also argues that to realize these opportunities Mozambique requires proactive public policy and investments to overcome significant challenges such as: climate change; over-concentration in current export market destinations; and the unintended side effects of some public policies. The study is focused on promoting an enabling environment for private sector growth in these value chains. It aims to inform ongoing debates about how agriculture and improved natural resource management can contribute more to economic transformation in Mozambique.

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ABBREVIATIONS

ACi	African Cashew Initiative
ACIANA	<i>Associação Comercial-Industrial e Agrícola de Nampula</i> (Nampula Commercial, Industrial and Agriculture Association)
AFR100	African Forest Landscape Restoration Initiative
AICAJU	<i>Associação dos Industriais de Cajú</i> (Cashew Industry Association)
CAGR	Compound Annual Growth Rate
CAP	<i>Censo Agro-Pecuário</i> (The National Agricultural and Livestock Census)
CAVA	Cassava: Adding Value for Africa program
CdM	<i>Cervejas de Moçambique</i> (Beers of Mozambique)
CGIAR	Consultative Group for International Agricultural Research
CNSL	Cashew Nut Shell Liquid
DADTCO	Dutch Agricultural Development and Trading Company
DUAT	<i>Direito do Uso e Aproveitamento da Terra</i> (land use rights license)
EU	European Union
EMBRAPA	<i>Empresa Brasileira de Pesquisa Agropecuária</i> (the Brazilian Agricultural Research Corporation)
FAO	Food and Agriculture Organization of the United Nations
FAOStat	Food and Agriculture Organization Online Statistical Database
FO	Farmers' Organization
f.o.b.	"free on board" or export price at the border after loading, not including charges, interest and freight beyond the border of the producing country
GDP	Gross Domestic Product
GIZ	<i>Deutsche Gesellschaft für Internationale Zusammenarbeit</i>
GOM	<i>Governo de Moçambique</i> (Government of Mozambique)
HAACP	Hazard Analysis Critical Control Point
HQCF	High Quality Cassava Flour
IAI	Inquérito Agrícola Integrado, Ministry of Agriculture and Food Security (Integrated Agricultural Household Survey starting 2014, see TIA below for earlier surveys).
IFAD	International Fund for Agriculture Development
IFDC	International Fertilizer Development Center
IIAM	Instituto de Investigação Agrária de Moçambique (Mozambique National Institute of Agronomic Research)
IITA	International Institute of Tropical Agriculture
INC	International Nut and Dried Fruit Council
INCAJU	<i>Instituto de Fomento do Cajú</i> (Cashew Development Institute of the Government of Mozambique)
INNOQ	Instituto de Normaçoão e Qualidade de Moçambique (Mozambique National Institute for Standardization and Quality Assurance)
IOF	<i>Inquérito sobre Orçamento Familiar, Instituto Nacional de Estatística</i> (National Household Survey, Mozambique National Statistical Institute).
KOR	Kernel Outturn Ratio

MADER	Ministry of Agriculture and Rural Development (successor to MASA and MITADER in 2020)
MASA	<i>Ministério da Agricultura e Segurança Alimentar</i> (Ministry of Agriculture and Food Security, merged with MITADER into MADER in 2020)
MEDA	Mennonite Economic Development Associates
MIC	<i>Ministério da Indústria e Comércio</i> (Ministry of Industry and Trade)
MITADER	<i>Ministério da Terra, Ambiente e Desenvolvimento Rural</i> (Ministry of Land, Environment, and Rural Development, merged with MASA into MADER in 2020)
MozFIP	The Mozambique Forest Investment Project or <i>Projecto de Investimento Florestal em Moçambique</i> of the GOM, funded by the World Bank
MSU	Michigan State University
mt	Metric Tons, or more simply “tons”
MZN	Mozambican Metical/Meticais (national currency)
NEPAD	New Partnership for African Development
NGOs	Non-Governmental Organizations
NRI	Natural Resources Institute, University of Greenwich, U.K.
PEDSA	<i>Plano Estratégico para o Desenvolvimento do Sector Agrário 2011-2020</i> (Agricultural Sector Strategic Development Plan)
PODERS	Programa Operativo para Dinamização da Economia Rural Sustentável 2020-2024 (Draft Program for Sustainable Transformation of the Rural Economy)
PPP	Public-Private Partnership
PROSUL	Pro-poor Value Chain Development Project of IFAD
R&D	Research and Development
RCN	Raw Cashew Nut
REDD+	United Nations Reducing Emissions from Deforestation and forest Degradation Plus program
SADC	Southern Africa Development Community
SARRNET	Southern Africa Root Crops Research Network
SDAE	<i>Serviço Distrital de Actividades Económicas</i> (District Services for Economic Activities)
SEBRAE	<i>Serviço Brasileiro de Apoio às Micro e Pequenas Empresas</i> (Brazilian service for assistance to micro and small enterprises)
SNV	Dutch NGO operating with the IFAD program PROSUL
SSA	Sub-Saharan Africa
SUSTENTA	The Integrated Agriculture and Natural Resources Management Project of the GOM, funded by the World Bank
SWOT	Strengths, Weaknesses, Opportunities and Threats
TIA	<i>Trabalho do Inquérito Agrícola</i> , Ministry of Agriculture and Food Security (national survey of smallholder agriculture to 2013, see IAI above for 2014 onwards)
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WB	World Bank



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1. CONTEXT AND ISSUES IN IMPROVING RURAL JOBS AND INCOMES

1.1 INTRODUCTION

A. OBJECTIVES

This volume synthesizes insights from work on agricultural and plantation forestry value chains in Mozambique with new contributions from 3 World Bank studies since 2017 under the Let's Work Program (LWP). These concern value chains for cassava, cashew and plantation forestry and their potentials for creating jobs¹. It will attempt to put these in the context of other recent studies on value chains concerning other crops and livestock products in Mozambique. The book will look briefly at experience in Mozambique in 2019 under cyclones Idai and Kenneth in the context of their impacts on agriculture and livelihoods. Factors that affect the trading environment for Mozambican agriculture will also be examined for the chains in question. Insights will be sought on how livelihoods in these agricultural value chains can be made more resilient through policies and investments.

The focus throughout is on entry points for creation of more and better jobs through agricultural value chains and implications for policy in this regard, using cassava, cashew, and plantation forestry as examples. As such, it is hoped that the work will make a modest contribution to informing ongoing debates in Mozambique as to how agriculture and natural resource management can contribute better to transformation of the economy.

As part of its planning process for 2020-2024, the Government of Mozambique is developing an ambitious program for the rural economy in 2020-2024, the Programa Operativo para Dinamização da Economia Rural Sustentável 2020-2024 (PODERS, Program for Sustainable Transformation of the Rural Economy). PODERS aspires to align Government initiatives from sectors engaged in the development of the rural economy in Mozambique.

The Ministry of Agriculture and Rural Development (MADER) is developing PODERS with the Ministries of Land and Environment (MITA); Sea, Inland Waters and Fisheries (MIMAIP); Industry and Commerce (MIC); Minerals and Energy (MIREME); Tourism and Culture (MTC); Public Works, Habitation and Water Resources (MOPHRH); and Economy and Finance (MEF).

PODERS is structured around 5 strategic pillars with the objective of strengthening: (1) the effectiveness of policies and institutions; (2) sustainable agricultural productivity; (3) food and nutrition security; (4) the management and use of natural resources; and (5) more competitive value chains. The present study is offered as a modest

¹ Costa and Delgado (2019a), Costa and Delgado (2019b), and Serzedelo de Almeida and Delgado (2019).

contribution to informing pillar (5). However, it also contains relevant material on the possible contributions of the cassava, cashew, and plantation forestry sub-sectors to each of the other pillars.

B. RATIONALE AND ISSUES FOR THIS WORK IN MOZAMBIQUE

Mozambique needs more and higher-productivity jobs. This is the number one policy preoccupation in Mozambique. Roughly one-half million new workers, a number equivalent to 3.7 percent of the total 13.5 million persons aged 15-64 actively working in 2019, are expected to be looking for jobs each year, cumulatively, over the next decade (Mozambique INE 2020; World Bank 2020c; Lachler and Walker 2018). This mirrors trends in other African countries, where 200 million young people aged 15-24 years old are looking for jobs today. This will increase to 275 million each year by 2030, and 325 million by 2050 (Christiaensen 2019).

With 48 percent of Mozambicans living below the poverty line² in 2014/15 (Beegle and Christiaensen 2019), increasing the return to their labor within their current or new occupations is a major challenge. Conventional wisdom for the share of total employment on-farm in Mozambique is 71 percent of all jobs, based on 2014 data (Lachler and Walker 2018). Further, the share of the total number of poor engaged in production agriculture in Mozambique, as in the rest of Africa, is even higher (Beegle and Christiaensen 2019). Agricultural employment in Africa is typically thought of as traditional on-farm jobs that are informal in the sense of involving family or other local labor that is unwaged, without formal benefits, and usually associated with low material levels of living. This is overwhelmingly the case in Mozambique.

The breakdown is shown in Figure 1.1. The numbers suggest that formal sector on-farm work accounted for 3.1 percent of all jobs in Mozambique in 2014, compared to 15.7 percent for all formal sector work other than on-farm, including the public sector.³ More than 95 percent of on-farm agricultural production workers are thought to be primarily self-employed, own-account smallholder producers, with comparatively few employed as full-time wage laborers on someone else's farm (Lachler and Walker 2018). As will be shown in the commodity chapters using the most recent national survey data, this view is accurate in terms of full-time jobs, but tends to miss the importance of seasonal wage labor, which is massively important in terms of worker numbers.

If agricultural value chains are to absorb new workers, few are likely to be able to become full-time waged agricultural employees straight away. The figures above show that only 14.4 percent of all working adults aged 15-64 in Mozambique were full-time, waged private sector workers in all sectors in 2014, including 2.4 percent of all working adults aged 15-64 that were full-time, waged agricultural on-farm workers.⁴ Thus, the total number of waged, agricultural on-farm workers aged 15-64 is less than two-thirds of all new labor entrants per year.⁵

² That is, below US\$1.90/day in 2011 purchasing power parity.

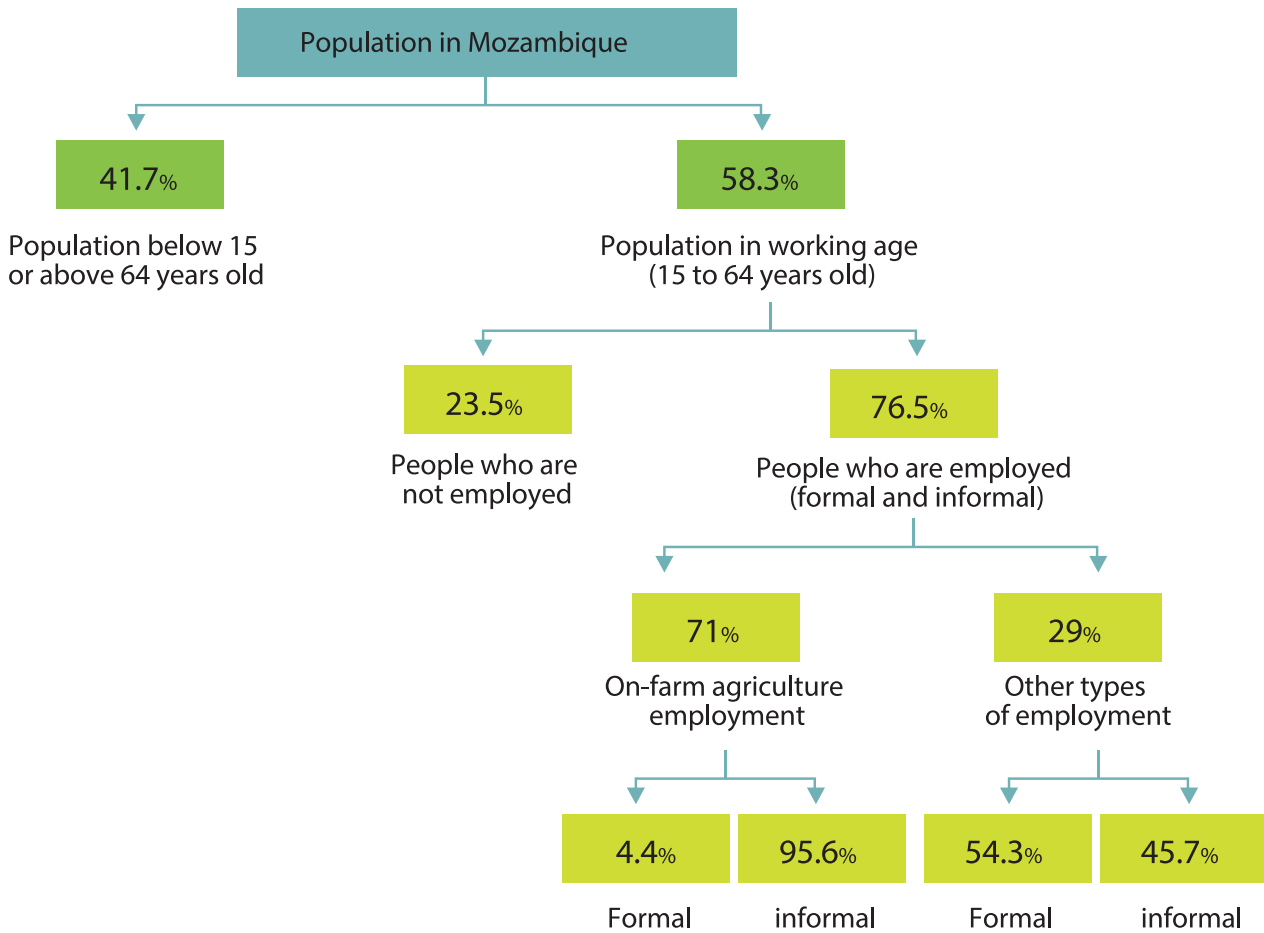
³ Calculated as 4.4 X 71 percent for on-farm formal work and 54.6 X 29 percent for all formal work off-farm.

⁴ From figures compiled from the Mozambique 2014 National Household Income and Expenditure Survey cited by Lachler and Walker (2018), includes employers of waged workers, and bearing in mind that only 76.5 percent of the age group were working.

⁵ Assuming a total Mozambican active labor force of roughly 13.5 million (2019) and 500,000 new entrants per annum.

FIGURE 1.1

The distribution of formal and informal work attributable to on-farm agriculture vs. non-agriculture in Mozambique 2014



Note: "Formal" includes waged workers and employers of waged workers.

Source: Lachler and Walker (2018) and calculated from data from Mozambique INE IOF 2015.

What happens in agriculture and the food system more broadly will be key for jobs overall and especially for better jobs, in the sense of waged jobs with regular pay and potentially some benefits beyond wages. Agricultural and food value chains off-the-farm in Mozambique include agricultural input provision, food storage, transport and marketing, wholesaling, food processing, retailing, and food services (such as restaurants). Somewhere between 25 and 30 percent of all waged work in Mozambique likely occurs in agricultural and food-related value chains, most it off-farm, based on broad national employment data and extrapolating the composition of agriculture and food non-farm employment from similar African countries.⁶ Food rather than traditional export crops account for most agricultural value added in Africa as a whole and in Mozambique specifically. Agricultural exports from Africa only amount to an equivalent value of 7 percent of the value of domestic food consumption (Christiaensen, 2019). In Mozambique in 2017, farmers sold only an aggregate by weight of about 5 percent of starchy staples produced (calculated from Mozambique, MADER 2020).

⁶ See Christiaensen (2019) for a review of the importance of waged post-harvest work in agriculture and food value chains in other African countries.

Application of the norm in Sub-Saharan Africa (SSA) of 25 to 30 percent of agriculture and food in total waged work to the 12 percent of the active Mozambican active labor force that were waged workers in 2014, between 3.0 and 3.6 percent of all Mozambican workers (waged and non-waged, in all sectors) in 2014 likely were employed in waged jobs in the non-farm part of agriculture and food value chains. Added to the 2.2 percent of the total national labor force in waged on-farm agricultural jobs in Figure 1.1, this implies that between 5.2 and 5.8 percent of all Mozambican workers (waged and non-waged, all sectors) have waged FTE jobs in agriculture and food value chains, farm and non-farm components combined.⁷ If new entrants get waged jobs in the same proportions as those already working, this suggests that agriculture and food value chains as a whole might provide an additional 27,500 new waged jobs per annum.⁸ The remaining 472,500 new entrants each year would need to look elsewhere, most probably informal agricultural work, urban unemployment, the urban informal sector, or quite rarely, a waged job outside agriculture and food.

The need for urgent action to promote the creation of more and better jobs in agricultural value chains is underlined by social unrest not explained by income inequalities alone, but surely aggravated by perceived lack of potential for greatly improved livelihoods, especially in remote rural areas. An example of this is the growing conflict in Cabo Delgado, once the most agriculture and food resource-rich provinces in Mozambique.⁹ It is urgent for Mozambican policy makers to focus on agricultural inclusion in economic growth.

Improving average labor productivity on-farm is key to creating both more and better jobs in agricultural value chains. Most farmers rely primarily on their own farms to feed their households, selling a small surplus each year, 5 percent on average per household in 2017, according to the IAI survey (Mozambique MADER 2020). Agricultural goods for marketing derive mainly from any surplus after farm families grow enough to be sure they have enough for their own household in a poor year. Average labor productivity in production agriculture in Mozambique is low. As shown in Table 1.1, it was only US\$530 in 2014 (constant 2010), 1.7 times in real terms what it was in 2003. By contrast, average labor productivity in the small industrial sector of Mozambique was virtually the same in 2014 compared to 2003, but still over ten times higher than in agriculture in 2014. In the service sector—important for the retail and hospitality part of agricultural value chains—average labor productivity was well over six times higher than in agricultural production in 2014, but only 1.4 times higher than in the service sector in 2003.

⁷ Interestingly, this simple estimate for Mozambique can be compared to the figure of 5.25% for the same variable for youth only in Africa that comes from multiplying an average of 21 percent of youth involved in agri-food systems by the separate average of one-quarter of them being waged; these figures are computed from a cross-country assessment of a very large number of employment surveys in Africa (Dolislager et al. 2020). This would suggest that our estimate for Mozambique is conservative.

⁸ The mid-point of the range 5.2-5.8 times 500,000 new entrants.

⁹ Attacks by jihadist insurgents started in 2017, while 2018 was the first full year of the conflict. More than 1,500 people had been killed by mid-2020, and at least 200,000 have had to leave their homes. Investments and agricultural livelihoods in the province are under increased threat. Poverty, unemployment, and lack of education have very likely allowed insurgent leaders to exploit feelings of bitterness and marginalization among local communities (Morier-Genoud 2020; Vines 2020).

TABLE 1.1**Average labor productivity in Mozambique by sector 2003-2014 (constant US\$ 2010 and ratios)
(constant US\$ 2010 and ratios)**

	Agriculture	Agriculture	Industry	Services	Industry/Agric
2003		318	5,046	2,413	15.9
2008		420	4,701	3,685	11.2
2014		530	5,643	3,424	10.7
2014/2003		1.7	1.1	1.4	

Source: World Bank Jobs Group CCSA data compiled in World Bank (2019f)

Even with all due disclaimers as to the comparability of data, it seems clear that average labor productivity in agriculture is still much lower than in industry and services but has been slowly catching up, due to lower average labor productivity growth in industry and services. Furthermore, the ratios of average per capita monthly earnings by sector are likely to be quite different than those based on average labor productivity, due for example to rural-urban (and thus sectoral) differences in subsistence income, capital endowment, and labor force participation. One consistent survey across the 3 main sectors dates from 2008 and shows average per capita earnings in services being 2.7 as high as in agriculture, and industry only 2 times as high as in agriculture.¹⁰

1.2 INSIGHTS FROM THE LITERATURE ON AGRICULTURAL VALUE CHAINS AND JOB CREATION IN AFRICA

A. THE KEY ROLE OF GROWING MARKET DEMAND FOR FOOD AS A DRIVER

In Mozambique as in other countries, more of the food system's jobs growth will be in food processing and food services as incomes rise and urbanization occurs; many of these new waged jobs will be within better reach of the poor, and often also of women.¹¹ This process of induced growth in employment in whole value chains will occur first and foremost where growth from other sources is occurring. In Mozambique, this will be predominantly in the South and particularly the greater Maputo region. It will also likely include other areas in proximity to the growth of natural gas extraction, processing, and shipping activities. Persons directly or indirectly involved with Total and ExxonMobil operations alone, when fully operational, are estimated to be likely to add effective demand for an additional 100,000 meals a day, requiring an additional 24 million eggs, 12,000 tons of meat, and 14,000 tons of fruits and vegetables a year (World Bank 2019c).

As in much of Africa, the food system share of waged and informal employment combined in Mozambique will steadily decline, though the absolute number of people employed in the food system still stands to increase for some time, as observed in other countries.¹² The focus of employment within the food system is also likely to change in favor of higher-paid waged jobs. In Eastern and Southern Africa in 2015, low-income countries by world standards, farming typically employed 91 percent of the labor force engaged in the food system, food services 6 percent, and food manufacturing only 3 percent (World Bank 2017b). In a middle-income country

¹⁰ World Bank Jobs Indicators Global Databank accessible at: <http://datatopics.worldbank.org/JobsDiagnostics>

¹¹ See a detailed numerical analysis of this for Uganda in World Bank (2018c) and for Tanzania in World Bank (2019b).

¹² "In Africa, More Not Fewer People Will Work in Agriculture" Jobs and Development Blog Post, November 12, 2018. Cited in Christiaensen (2019).

such as Brazil, the comparable figures are 49 percent in farming, 26 percent in services, and 25 percent in food product manufacturing (Ibid.).

The depth of the impact of rising and changing food demand on local agricultural production will depend on the ability of production systems to respond in quantity and quality and competitiveness vis-à-vis imports. While expanding, rising food production in Africa has not been able to keep up with demand; the value of African food imports has risen by about US\$30 billion over the past two decades. These include cereals as well as meat and processed food (Christiaensen, 2019). In Mozambique, income elasticities of demand for staple starches remain high in both rural (1.0) and urban (0.8) areas (World Bank 2019c). This implies for example that a one percent increase in income is associated with a one percent increase in consumption of staple starches in rural areas, suggesting that demand even for basic calories is far from saturated. Similar measures for meat are 1.3 for rural households and 1.5 for urban households (Ibid.). Although the estimation behind these numbers uses data from 2006, findings are commensurate with other countries at Mozambique's present level of economic development (World Bank 2017b).

The conditions for continued long-term growth of effective demand for food are favorable: present high annual population growth in Mozambique of 2.8 percent (World Bank 2019a) and urbanization of 4.6 percent¹³ result in continually robust demand growth for food. This is still very much the case for staples¹⁴ (and animal feed), but increasingly also for higher value and more protein rich and nutritious foods,¹⁵ as well as more processed and convenient foods (Tschirley et al. 2015). Vibrant agricultural value chains, needed to feed the cities, also employ a sizeable share of those leaving farms, often in better-paying jobs.

As has already happened in many other parts of the world, including all high-income countries and in the last 50 years middle-income East Asian and Latin American countries, food demand in Mozambique and surrounding countries is expected to continue to shift dramatically from rural diets of barely transformed staples to urban diets of highly processed and pricier horticultural and animal-sourced food products (Tschirley et al. 2015). The value of food consumption in Southern and Eastern Africa is expected to nearly triple by 2050, when 80 percent of foods purchased in the region are expected to be industrially processed (Ibid.). Increases in both income and the opportunity cost of the time of food procurement and meal preparation are observed globally as the global middle class rises (Frazao et. al 2008). These phenomena are then associated with a switch from consumption of lower priced to higher priced (more preferred) calories and of processed as opposed to unprocessed foods (Ibid.). Nothing indicates that this will happen differently in Mozambique.¹⁶

By 2050, it is projected that SSA as a whole will need to import one-third to one-half its food supplies by value, raising the import bill by about US\$150–US\$200 billion annually in present dollars (van Ittersum et al. 2016). With its endowment of agricultural resources and favorable location, Mozambique is well-placed to exploit these growing regional markets, which currently are increasingly serviced by non-African exporters. Mozambique borders 6 countries, several of them likely to be significant food importers.

¹³ <https://www.indexmundi.com/mozambique/urbanization.html>

¹⁴ Staple crops are the crops that constitute the dominant portion of the standard diet, supplying a large fraction of the energy needs. In Mozambique, they primary include maize, cassava, and—to a lesser extent—sorghum and rice.

¹⁵ Such as meat, dairy, fruits and vegetables.

¹⁶ This process is sometimes referred to as the “nutritional transition” arising from consumer sovereignty in fast developing areas that leads to the unhealthy diets and obesity widely observed in wealthier countries. The point for present purposes is that the transition will occur, and it will greatly affect the aggregate demands made of agriculture. This does not imply an endorsement, nor does it preclude nutritional education to improve eventual outcomes to the extent possible.

B. MARKET FAILURES OFTEN EXCLUDE SMALLHOLDERS FROM PARTICIPATING IN DEMAND-DRIVEN GROWTH

The reasons for less than full participation of smallholders in expanding food markets are multiple. They also may be getting worse over time in Mozambique. Access of rural people, and especially the poor, to transport infrastructure—especially in the center and north of the country—appears to be worsening (World Bank 2019a). In addition, smallholders often face asymmetries of information critical to exchange, such as knowing where prices are highest, where policy is going, the ability to brand their commodity products, and other items that put them at a disadvantage with commodity buyers vis-à-vis those they sell to (World Bank 2019c). Conversely, it is costly for firms to deal with large numbers of widely dispersed people they barely know and who are hard to hold to account in commercial matters. Lack of, or one-sided, market information and unenforceable contracts result in lower profits for all in exchange relationships.¹⁷ These transaction costs result in poorly functioning or missing markets.¹⁸

These conditions are widely observed in developing countries, and especially in SSA (Swinnen and Kuijpers 2017). As a result, smallholders are often not or only slowly included in rapidly expanding markets, especially for high-value and perishable products where asymmetries of information between buyers and sellers tend to be high (is the milk good or adulterated, for example?) (Delgado 1999a, Holloway et al. 2004). Overall, agricultural production for the market and diversification away from staples have been lagging and agricultural labor productivity and earnings have remained low (Barrett et al. 2019).

A wide variety of approaches have been used to increase smallholder inclusion in markets in Africa and around the world through reducing transaction costs of exchange with smallholders (Barrett 2008; Barrett et al. 2012). As in the broader issue of how to promote agricultural growth in smallholder situations worldwide, a key question involves the respective merits for sustained growth of a hard push to alleviate a single constraint (such as infrastructure, fertilizer, or seed), versus a package approach that addresses myriad input, factor, and product market constraints to technology adoption and agricultural commercialization (Mellor 1966, Timmer 1988, Lele 1991). In Africa, both underutilization of labor on the farm, linked to agriculture's narrow seasonality, and low productivity of land due to an absence of land-augmenting technological change, tend to hold smallholder labor productivity back (Lele 1991, Christiaensen 2019). Reasons vary across situations, depending on agricultural input, land, labor, capital, and product market constraints. The main policy choice moving forward is between integrated approaches and single-entry point approaches.

C. INTEGRATED VERSUS SINGLE ENTRY POINT APPROACHES FOR IMPROVING SMALLHOLDER INCLUSION

After the 2008 world food and fuel price spikes, much attention in Africa, including Mozambique, went to increasing modern input adoption for items such as improved seeds and inorganic fertilizer. But interventions were often single focused, such as fertilizer subsidy programs, or poorly coordinated. This left many constraints unaddressed, foregoing synergies or yielding insufficient effects to render the interventions profitable (Christiaensen 2019). In Mozambique as recently as 2015, only 6 percent of farmers used fertilizer, slightly less than the regional average, but the intensity of application at less than 5 kg/ha was more than four times lower than the regional average for Africa (World Bank 2019c). Similar observations may explain the lack of mechanization and irrigation. Only one percent of farmers used

¹⁷ World Bank 2018b. The general economic term for these costs is transaction cost; these costs are borne by all in the exchange relationship as firms are only able to pay reduced prices to smallholders due to uncertainty about what they buying and unreliable deliveries, and in turn have lower revenue from the less reliable processed products they sell.

¹⁸ Delgado (1999a), Wiggins (2014), Pernechele, Balié and Ghins (2016), Beegle and Christiaensen (2019), cited in Christiaensen (2019)

the services of tractors, with only 13 tractors per 100 km² (Ibid.). Only six percent had an extension visit, and only one percent used either improved seed or had access to credit (Ibid.). Clearly a more integrated approach than a single input program is required for sustained productivity growth.¹⁹ The resulting complexity challenges effective implementation, especially given missing or poor institutional environments.

Inclusive agricultural value chain development is increasingly pursued as a market-based organizational solution to simultaneously address multiple market constraints (Barrett et al. 2019). The essence of the more integrated value chain models is to involve different actors in the value chain, jointly consider their constraints to increase production and business volumes, and then link smallholder producers with the other actors in the chain such as processing factories and marketing agents but at times also financial institutions and input providers. In theory, the institutional linkages involved overcome the inherent asymmetries of information, uncertainties, and lack of trust on all sides that prevent smallholder inclusion.

Based on such integrated arrangements, higher volumes of better and more consistent quality can be secured by stakeholders in the chain, and these will be remunerated accordingly in a competitive market system. Producers receive access to credit, agronomic knowledge, price premiums, combined with or instead of a reduction of production, price, or market risks. This approach thus addresses several input, factor, and product market constraints simultaneously. Contract arrangements can be bilateral or multilateral, involving multiple actors, and range from largely informal to fully formal (Christiaensen 2019; Barrett et al. 2019). Depending on the nature of the contract, farmers remain largely self-employed entrepreneurs with special access to input and output markets, or become sharecroppers, or even quasi waged workers with the processor or marketing agent stipulating production modalities. Farmers can also fall somewhere along the continuum.

D. A DIVERSITY OF MODELS FOR BETTER INTEGRATING SMALLHOLDERS IN GROWTH INDUSTRIES

Different levels of the value chain can and do promote smallholder inclusion. Coordination and integration of producers with other value chain actors can be initiated by firms motivated by the need to secure raw materials of known quality in sufficient quantity at the time they are needed. These forms of “vertical coordination” (or “aggregation led from the top”) can include multinationals as well as domestic firms. Provision of credit, inputs, extension advice, and transport by the integrating firm in return for guaranteed sales from farmers at prices that take into account loans outstanding is usually central to such arrangements. “Horizontal coordination” can arise through smallholder producer organizations, such as cooperatives, that band together to achieve common objectives. A mixed form of vertical and horizontal coordination arises when large farms are linked to their small farm neighbors through outgrower schemes, which provide inputs and marketing outlets to smallholders, and greater clout for both small and large farms in dealing with processors and often better relations of processors with local communities.

Agents external to commercial value chains such as governments, NGOs and international organizations also can and do promote smallholder inclusion in commercial chains. Examples include public-private partnerships (PPP) where governments, NGOs, philanthropies, or external development partners subsidize the cost to firms of integrating new smallholder suppliers. They can also provide other complementary public goods and services, thereby leveraging private sector investment.²⁰ Examples include private investment in roads, electricity, water,

¹⁹ Christiaensen (2019) cites the case of Ethiopia. The Ethiopian government worked simultaneously on increasing smallholder staple crop productivity through: (a) the deployment of 45,000 extension agents (three per district), (b) facilitating access to credit, and water and land management, (c) improving market connectivity through rural road investment and (d) providing a form of insurance through a Productive Safety Net Programs. Since the mid-1990s, smallholder cereal yields more than doubled, and extreme poverty more than halved.

²⁰ As Christiaensen (2019) points out, this is in the spirit of the 2015 Addis Ababa Financing for Development Action Agenda, the

or warehouses that can be shared under various forms of expense recovery. The British NGO AgDevCo, for example, has been active in this vein in Mozambique since 2009, mobilizing over US\$21 million in investment and linking 85,000 farmers to commercial markets through structured partnerships combining development partner funding (mainly Norwegian in this case) and private capital.²¹ The German agency GIZ, through its “ProEcon” Program (Improving Framework Conditions in the Private and Financial Sector in Mozambique) has supported inclusion of over 1,000 microenterprises and 30 SMEs, of which 20 percent are led by women.²² The World Bank-funded projects “SUSTENTA” (Integrated Agriculture and Natural Resources Management Project) and “MozFIP” (The Mozambique Forest Investment Project) and the Catalytic Fund for Demonstration and Innovation work through the Government to combine technical assistance, financing, and risk sharing mechanisms for small and medium farmers and communities. The objectives are to help transform subsistence agriculture into a more sustainable, productive, commercial activity well integrated into value chains.

Broad-based interventions to promote smallholder inclusion focus on improving the business environment in which value chains operate, including rural infrastructure, administration and enforcement of property rights, contract enforcement, non-arbitrary taxation, reduction of corruption, and easing the administrative burden of doing business. The general objective is to improve the functioning of value chains by lowering transaction costs and reducing bottlenecks. The annual World Bank analysis and ranking of the evolution of countries’ overall business environment (World Bank Doing Business project) is one example of a general intervention.²³ The “Enabling the Business of Agriculture” initiative represents a specific World Bank assessment and ranking of countries’ agricultural business environment.²⁴

Selective interventions other than aggregation by firms to support inclusive value chains are targeted at specific chains and/or specific actors. Selective interventions can take the form of direct assistance by an NGO or other organization to farmers or farmer organizations for providing agricultural extension and credit, for example, or to help establish linkages with other value chain actors. Selective initiatives can also directly support lead companies in the chain to lend to producers and guarantee repayment to banks. Still another model involves direct bank loans to emerging farmers that benefit from partial credit guarantees by aggregators.²⁵ As an alternative to directly supporting either producers or buyers, interventions also focus on establishing multi-stakeholder platforms, as under the Productive Alliance approach (World Bank, 2016). Finally, interventions to improve transparency of value chains and pricing, and to build capacity for off-farm tasks in agriculture and food value chains, are ways to improve both inclusion and creation of more and better jobs.

E. CONSENSUS ON ISSUES IN SMALLHOLDER AGGREGATION SCHEMES IN AFRICA TO DATE

The size of the gains from vertical integration for smallholder producers and wage workers depends on both the intrinsic value added from the integration and the respective bargaining power of different actors along the chain. The value added from integration is primarily a result of greater efficiency, including economies of scale and scope. This involves reducing handling costs per unit (scale) and any saving gained by producing two or more distinct goods simultaneously (milk and butter, for example), when the cost of doing so is less than that of producing each separately (scope). But it also potentially includes an important cost reduction from lower transaction costs. The latter arises, say, when a dairy coop boosts returns to farmers and reduces costs to a dairy

World Bank’s Maximizing Finance for Development approach and the European Investment Plan.

²¹ See <https://www.agdevco.com/our-investments/by-country/Mozambique>

²² Through their Inclusive Business Models (InBM) approach.

²³ See: <https://datacatalog.worldbank.org/dataset/doing-business>; https://www.doingbusiness.org/content/dam/doingBusiness/media/Annual-Reports/English/DB2019-report_web-version.pdf

²⁴ See: <https://eba.worldbank.org/en/eba>

²⁵ A subsequent section will examine some innovative approaches being explored in Mozambique.

processor for a given level of final milk production by a total amount that exceeds the cost of running the coop, a frequent occurrence given the high transaction costs in smallholder dairy (Holloway et al. 2004).

Market power that determines the distribution of net benefits among stages of crop value chains often stems from structural factors favorable to smallholders. When there is significant demand for the product and multiple outlets, and farmers are aware of this, they have more opportunities for side-selling or diversion of value-chain-provided inputs or technology. Their bargaining power is larger. Similarly, farmers' market power is strengthened when there are fewer alternative suppliers. Inclusion of smallholders is also more likely when sourcing from smallholders is cheaper than producing on company-owned plantations. This can arise, of course, if companies have difficulty accessing land. It also arises when production is more labor-intensive and tasks are more diverse, which increases the monitoring cost of labor, as with many higher-value crops and animal products (Delgado 1999a, Kherallah et al. 2002). This strengthens the hand of farmers in aggregation. In principle, producer organizations can also help ensure fairer distribution of the gains to farmers, while helping protect aggregating firms from side-selling by individual farmers.

Animal-source products tend to have a somewhat different set of factors that determine market power dynamics²⁶ along value chains compared to crops. These differences stem from the higher transaction costs associated with animal-source foods due to perishability and from other characteristics of supply chains particular to animal industries. Animal-source foods (in the form of meat, milk, and fish) have relatively higher perishability in most cases than plant-based foods, especially in places where reliable refrigeration is lacking. High perishability places a premium (and thus higher prices paid) for the buyer on being able to trust that suppliers handled the produce the right way before delivery, and also sellers being able to be sure that buyers will not disappear when you are holding a perishable commodity.

These concerns are magnified when suppliers are smallholders; there is greater food safety risk for animal-sourced foods stemming from bacterial growth in mixed batches from many different producers. Other characteristics of supply chains for animal-source foods that tend to concentrate market power away from smallholders are the relatively tight concentration of corporate control of improved animal genetics early in supply chains, especially for poultry and swine; the high level of capital input per unit of output; and the proportionately greater cost for smaller sellers of destructive sampling of high-value units at points of sale. Under these conditions, smallholders tend to benefit from vertical integration with firms that can provide capital, technical advice and guaranteed market outlets in return for contractual relationships that are respected (Delgado 1999b; Delgado et al. 2008).

Smallholder production of pigs, poultry, and milk has expanded at a stunning pace in developing countries in the past 3 decades (Delgado et al. 2008). Yet most of this increase has been under some form of aggregation by industrial processors, and market power to squeeze the margins of other actors in the chain has resided consistently in the hands of owners of improved animal genetics (Ibid.). Large-scale aggregation is less frequently encountered for ruminant agriculture in developing countries. Grazing is the main source of feed, or sometimes forages. Genetics remain important to performance, but characteristics are more difficult for firms to capture and control compared to short-cycle monogastric livestock, where day-old chicks and piglets are major and frequently recurring purchased inputs. Furthermore, the lack of a distinct price premium for marbled beef in developing countries—at least on a scale comparable to that in wealthy countries—makes the form of integration involved in finishing grass-fed cattle in feedlots uncommon in developing countries.

The maximization of job creation does not always include trying to make all farmers more productive through extension or aggregation. A more realistic approach is to focus on raising productivity of the more commercially-oriented small-scale farmers (sometimes referred to as emerging), who are better positioned to adopt new

²⁶ Such as being able to garner a higher share of the final retail output price of a commodity.

technologies and shift to producing higher value crops and products (Maertens and Swinnen 2009; Mellor 2017; Beegle and Christiaensen 2019). Poorer farmers with less capacity or will to take on risk can benefit through the labor market as wage laborers on and off the farm, or through own account off-farm work, including in agricultural value chains.

There is growing evidence on the positive spillover effects of the emergence of middle-sized and larger farms on smallholder productivity. Mozambican smallholders in a radius of 50 km from a large commercial farm were shown to be more likely to increase input use, adopt modern agricultural practices and have moderately higher incomes (Glover and Jones 2019). Experience in Tanzania since the food price spikes of 2008 clearly shows the jobs-creating power of the emergence of middle-sized farms (in this case greater than 5 ha but less than 20 ha). Research using detailed national household surveys from 2008 through 2014 in Tanzania shows that medium-scale farms added 13 million additional paid work days for laborers per annum in 2014 compared to 2008, days that would not have been added if the number of medium-scale farms had not grown (World Bank 2019d). By 2014 these new medium-scale farmers also were adding an additional US\$150 million in demand for purchased agricultural inputs and services. They added amounts of a similar magnitude for local consumption expenditures and benefits for workers in agro-processing industries set up to handle the extra agricultural output (World Bank 2019d). These figures do not include additional but harder-to-measure likely benefits from “forward linkages”, such as improving the supply and lowering the costs of raw material for agro-processing industries.

The poor—and women in particular—can benefit from emerging farming and forward linkages. This is primarily due to higher on-farm labor demand, typically supplied by the lower skilled and those with less land (Meemken and Bellemare 2020). Often it is women who take advantage of these opportunities. However, production of higher value products for more demanding markets also imparts skills. Important poverty-reducing and women-empowering effects through wage employment on horticulture-exporting estate farms have been documented in Senegal, among others.²⁷ Tanzania provides another example, farther along the value chain, where 287 agro-processing enterprises provided 55 percent of national manufacturing value added in 2012 and employed 58,000 people in formal waged jobs. Two-thirds of the latter were women, a much higher percentage of women in such jobs than in other industries (Kumar and Agarwal 2016). The private adoption of labor standards by the exporting firms can further improve labor conditions of the workers.²⁸

Staple crops on the whole tend to be less suitable for contractual arrangements, with the exception of cases where special crop attributes are needed in finite quantities by industrial clients such as a precisely defined degree of tannin in sorghum or lysine in maize, or other hard to monitor attributes not easily or predictably found in local spot markets. The standardized and bulk nature of staple crops leave little room for quality upgrading and value-addition at the farm gate. This reduces buyers’ capacity and incentives to provide a price premium that incentivizes producers to ensure a consistent supply of high quality and volume to run their factories or cater to their urban markets.²⁹ There are also many potential buyers, making contract enforcement much more difficult.

The risks of side-selling by producers and contract breach by buyers are higher. The divisibility and relative lack of perishability of most staples (small amounts can easily be stored for some time) limit economies of scale in procurement, storage, processing, and marketing. This further limits incentives for traders and processors to invest in coordinating the chain. Some experimentation with contract farming to overcome the multiple market constraints is ongoing in rice and maize farming (Christiaensen 2019), but overall contract farming in staples remains rare and with mixed results so far outside special cases.

²⁷ Van den Broeck, Swinnen, and Maertens (2017) cited in Christiaensen (2019)

²⁸ Schuster and Maertens (2016) cited in Christiaensen (2019).

²⁹ Grains for breweries are often sold through advance contracts with premium prices in Africa because of the need for specific attributes and qualities at specific times, but this rarely applies to grain used for other prepared foods.

Integrated value chains are more likely to be effective for high value crops and animal products such as fruits, vegetables, eggs, dairy, and some meats. The prices of these products are very quality sensitive, they tend to be perishable, and attributes such as taste, food safety, and length of storability at each stage of the chain depend on care taken at earlier stages (think of a dairy procuring raw material every day from co-mingled bulk lots sold individually by thousands of smallholders). This requires considerable effort and cost to monitor. This may not be feasible in the absence of institutions, branding, and trust built through contracts. In other words, some products, especially from smallholders in countries such as Mozambique, are particularly subject to high transaction costs for search, monitoring, and evaluation that rise from asymmetries of information between parties to exchanges along the value chain (Grosh 1994, Delgado 1999a). Under such circumstances, value chain arrangements involving vertical coordination, such as contract farming, are likely to help everyone compared to other forms of industrial organization (Grosh 1994, Delgado 1999a, Swinnen and Kuijpers 2017, Barrett et al. 2019).³⁰ The key issue is that transaction costs—unlike more mundane transport, production and marketing costs—are net costs to both buyers and sellers, and thus make everyone worse off. For quality-sensitive and perishable items, they tend to be quite high. Hence alleviating them allows the creation of significant value for both sides of transactions, with market power determining the distribution of benefits and the stability of the exchange relationship over time.

1.3 THE CONTEXT FOR FARMING IN MOZAMBIQUE

A. GEOGRAPHY, NATURAL RESOURCES, AND CLIMATE

Mozambique has a natural endowment suited for agriculture, but with considerable climate risk. This endowment and associated risks shape the scope for value addition and resilience in “farm-to-fork” value chains. Across much of the country, soils are fertile, water is abundant, and the climate is favorable. Farmers can harvest two crops in much of the country. Average annual rainfall in the north and center of the country varies across locations and years and has a mean in the last decade well in excess of 200 mm/year. In the drier south, the mean in the last decade is in the low 100s. By global standards, land is abundant relative to Mozambique’s rural population, with potential for cultivating 45 percent of the land, and only 10 percent being cultivated. Moreover, agriculture is vulnerable to many risks, especially those related to weather (World Bank 2018b, 2018d).

The El Niño–Southern Oscillation (ENSO) has been linked to weather anomalies in Mozambique, affecting crop yields and the frequency of droughts, wildfires, and typhoons. From 1981 to 2016, average rainfall levels in Mozambique increased with the intensity of both warming El Niño events and cooling La Niña events. Higher-than-average temperatures were observed during La Niña months in some regions. Mozambique is particularly vulnerable to ENSO events. In the 16 years between 2000 and 2016, 10 oceanic anomalies occurred: five El Niño events and five La Niña events. The 2015/2016 El Niño event had devastating impacts on Mozambique. Maize prices rose sharply in early 2016 under the combined effect of El Niño’s related erratic rainfall, increasing food insecurity, and the worsening economy. Prices increased strongly across all areas of the country despite maize production above the long-term trend, according to United States Department of Agriculture (USDA) data (World Bank 2018d). Even more recently, Cyclone Idai in 2019 ravaged agricultural activities along its path, mostly in Sofala and Manica. Idai plus smaller cyclone Kenneth in 2019 in the far north of Mozambique are estimated to have reduced national maize and rice production in 2019 by 15 to 20 percent (World Bank 2019a).

Agricultural households in Mozambique have different levels of exposure to tropical storms and cyclones according to location. Agricultural households located in Nampula, Zambézia, Sofala, and Inhambane Provinces are the most exposed. These are also major agricultural production areas. For households exposed to storms, the

³⁰ Contract farming is not the only option for integration of smallholders in expanding high value markets, but it is the best known one. Barrett et al (2019) provides an up-to-date discussion of the underlying issues that go beyond the scope of the present inquiry.

threat is highest during the first (main) growing season. Cyclone activity, with its heavy rains, threatens much of the main growing season in central and southern Mozambique and the middle portion of the northern region's single growing season; the center and southern regions' second season occurs outside of cyclone season.

Three additional weather shocks can directly affect first season crops. These are drought, excess rain, and heat waves, called weather risk hereafter. While excess rain is the (slightly) more prevalent risk in the center and south regions, all these events are equally likely in the north region. Exposure to weather risk during the first season varies by province. Agricultural households in Niassa (11.1 percent of the national total), Sofala (10.4 percent), and Zambézia (9.9 percent) are located in the three provinces most exposed to drought among Mozambique's 11 provinces. Manica (11.5 percent), Sofala (10.9 percent), and Cabo Delgado (10.8 percent) are the provinces most exposed to excess rain. Sofala (10.9 percent), Manica (10.4 percent), and Niassa (9.6 percent) are the provinces most exposed to heat waves.

At the country level, households with two growing seasons (in the center and south regions) are, on average, more exposed to droughts in the second growing season than in the first season; less exposed to excess rain in the first season than in the second season; and equally exposed to heat waves in both seasons. The likelihood of experiencing a drought is 44 percent higher in the second season, and the likelihood of excess rains is 9 percent in both seasons (World Bank 2018d).

Agricultural households in the south region, mainly Maputo, are by far the most exposed to drought risks in the second growing season. Agricultural households in the center region are more exposed to excess rain in the second growing season than those in the south region. Sofala, Inhambane, and Tete Provinces are the most exposed to heat waves during the second growing season (Ibid.).

Weather risks have consequences for Mozambican households' wealth, technology adoption, and inputs use. The long-term consequences for rural households of two types of weather risks were analyzed: (a) production risks from drought, excess rain, and extreme temperatures during growing seasons, and (b) broader risks due to tropical storms, including cyclones, that also disrupt infrastructure. In Mozambique, evidence suggests that weather risk exposure slows wealth accumulation, technology adoption, and on-farm capital growth. Increased weather risk exposure is also shown to reduce the use of purchased inputs, including fertilizer (World Bank 2018d). And weather risks impede the use of hired labor, implying that farmers with greater risk exposure depend exclusively on family labor. Greater risk exposure also appears to impede the use of improved agronomy practices. This is significant because the practices do not require an upfront cash investment, although they do require investment in labor that is at risk.

B. THE IMPORTANCE OF DEVELOPMENT CORRIDORS FOR MARKETING OUTLETS

Development initiatives in Mozambique to date have emphasized opening remote interior areas to ports on the coast. Even when initially motivated by needs for marketing extractives (as in marketing coal from Tete through the port of Nacala), infrastructure investment inevitably shapes the nature of agricultural value chains, especially for items that are potential exports. While these corridors relate to more than agriculture, they are especially critical for agriculture and other natural resource industries. The country's long border to the west and its access to ports along its east coast offer the potential for Mozambique to export its products to regional and international markets. Without corridors implemented through infrastructural development, rural communities tend to be isolated because of very poor internal infrastructure, especially running north to south. Corridors are also tied to plans for mobilizing private sector investment in support of national priorities. Six main development corridors running east to west are featured for the development of agricultural value chains in Mozambique's Strategic Plan for the Development of the Agricultural Sector (PEDSA) (Republic of Mozambique 2010, World Bank 2017a). The east-to-west corridors and their targeted value chains are portrayed in Table 1.2 going down the table from the north to the south.

TABLE 1.2**Development corridors and associated agricultural value chains targeted for development**

Region	Corridor	Agricultural value chains
North	Pemba-Lichinga	Potato, wheat, beans, maize, soy, cotton, tobacco and poultry
	Nacala	Cassava, maize, cotton, fruits, poultry and groundnuts
Center	Vale do Zambeze	Rice, maize, potato, cattle, goats, cotton and poultry
	Beira	Maize, wheat, horticulture, poultry, soy, rice and cattle
South	Limpopo	Rice, horticulture, cattle and poultry
	Maputo	Rice, horticulture, cattle and poultry

C. THE SMALLNESS OF FARM SIZES**TABLE 1.3****Mean farm sizes in Mozambique per size quintile 2017**

Size quintile of farms	Mean farm size (ha)
1	0.58
2	1.46
3	2.04
4	3.12
5	6.60
All farms	2.75

Note: Counting 3.68 million small and medium farms in Mozambique, with 736,000 farms per quintile.
Source: 2017 Small and Medium Farms Agricultural Survey and 2017 Large Farms Census, Mozambique.
Mozambique, MADER, 2020.

TABLE 1.4**Distribution of farm sizes in Mozambique 2017**

Size class (ha)	Less than 10 ha	10 ha to less than 50 ha	50 ha to less than 200 ha	200 ha to less than 1000 ha	1000 ha to less than 5000 ha	Greater than 5000 ha
Number of farms	3,601,578	78,626	885	47	27	10
Share of farms (percent)	97.8	2.1+	0.0+	0.0	0.0	0.0
Share of area cultivated (percent)	86.0	10.8	0.6	0.2	0.6	1.8
Mean cultivated area (ha)	2.4	14.0	71.7	398.3	2,045.5	18,666.6

Source: 2017 Small and Medium Farms Agricultural Survey and 2017 Large Farms Census. Mozambique, MADER, 2020

Most food that smallholder Mozambican farmers produce is for their own consumption, with the share of marketed surplus low. Table 1.5, which lists the average share of production of key food crops that households market, shows that none of the shares exceed 7 percent. Household productivity is directly linked to food consumption and food security. For poor households, food accounts for a disproportionately large share of consumption, which directly links smallholder output to aggregate measures of rural poverty as well (World Bank 2018b).

D. ACCESS TO FINANCE IS A SIGNIFICANT BARRIER FOR MOZAMBIQUE'S SMALLHOLDERS

The absence of affordable financial services prevents rural communities, smallholder farmers, small emerging commercial farmers, and agriculturally-oriented, micro small and medium-sized enterprises (MSMEs) from expanding. Smallholders are among the most financially excluded groups in Mozambique. These producers need credit to purchase seeds, pesticides, fertilizer, equipment, and labor before planting. They also need credit for marketing, including instruments such as warehouse receipts, fixed-term loans, or overdraft facilities.

Very few smallholders in Mozambique use formal banking or agricultural sector credit to finance inputs (Mozambique MASA 2015). In 2017, only 1.3 percent of farms used formal agricultural credit (IAI 2017 in Mozambique, MADER 2020). The few farms who had access to credit received it from Government programs or from farmer associations. Some private companies in Tete and Niassa are also sources of farm credit, which is normally lent through aggregation schemes (FinMark Trust 2012). The most frequent stated reason for a rural household taking a loan is for a non-medical emergency (Ibid.). Very few rural households report other reasons, such as starting or expanding a business, investing in agricultural inputs or education, or purchasing household goods or assets.

TABLE 1.5**Crops produced, amounts, and percentage of each sold in 2017**

Crop	Production (metric tons)	Share of production sold (percent)
Cassava	4,981,314	2.6
Maize	1,774,715	7.5
Sweet potato (excluding orange)	390,741	3.5
Peanut (small)	247,846	13.5
Cowpea (ordinary)	198,905	6.3
Rice	193,762	6.6
Pigeon Pea	167,743	13.9
Sorghum	143,658	1.9
Coconut	135,507	19.5
Peanut (large)	116,049	13.3
Cotton	98,884	96.3
Beans (common)	79,183	30.2
Orange fleshed sweet potato	69,899	10.5
Sesame	46,187	54.8
Soybean	39,812	75.6
Tobacco	37,102	66.4
Bambara groundnut	27,243	4.9
Pearl millet	22,734	2
Cowpeas (oloko)	16,832	16.1
Sunflower	10,557	17

Source: Calculated from Mozambique MADER 2020

The banking sector in Mozambique, consisting of 17 banks with 600 branches, lends mainly to corporate customers, particularly to large trading firms in urban areas (IFAD 2017). Agricultural loans account for only about 3 per cent of total lending (Ibid.). Another challenge is concentration of branch networks in the capital city of Maputo and in the southern provinces. In 2017, one-third of all bank branches were located in Maputo itself (Ibid.). The Bank of Mozambique has issued a directive on location of bank branches to encourage expansion to under-banked localities in rural areas.

Moreover, a number of World Bank projects have included, at the request of the Government of Mozambique (GOM), components for smallholder financing. These include the World Bank's Integrated Growth Poles Project, the Mozambique Forest Investment Project (MozFIP), and the Integrated Agriculture and Natural Resources Management Project (SUSTENTA). SUSTENTA introduced partial credit bank guarantees covering 50 percent

of the principal amount of a loan from a commercial bank to an emerging farmer, an MSME, or a producer organization (beneficiaries). MozFIP promotes the commercial planting of trees and the restoration of degraded areas in the province of Zambézia, using payments to communities and companies based on performance and technical assistance provided. It provides performance-based payments in terms of planted tree survival rates, among other criteria, to establish and maintain tree plantations for commercial purposes, as well as the restoration of priority areas within communities.

The International Fund for Agricultural Development (IFAD) Rural Enterprise Financing Project (REFP), launched in 2017, aims to increase use of appropriate, affordable, and innovative financial services by smallholders and MSMEs in rural areas. The project offers a menu of alternative financing instruments adapted to the different financial capacities and requirements of smallholder farmers, fishers, and rural agricultural enterprises. Yet these mechanisms remain at the project level. Scale-up would require adoption by other financial institutions, which is uncertain given the costs (IFAD 2017).

Thus, agricultural finance in Mozambique is still largely led by concessional funders such as external development partners and philanthropies. This manifests not only in terms of limited outreach to smallholders and rural MSMEs, but also in terms of the limited financial products available and innovations employed, such as low use of digital finance. There is still only a small volume of private lending to large, better collateralized corporate borrowers in agriculture. The nascent microfinance sector presently involves 11 micro banks and community-based financial organizations, such as Credit Associations and other informal local saving groups (IFAD 2017).

Overall, agricultural finance worldwide is active in terms of exploring alternatives to traditional, land-based collateral lending models. “Movables-based” finance, for example, might increase access to credit for farmers and SMEs (World Bank 2019d). Movable assets in this case could be agricultural products or capital goods already owned by the firm or farm. Their use as collateral requires both a sound underlying legal and regulatory framework and a secure registry for movable assets. Some East African countries, such as Rwanda, are making progress on institution building for the legal frameworks and are using digital technology for the regulatory framework (World Bank 2018e). These represent possible important developments for assisting Mozambican smallholders in the future.

One current lending model in Mozambique is for a bank to make a bulk loan to an industrial processor (or another company intermediary or aggregator), who then uses the proceeds to finance a series of producers in their supply chain. This helps banks lower risk since the aggregator better understands the risk profile of the smallholders and is better positioned to seek recourse for non-performing loans—by withdrawing credit for future purchases, for example. These aggregation schemes also address other important limitations smallholders face, such as low access to inputs, technical assistance, and markets (Barrett et al. 2019).

E. THE POTENTIAL IMPACTS OF OIL AND GAS ON THE RURAL SECTOR

There have been 34 identified extractives “megaprojects” exceeding US\$500 million each³¹ (primarily oil, gas, coal, and other minerals) in Mozambique since 2002, representing a total of about US\$44.5 billion in actual and planned investments (World Bank 2020a). These account for 60–70 percent of total Mozambican exports, which have accelerated greatly in recent years. In 2016 and 2017, investment in extractives represented almost half of GDP growth (ibid.). Planned investments in liquified natural gas in northern Mozambique alone are expected to reach US\$60 billion and have the capacity to generate revenues of approximately US\$300 billion over the next

³¹ Using the United Nations Conference on Trade and Development (UNCTAD) definition of a “megaproject” as an investment exceeding US\$ 500 million.

30 years (ibid.).³² Mozambique is likely to benefit by US\$36 billion to US\$50 billion in terms of fiscal revenues by 2032 as the result of these investments (ibid.).

Such seismic changes will clearly impact most commodity value chains in Mozambique, including the 3 profiled here. The sheer volume of consumer spending likely to result from these operations will create significant additional demand for more processed, higher-value foods and wood products produced in Mozambique's rural areas. Some of this new, highly stimulative demand will spillover directly to increased demand for the products of the cassava, cashew, and plantation forestry value chains.

However, these favorable demand developments for the 3 value chains also bring less optimistic uncertainties. First, the value chains studied will need to compete for agricultural production resources with higher-value, animal-sourced food and horticulture value chains. These are the commodities for which expenditures in southeastern Africa rise most rapidly when both private and public formal sector wages rise (Tschirley et al. 2015).

Further, examples from elsewhere, including in Africa, suggest that the main effects of an extractive commodity boom on smallholder-based agriculture are likely to be indirect cost increases on output and inputs. Commodity booms make domestic products more expensive relative to imports due to an appreciating real exchange rate,³³ which at the same time raises the cost of domestic labor and land relative to output prices. The result is that costs of producing tradable agricultural products go up while returns from selling them go down. To recap the argument, rapid growth of extractive exports such as natural gas often sets in motion a "Dutch Disease" effect, as first observed during a natural gas export boom in the Netherlands that discouraged manufacturing growth (Corden 1984, Brahmhatt et al. 2010).

The greater the local content of external investment, and domestic consumer spending arising from domestic incomes generated by these investments, the more resource inflows from external sources bid up the price of the local non-tradable resources like land and labor relative to other prices. This tends to depress agricultural profits. During past booms in Mozambique, the relative domestic price impacts of foreign direct investment inflows were almost entirely offset by imports of goods and services.³⁴ However, the danger of Dutch Disease for agriculture will increase if the local content of investment and consumer spending boosted by investment increases, which is likely to happen.

Thus, jobs prospects in the cassava, cashew, and plantation forestry value chains will be strongly influenced by how resource inflows from mineral rents are handled in the macroeconomy. Resolution of these issues will be largely determined by factors and decisions outside the agricultural sector and the scope of this study. However, they are very likely to happen over time and require advance planning to prevent serious disruption of agriculture.

³² Compare to Mozambique's estimated GDP of approximately US\$12 billion in 2019 (World Bank 2020a).

³³ Recall that the real exchange rate can be measured by the nominal exchange rate (MZN/US\$) adjusted for differences in overall inflation in Mozambique compared to its trading partners. The nominal rate can depreciate (more MZN per US\$) while the real rate appreciates if inflation is much higher in Mozambique than its trading partners. Krueger et al. (1988) provides a comprehensive reference.

³⁴ Analysis by the International Monetary Fund for Mozambique suggests that Dutch Disease has not been in evidence in past investment booms in Mozambique (World Bank 2020a). The IMF's external balance assessments indicate that the real exchange rate was mostly in line with fundamentals between 2011 and 2015 (ibid).

1.4 INSIGHTS FROM RECENT AGRICULTURAL VALUE-CHAIN STUDIES IN MOZAMBIQUE

A. A RENEWED INTEREST IN AGRICULTURAL VALUE CHAINS IN MOZAMBIQUE SINCE 2010

A renewed emphasis on agriculture and farmer incomes became evident as Mozambique sought to emerge from decades of civil war, as expressed in the Strategic Plan for Agricultural Development (PEDSA) 2010-2019 (Mozambique 2010). PEDSA focused on development corridors and value chains, which led to a growing interest in analytical agricultural value chain studies. The U.S. Land Grant Universities supporting the analytical effort at the [former] Mozambique Ministry of Agriculture and Food Security (MASA)³⁵ (most notably Michigan State University and University of Florida) were especially helpful in this effort. A notable example was a seminal cassava value chain study (Donovan et al. 2011). Another aspect of this era is rise in interest in working with domestic private companies to evaluate modernization of agricultural production.

In support of PEDSA, and at a time of overall stagnation in Mozambique's agricultural sector, the country's development partners funded diagnostic surveys to identify commercial value chain development opportunities for smallholder farmers. Two large national surveys covering a broad swath of commodities were especially influential (World Bank 2016a, USAID 2016). These studies suggested areas of opportunity for development or scaling-up of specific commodities. However, they were typically not based on household or firm-level surveys. Consequently, they were of limited use for comparing expected costs and benefits of different options, or for assessing net impacts of proposed actions on farm incomes.

B. A PRACTICAL EXAMPLE OF AGRICULTURAL POLICY ANALYSIS THROUGH VALUE CHAIN ASSESSMENT: THE RISE OF PIGEON PEA 2002-2017

At roughly the same time that the big diagnostic desk studies of value chains were being launched, the pigeon pea export value chain emerged as a smallholder success story. Pigeon pea (*Cajanus cajan*) had been grown as a minor crop in north and central Mozambique for many years. From 2002 to 2012, however, production of pigeon pea on smallholder farms grew by 8 percent per year, far faster than anything else. By 2012, more than 1 million Mozambican households were producing pigeon pea on one-quarter million ha, rivaling peanuts and rice in national economic importance (Walker et al. 2015). By 2014, Mozambique was the 5th largest producer and 3rd largest exporter of pigeon pea globally (Ibid.). The vast majority of production was exported raw to a single country, India, which uses pigeon pea as the key component in dhal, a ubiquitous national food condiment. Mozambican exports occur from September to January, when Indian prices are high prior to the harvest of India's rainy season crop (Ibid.). A growing market in India, accounting for 90 percent of global imports of pigeon pea, seemed to offer major prospects for continued and lucrative Mozambican exports. In 2016, Mozambique exported 170,000 tons of pigeon pea worth US\$ 125 million (Oppewal and da Cruz 2017).

Then, following good rains and domestic production programs in India that led to surplus production, the Mozambican export price fell by a factor of 9 in 2017 (Oppewal and da Cruz 2017). This led to a farm crisis in Mozambican production zones in 2017, notably in Nampula and Zambézia provinces (Ibid.). Policymakers, including the President, sought answers. Since the main issue was export concentration in one market, a value chain study of pigeon pea that might identify options for strengthening and diversifying the sub-sector seemed warranted. Accordingly, MASA commissioned and prioritized such a study, the first known time that Mozambique requested an agricultural value chain study to inform policy discussions at the highest level.³⁶

³⁵ Merged into a new Ministry of Agriculture and Rural Development (MADER) with effect from early 2020.

³⁶ The resulting study was funded and carried out by the International Growth Center, with staff support (but not funding or co-authorship) from the Let's Work Program, following a very tight turnaround time (Oppewal and da Cruz 2017).

The study's main recommendations focused on promoting dissemination of improved market information for farmers and promoting diversification out of pigeon pea production (Oppewal and da Cruz 2017). The pigeon pea case illustrates the potential for African smallholder agriculture to take advantage of major changes in global demand for specialty crops. This is in contrast to the Asian Green Revolution prioritization of supply-side interventions for boosting production of staple cereals for domestic consumption.³⁷ However, the pigeon pea case also illustrates the importance of value chain analysis to ensure that demand is more likely to be sustained through export market diversification and maintenance of long-run competitiveness versus alternate suppliers.

C. FOCUSING ON SMALLHOLDER INCLUSION IN MAIZE, POULTRY, AND SESAME VALUE CHAINS

Interest also grew for studying how to help smallholders in other rapidly growing agricultural commodity markets. The promise of growing maize demand under urbanization and income growth could not be neglected. As Table 1.5 shows, national cassava production in 2017 was nearly 3 times that of maize by weight, but the tonnages marketed of the 2 staples were about the same. Maize accounts for 30 percent of cropped land in Mozambique, is widely consumed in both Mozambique and elsewhere, and has multiple uses besides direct food as feed, fuel, and industrial raw material. Productivity can also be raised substantially for maize through increased use of fertilizer and improved seeds. Poultry production and consumption are also rising rapidly in Mozambique and elsewhere, as fast as any other food commodity,³⁸ driven by urbanization and income growth. Finally, sesame garnered attention as a potentially high-value export crop with rapidly growing demand from markets in Asia. Sesame also has potential to garner quality-based price premiums if the value chain is well coordinated. It is also a crop that can be grown in areas where pigeon pea and cotton are also grown, thus representing a farm diversification opportunity.

Accordingly, the World Bank surveyed smallholder involvement in maize, poultry, and sesame value chains in Mozambique in 2017 and 2018.³⁹ Unlike previous work, these studies used household-level and rapid market assessment field surveys. Along with existing household data, such as from MASA's Inquérito Agrícola Integrado (IAI) 2015, this allowed both qualitative and quantitative assessment of incentives in the 3 value chains at different levels. The assessment for maize showed farmers earned very low financial profits (also true when redone using "economic" prices adjusted to remove the estimated policy distortion effects). However, maize traders and processors were earning high financial profits. This suggested scope for improving farm incomes by improving farmer access to—and transparency of—market information, which would increase the need for competition in procurement by maize traders and processors. Poor rural infrastructure and the absence of maize drying to prevent aflatoxin were also identified as issues. Side-selling of maize by farmers is also easy due to its ubiquitous use in Mozambique, implying a low potential for profitable vertical coordination in the maize sector from the firm point of view. A possible exception would be where the integrating company could pay a higher than prevailing price because of access after processing to markets closed to others (such as having an exclusive contract to supply maize grits of a defined quality level to a brewer).

The assessment for smallholder poultry showed mixed results. The industry is strongly demand driven as national demand for chicken doubled from 2008 to 2017, and industrial poultry production technology is easy to import. Independent farmers tend to sell live chickens everywhere, while integrators mostly sell frozen chickens in the main towns. Profit margins per bird for independent producers are 7 times higher than for smallholders

³⁷ The Asian Green Revolution is authoritatively reviewed in Mellor (2017).

³⁸ At stages of development in non-vegetarian countries similar to Mozambique, poultry products are typically the fastest growers in demand (Delgado 1999b, Tschirley et al. 2015). For developed countries, these rapid growth rates recede and are replaced by indirect demand for commodities like palm oil, so prevalent in processed items (Byerlee et al. 2017).

³⁹ Results for the rest of this section all come from World Bank (2018b).

under integration. This reflects the fact that for independents profits include returns to capital, knowledge, transport, and marketing (in addition to production costs). Contract farmers only need to provide labor (including supervision), land, and the building and integrators do the rest and get paid for it. However, poultry sector integrators face high working capital costs, with feed alone accounting for roughly 70 percent of the final cost, on average, at the farm gate. The sector also carries high animal disease risks. Only an integrator model is likely to provide necessary financing and to be able to contain major poultry disease risks. The need over time to improve food safety in the value chain under soaring demand will also likely drive vertical integration (Delgado et al. 2008).

Assessment of the sesame sub-sector shows high potential for smallholders, but also fundamental governance issues for integration, which is necessary to grow sesame more intensively. Mozambique has favorable conditions for growing sesame, and the seasonal labor requirements for sesame cultivation do not compete with the seasonal labor requirements for staples such as maize. Since seasonal labor constraints are often major for smallholders, this makes sesame especially attractive. Sesame demand in Asia and the Middle East is expected to grow. Sesame cultivation is profitable for smallholders under all models, but comparison of models shows that they are more profitable and have lower capital requirements and less risk when an integrator provides input supplies and outlets. Credit and extension assistance is essential to take advantage of substantial price differentials for dehulled white sesame of uniform quality. Most sesame sold by independent smallholders is bulk undifferentiated and low-quality grade, which can easily be sold (including side-sold) to South Asian collectors in growing areas during the marketing season. Given this threat, sesame aggregation has not advanced to meet its significant potential.

1.5 VALUE CHAINS SELECTED FOR FURTHER ANALYSIS AND INTENDED CONTRIBUTION

A. THE DIVERSITY OF THE 3 VALUE CHAINS SELECTED FOR DEEP DIVES

Adding to the assessment work, in early 2017 the Let's Work Program (LWP) decided to undertake in-depth value chain analysis for improving the number and quality of jobs in 3 natural resource value chains. Pigeon pea and sesame would have been priorities due to their success as rapidly growing smallholder sources of cash income from exportable crops. However, these 2 crops had been well assessed compared to other priority crops. After consultations with the GOM, new work was undertaken for:

- a) Cassava, the main food staple, but more recently a promising industrial raw material.
- b) Cashew, a traditional high value agricultural export showing great promise, but also a sector with major job creation barriers.
- c) Plantation forestry, key for resilience of rural livelihoods and climate change mitigation.

Cassava is a tropical food crop whose global production grew at 2.7 percent per annum between 2000 and 2016. By weight, cassava is Sub-Saharan Africa's (SSA) main food starch, representing about one-third of total food starch consumption. In Mozambique, cassava is also the principal food starch, representing 30 percent of all calorie intake (Costa and Delgado 2019a). Industrial use of cassava has end uses as diverse as processed foods and plywood, wet cake and starch for beer-making, ethanol for distillery and pharmaceutical uses, and industrial starch for sweeteners, toothpaste, and cosmetics (Dalberg 2015). Public policy over the years has tried to encourage development of the cassava sub-sector, without much success.

Cashew is a major traditional export in Mozambique. The country was once the largest producer in the world, but global market share has since shrunk to about 3 percent following policy shifts and disruptions from civil conflict in

the caju growing areas. The potential for widespread impacts remains strong, however, given that approximately 1.3 million Mozambican farm households had cashew trees on their land in 2015, but productivity is low (Costa and Delgado 2019b). Cashew production is also highly affected by climate change and the lack of pest management (chemical use); any strategy to boost cashew production—which is where most new jobs in cashew will be found—must attend to these issues (Ibid.). INCAJU (National Institute of Cashew) is the state agency in charge of supervising the cashew business in Mozambique. Mozambique only processes about one-third of its raw cashew nut (RCN) production, with most RCN still exported in its unprocessed form. The potential for expanding jobs through more cashew processing in Mozambique is significant. Trading is the third area of potential job creation as thousands of small and medium traders act as middlemen, retailers, wholesalers, and exporters. Since almost all cashew is exported, foreign markets play a major role in deciding what is possible in Mozambique.

Mozambique is a relatively forest-abundant country. There has been considerable private activity seeking access to land in Mozambique for large-scale private plantation forestry activities over the last decade-and-a-half. Results to date from large-scale commercial investments in plantation forestry have been disappointing, with planted areas and job growth much smaller than hoped for by all. Commercial investors are actively seeking ways to engage better with communities already on the land to find ways forward for better land access and more creation of higher-paid jobs. New models of plantation forestry development are also being explored. Most Mozambicans make the main part of their living from small-scale agriculture. Agricultural soil and water are being rapidly degraded, aggravating the effects on smallholder resilience of ongoing climate change. Community-level plantation forestry with commercial inputs may offer hope that the incentives that promote unregulated depletion of common ecological resources can be overcome by public-private partnerships and more and better jobs created.

B. THE INTENDED CONTRIBUTION OF THIS BOOK

This book is about jobs in rural commodity supply chains, formal and informal, from farm input and service providers to farmers to market agents to processors. When looking at how to promote more and better jobs, the present extent and relative importance of formal as well as informal employment in agriculture, measured in terms of numbers of workers and hours worked, tends to be greatly under-estimated in Mozambique. Similarly, the potential of agriculture to create more and better jobs is also neglected.

However, like the rest of the tropics, but especially in Mozambique with its long coastline and significant share of cropping that is rainfed under semi-arid tropical conditions, farmers are the persons with their livelihoods most vulnerable to climate change. We argue that revitalizing cassava production and integrating plantation forestry into agricultural communities are among the most promising solutions to mitigate and adapt to growing climate change risks to rural livelihoods and food security. The book also looks at options for Mozambican agriculture and forest product industries to deal with global agricultural market distortions that affect their interests, as well as the likely effects on Mozambican agriculture of having a booming extractives sector.

Improving key value chains to create widespread, better paying work in agriculture and plantation forestry will likely not happen under business-as-usual. It will require new collaborative approaches that benefit farmers and those downstream and upstream, supported by coalitions made up of civil society, the private sector, and Government. There is no doubt that traditional smallholder agriculture cannot indefinitely provide a decent living to the rural population. We argue that the right efforts, comparative advantages, resources, and skills in cassava, cashew, and community-based wood lots—the examples we study here—can support transformation to widespread improvement in lives and industrial growth.



2. CASSAVA, A TRADITIONAL FOOD CROP WITH INDUSTRIAL POTENTIAL

2.1 INTRODUCTION: OBJECTIVES AND ISSUES FOR MOZAMBIQUE

This chapter looks at cassava production, processing, marketing, and consumption in Mozambique to identify how to increase industrial processing jobs and smallholder and trader income. The objective is to promote household incomes and more and better jobs in Mozambique from cassava. In particular, the chapter points to policies to attract private investment into industrial cassava product processing and marketing, both for domestic and export markets.

In Mozambique in 2017, as in the rest of Africa, cassava was the principal national starchy food staple, representing 30 percent of all calories in Mozambique. This is well ahead of maize, 70 percent of which is consumed by those who grow it using traditional processing (Mozambique, Ministry of Agriculture and Food Security (Mozambique MADER 2020). Over 100 varieties of cassava are grown in Mozambique (Donovan et al. 2011). It plays a special food resilience role in rural areas of Mozambique, and indeed to the surrounding region, due to its suitability for cultivation in a wide variety of soils, tolerance to climate fluctuations, and flexibility in harvest timing (Haggblade et al. 2012).

Yet Mozambique's average cassava yields are low relative to West Africa, and one-half and one-third of those in Latin American or Asia, respectively (FAOStat 2020). Almost all cassava processing in Mozambique is non-mechanized and traditional, involving soaking, drying, chipping, or grating—highly labor-intensive, low-profitability work. Some mobile mechanical processing units are found, mostly in the south. Domestic markets are primarily for food, with only 6 percent of production in 2010 used commercially for non-food; of this, two-thirds were used for feed, and one-third for starch (Donovan et al. 2011). This is in contrast to West Africa, Asia, and Latin America, where industrial cassava processing for starch and feed are well established.

As we will show, global markets for processed foods and industrial starch from cassava and regional demand in southern Africa are all growing. Low levels of productivity for cassava and poor transportation infrastructure in

Mozambique represent major barriers to development of a viable, larger-scale cassava processing industry, as the unit cost of raw material is higher if yields are low. From the farm point of view, prices offered by industry are too low to cover costs (Costa and Delgado 2019a). On small farms, marketed surplus comes mainly from having a small safety margin of production over anticipated subsistence needs. Policies to encourage development of the cassava sub-sector over the years has led to mixed results. The current Agricultural Sector Strategic Development Plan (PEDSA) (Mozambique MASA 2010) prioritizes cassava, and the crop should play a key role in the new GOM PODERS strategy for 2020-2024 (under discussion during publication of this book).

2.2 OVERVIEW OF THE GLOBAL CASSAVA SECTOR

A. A TRADITIONAL FOOD SECURITY CROP WITH MAJOR INDUSTRIAL USES

Cassava (*Manihot esculenta* Crantz) is a starchy root crop typically harvested on an annual or bi-annual basis in tropical and subtropical areas. Widely consumed across SSA, mainly in West and East Africa, it is the single most important source of calories in SSA (FAOStat 2020). Cassava is a primary food security crop due to its storability that allows considerable flexibility across weeks and seasons as to when it is harvested. Cassava can thus provide calories in key deficit periods, which is especially important to small farm households reliant on subsistence cropping. It is also resistant to drought and disease and tolerant to poor soils (Parmar et al. 2017).

Cassava is also a fast-expanding food crop in Africa and Asia, and is widely consumed in Latin America. In 2018, world production of cassava was 278 million mt (FAOStat 2020), and the global compound annual growth rate (CAGR) from 2000 to 2018 was 2.8 percent.⁴⁰ In 2018, cassava was by far the most significant starchy staple produced in Africa by weight, accounting for one-third of total starchy staple tonnage in Africa that year, and roughly 60 percent all cassava produced globally (FAOStat 2020).

Cassava grows well in poor soils with limited labor requirements. Most cassava farming smallholders intercrop it with other food crops, such as beans, groundnuts, or maize depending on the region. Cassava is propagated vegetatively,⁴¹ reducing the need for purchased inputs such as seed or fertilizer. Important from the perspective of finding ways to increase overall employment, cassava is flexible in terms of the timing of labor input, unlike most crops. Yet, the labor input, concentrated around planting and harvesting, is high when required, with laborious and time-consuming harvesting typically done manually. Cassava also requires considerable post-harvest effort due to its bulkiness (cassava fresh roots are 70 percent water) and processing needs for preservation. Drying can involve heavy farm household work to press water out of roots with weights or a mechanical press (Ibid.; Donovan et al. 2011).

However, processing is the most labor-intensive part of food cassava. Many varieties of cassava, especially in Africa, taste bitter due to high amounts of toxic cyanogenic glucosides, which has both advantages and serious disadvantages. In terms of advantages, the bitter varieties are more tolerant to pests and diseases while growing, which helps explain their popularity with farmers (Donovan et al. 2011). Relatedly, they can be stored unharvested in the ground more at least 12 months and even up to 30 months. This allows cassava in traditional systems to play a food security reserve role allowing for flexibility in harvesting and inter-annual, farm-level food stock “carryovers” (to the extent that the crop from the previous year is unharvested but still usable) (Salvador et al. 2014). Furthermore, bitter varieties in Africa have higher yields than sweet varieties (Ibid.)

The food security role of cassava is reinforced by its broad agro-ecological adaptability, its ability to produce reasonable yields under acidic and infertile soils, and its drought tolerance (Ibid.). However, the presence of cyanogenic glucosides also presents significant disadvantages; without the laborious special processing, using cassava for food or feed can result in death (Parmar et al. 2017). Safety is not observable directly by the casual buyer of processed cassava without chemical testing, so trust becomes especially important. Furthermore, use of cassava in industrially processed food items burdens processors with safety testing and certification in addition to normal prevention of contamination or spoilage.

⁴⁰ Calculated using FAOStat data accessed April, 2020; the CAGR was estimated between the mid-points of 2000-2002 and 2016-2018 respectively in view of high annual volatility in production.

⁴¹ That is, it is not spread directly by planting from seed as most crops are. Instead, a cutting is typically partially buried in wet soil with buds showing; these eventually sprout stems and roots that grow from the lower part.

B. THE EMPLOYMENT POTENTIAL OF CASSAVA DEVELOPMENT

The widespread extent of cassava cultivation and consumption in Mozambique implies that growth in this value chain could significantly increase rural incomes. Much of this added income would occur in remote, mostly poor rural areas, such as in inland northern Mozambique, where the population suffers significant seasonal underemployment and low average household incomes. This strongly suggests that increments to income from cassava would be largely spent on consumer goods and services rather than being saved (Delgado et al. 1998a).

Relative remoteness in rural areas suggests that spending will be on local services and locally-produced consumer items with few alternative markets (ibid.). Under these conditions, the direct impact from increasing cassava grower incomes would be to stimulate growth in production of other locally-produced rural goods and services (such as processed foods, local beer, local furniture and baskets, haircuts).

Extensive evidence elsewhere in Africa shows that the “multiplier” effect on employment and income in these conditions is typically about 100 to 200 percent over the initial direct income impact (World Bank 2007). Thus Mozambican Meticais (MZN) 1,000 in income growth for a small farmer from increased sales of cassava would induce about MZN 1,000 to MZN 2,000 in spending on local rural goods and services, helping to employ local labor further beyond the initial job gains in cassava. These gains may be modest individually, but combined they help promote significant local job creation in both cassava production and non-cassava⁴² activities, in addition to “backwards and forwards” linkages to more spending on cassava input, marketing, and retailing sectors. Clearly, boosting productivity in the cassava value chain is key to large-scale employment creation.

On the other hand, it is the nature of cassava as a commodity that direct potential for creating better jobs (as opposed to income multiplier effects) is mainly in processing. The high perishability of cassava roots limits the window for its marketing as a fresh product, and complicates its use as an industrial raw ingredient (Dziedzoave et al. 2006). Yet, cassava in recent decades has nonetheless become a major raw material for higher value-added manufactured products in Asia, Latin America, and a few African countries (Chuasuwana 2017). High Quality Cassava Flour (HQCF) can substitute for a modest portion of wheat flour in bread, pastries, cookies, and biscuits. Ethanol made from cassava can be used as extra-neutral alcohol (ENA) for medicinal purposes, or for potable spirit distilling. Ethanol from cassava can also be used as fuel, but is rarely competitive with ethanol from other sources. Cassava can be processed mechanically but only as a perishable wet cake for beer brewing. Dried cassava pellet chips have been sometimes used for animal feed. Finally, cassava is a preferred material in tropical countries for manufacture of high-grade industrial starch (Dalberg 2015; Parmar et al. 2017).

Detailed study of the cassava chip and cassava starch value chains in Thailand shows that net margins per metric ton (mt) of final output in both chains are overwhelmingly higher in processing compared to other parts of the chain, even if the labor input is much higher per mt in the growing stage (Arthey et al. 2018). For example, for starch, they calculate that the net margins per final mt of output are US\$4.60 for the farmer, US\$2.30 for intermediaries between farm and factory, and a huge US\$127.00 for the processor (ibid.). On the labor side, farmers put in 22 person-hours FTE of labor input per mt of final output, compared to 7 person-hours FTE of processor labor (ibid.). This suggests that average labor productivity in cassava growing for starch was about US\$ 0.21 per person-hour, compared to US\$18.14

⁴² These gains stem from the fact that in many rural places in Africa, people are poor and consequently save little from increments to income, and (unlike wealthier or urban people for the most part) spend most of increments to income on labor-intensive local goods (locally prepared food and drink, local furniture and woven straw goods, artisanal bricks, etc.) and local services (all basically “nontradables”, as opposed to goods that could be imported to or exported from the local area, such as Asian radios and local cashews, say) (Delgado et al. 1998a). This spending pattern draws otherwise underemployed labor (in particular) into providing the extra (non-exportable) local goods and services bought as a result of the initial income infusion to the local area, and then a new cycle begins when they too spend locally. The fact that the local areas in question are remote and poor is an important explanatory factor for why broader markets for their local goods and services are largely limited to local consumers and the consequent persistence of under-employment in the first place (ibid.).

per person-hour in processing. For cassava chips, comparable average labor productivity figures per person-hour were US\$0.10 for the farmers and US\$13.00 for labor in processing (Ibid.).

Back-of-the-envelope calculation of the employment potential of cassava processing in Mozambique suggests that a small “artisanal” workshop processing 70 mt of fresh cassava roots annually into 14 mt of flour with mainly manual labor could employ 9 workers (4 skilled, 3 semi-skilled, and 4 unskilled), with a yield of just over 1.5 mt flour per worker per annum (Global Development Solutions 2018). A medium-sized industrial processor in Mozambique with some mechanization would turn 1,190 mt of fresh cassava annually into 480 mt of cassava chips and 238 mt of flour (Ibid.), employing about 17 workers (four skilled, three semi-skilled, and 10 unskilled), producing 14 mt of flour and 28 mt of chips per worker (Ibid.).

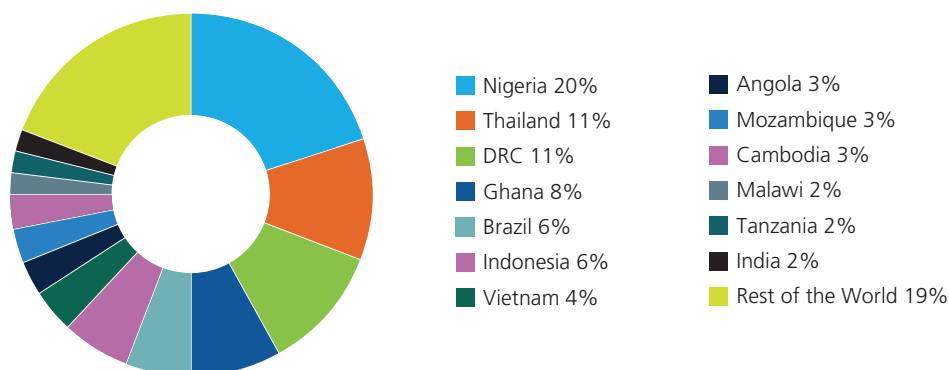
These figures clearly suggest that processing cassava is subject to economies of scale, even if this is not necessarily the case for production. This in turn suggests that “better” jobs in processing will be relatively few compared to the mass of farmer livelihoods. Further, they are more likely to be found on the industrial processing side rather than the artisanal segment. The corollary is that new demand for, for example, 90,000 mt of cassava flour would create 60,000 very low-paid processing jobs, but less than 7,000 presumed higher-paying industrial sector jobs.

C. MOZAMBIQUE’S COMPETITORS AND POTENTIAL CLIENTS IN THE CASSAVA WORLD

Between 2008 and 2018, Africa produced 58 percent of the world’s total raw cassava roots, with Asia producing 31 percent and Latin America 11 percent. Nigeria alone today produces one-fifth of world production (FAOStat 2020). Almost two-thirds (64 percent) of global cassava production concentrates in 6 countries: Nigeria, Thailand, Democratic Republic of Congo (DRC), Ghana, Brazil, and Indonesia (Figure 2.1). This growth has come primarily from expansion of planting area rather than rising productivity, except in parts of Asia. Furthermore, productivity per hectare in Africa, and especially Mozambique, are inferior to other regions.

Mozambique, Malawi, Zambia, and Tanzania are the main cassava producers in southeastern Africa. Despite the production potential in these countries, cassava commercialization remains in early stages, with only 10 to 30 percent of production marketed (Haggblade et al. 2012).

FIGURE 2.1
Percentage shares in global cassava production 2018



Source: FAOStat accessed April 2020.

Unlike West Africa, where cassava commercialization has focused on marketing prepared cassava-based convenience foods, emerging cassava markets in southeastern Africa have focused on fresh cassava, low value-added cassava flour, and experiments in industrial processing of cassava-based starches, biofuels, and feeds (Ibid.).

In West Africa, Nigeria has been particularly keen on developing its cassava value chain as part of a strategy to boost rural incomes and diversify its economy from dependence on petroleum exports and its food security from staple imports funded by those exports. In 2002, the Government of Nigeria launched the first national policy to promote increased cassava output and processing. Later, in 2011, the Government launched its Cassava Transformation Agenda, which sought to create a new generation of commercially-oriented cassava farmers linked to value chain businesses providing reliable demand for cassava as raw material for industry.

Nigeria is the main African exporter of dried cassava products to global markets. In 2016, it exported well over 600,000 mt of dried cassava products, more than doubling exports from 2014, the first year of significant Nigerian trading in that commodity, following a 2013 agreement with China (FAOStat; Premium Times 2013). Latin America has an advanced cassava food industry led by Brazil and processes several industrial cassava derivatives. Asian countries are most advanced in processing non-food cassava derivatives. The bulk of cassava produced outside Africa is not for human food but mostly for industrial purposes and feeds.

Asia—especially Thailand and Vietnam—is Mozambique’s main competitor in global markets for cassava. Thailand is the world’s largest exporter, accounting for 57 percent of global exports of dried cassava products by value in 2018, down from 75 percent in 2016 (FAOStat 2020). Thailand exports cassava chips (about 60 percent of Thai cassava exports by volume), cassava native starch⁴³, and modified starch. Thailand’s earnings from cassava product exports reached nearly US\$1.07 billion in 2017, having grown at about 4 percent annually in nominal dollar terms since 2010. Thailand processes 40 percent of national cassava production into starch for both domestic and export markets (Chuasuwana 2017). See Box 2.1 for greater detail on the inspiring Thailand cassava story.

Other Asian countries also became leaders in diversified industrial processing of cassava in many forms starting in the 2000s. Thailand and Vietnam remained important suppliers of raw material besides implementing diversified processing. In 2017, about two-thirds of Thai cassava exports were dried chips and one-third higher value-added native cassava starch or modified cassava starch. These last two seem destined to gradually displace chip exports. While almost all Thai chip exports go to China, China and Japan together account for just over half of Thai exports of cassava starch, and a number of other Asian countries account for the rest (Chuasuwana 2017).

In Vietnam, the government also played a strong role in developing the industry and promoting access to export markets. Cassava is Vietnam’s third export crop, a true revolution in the agricultural sector carried out in the last 20 years. Vietnam exported US\$285 million worth of cassava products in 2017. Vietnam improved drastically the genetic material available to farmers to increase productivity by 400 percent (8.6 mt to 26 mt/ha), with aims to achieve 60 to 80 mt/ha. Vietnam is now the second largest exporter of cassava products, with a growth rate of 6 percent per annum in export value between 2010 and 2017 (FAOStat 2020).

⁴³ “Native starch” refers to starch occurring naturally in cereal and root crops and extractable through simple methods, keeping intact the form of the granule and the shape and composition of the constituent amylose and amylopectin molecules. Cassava is one of the most easily obtainable sources of native starch. Native starch is generally adequate for many but not all industrial uses. By contrast, modifications can be carried out on native starch through complex methods to confer chemical properties needed for specific uses, and this is generally referred to as “modified starch”. “Cassavabiz”, an industry website, gives extensive details on starch uses and specifications for use of cassava in industrial starch processing, see: <http://www.cassavabiz.org/postharvest/starch03.htm>

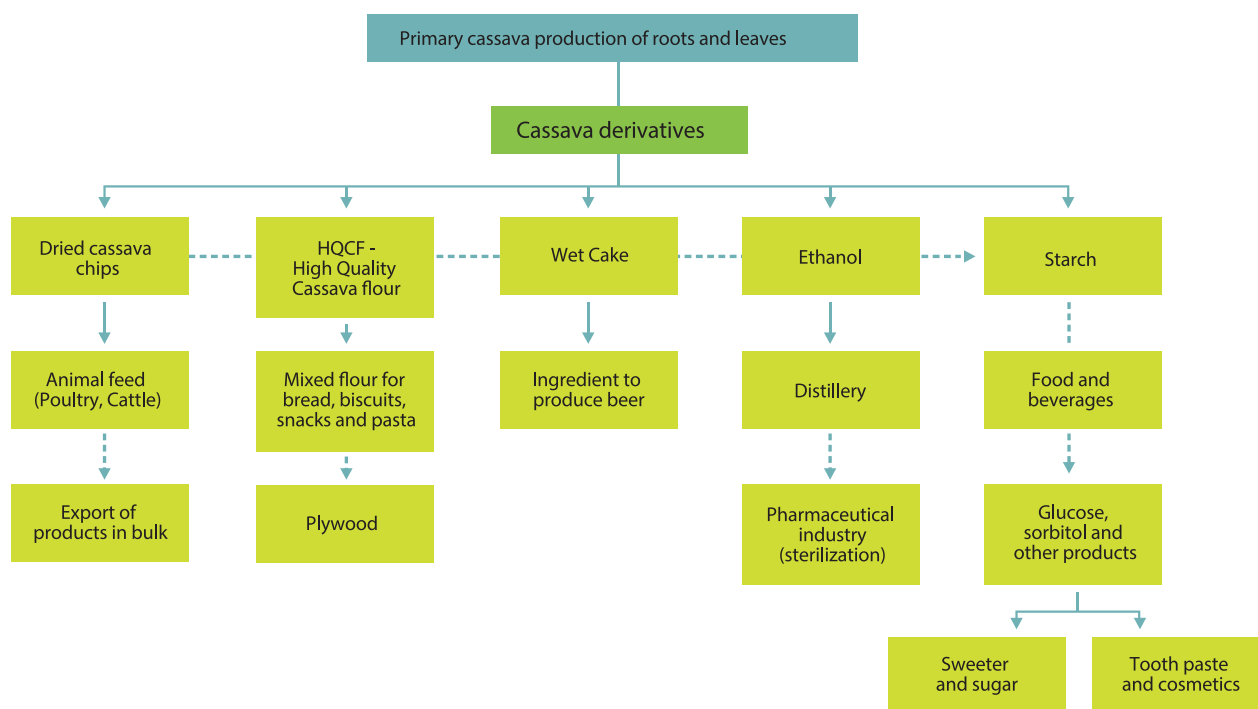
BOX 2.1: THAILAND'S EXPERIENCE WITH CASSAVA

Thailand's opportunity to develop the dried cassava pellets value chain arose from 3 factors specific to the 1970s (Nelson 1983). First, there was a search to provide economic opportunities to the relatively poor population in the northeast left behind by rapid growth in the rest of the country. Second, expansion of the road network in the region occurred simultaneously, primarily for military defense. Third, the EU Common Agricultural Policy (CAP) of the at the time led to high European protection against feed grain imports such as maize. Thai entrepreneurs and European importers saw an opportunity to ship pelletized cassava to Europe as an alternative livestock feed ingredient, entering almost duty-free.

Thailand was able to capitalize on this opportunity due to a proactive policy to promote productivity through 3 paths (Dalberg 2015). First, the Government strongly supported research and development (R&D), both to create high-yielding varieties and to promote use of cassava products in manufacturing. Second, both governmental and non-governmental institutions supported smallholder farmers—who grow most of Thailand's cassava—to access improved varieties, inputs, and financing. Third, the Government created a favorable business environment for cassava processing and end-use products. This included interventions such as supporting technology implementation for downstream SMEs and contract farming systems; implementing root and ethanol price guarantees; developing processing technologies; and building transportation and logistics systems. In addition, the Government invested in identifying and developing alternative markets through international conferences, exhibitions, and study tours organized by the Ministries of Commerce and Foreign Affairs (Ibid.).

Thailand, along with Vietnam and Brazil, also adapted quickly to changes in the structure of international demand. European policy imports steadily shifted away from dried cassava in the mid to late 1980s, culminating in almost none after reform of the European Common Agricultural Policy in 2005. In Thailand, cassava chip production, a grain substitute intended for the Chinese market and useful for both feed and alcohol, replaced almost all cassava pellet production (Kaplinsky et al. 2010; Chuasuwan 2017). China has been by far the main source of demand for dried cassava products; demand for imports of grain substitutes is likely directly linked to China's policy of long-term stabilization of high domestic food grain prices (Hansen and Gale 2014). However, Chinese feed grain import policies began to change after the 2008-2010 global food crisis, the rise of Chinese mega-cities, and continuing major imports of soybeans (Ibid.). Thai dried cassava chips exports to China began to slacken in 2017, which may signal decline in Chinese market demand (Chuasuwan 2017).

In summary, Thailand and Vietnam carried out supply-side revolutions to develop their cassava value chains when seeing demand surge opportunities, first from Europe, then from China, and then from the rest of Asia. Demand continues to evolve from a policy-induced interest in finding cheap non-grain sources of starchy animal feed to refined raw material for a variety of high value-added uses such as food, beverages, cosmetics, pharmaceuticals, and textiles (Figure 2.2). These value-added products offer potential for higher paid work, but most cassava jobs in Mozambique will remain in primary production of raw roots for the foreseeable future.

FIGURE 2.2**Value-added uses of cassava in global markets**

Source: Prepared by Carlos Costa based on stakeholder field visits in Mozambique

2.3 CASSAVA PRODUCTION JOBS AND PRODUCTIVITY IN MOZAMBIQUE

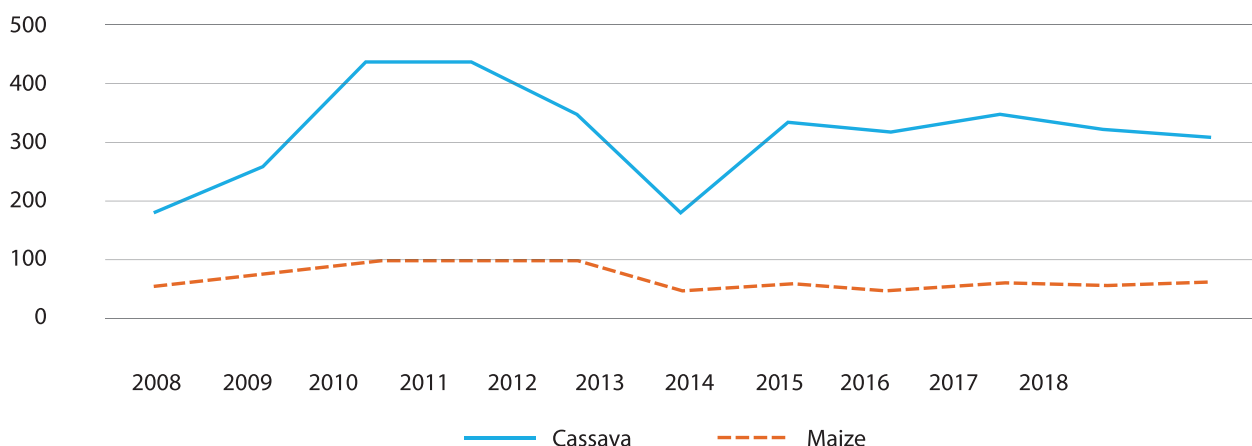
A. PRODUCTION IN COMPARISON TO OTHER STAPLES

Cassava and maize are the main starchy staple food crops in Mozambique, and despite the volatility of cassava production, per capita production (and consumption) of cassava remains well above maize, as shown in Figure 2.3. Cassava is also an important contributor crop for Mozambique’s overall GDP. Agriculture accounted for roughly 24 percent of GDP in Mozambique in 2019,⁴⁴ and cassava production’s direct share by value was more than one-quarter. This means that cassava’s share of overall GDP is close to 5 percent (FAOStat October 2018), not including contributions to GDP from cassava processing and marketing. According to the 2017 IAI household survey, cassava is the most important crop with annual production of 4.98 million mt (2017), followed distantly by maize at 1.77 million mt (Figure 2.4). About 1.85 million small and medium farms produced cassava in Mozambique in 2017, accounting for 53 percent of the 3.5 million small and medium farms (Mozambique MADER 2020).

⁴⁴ World Bank national accounts data, and OECD National Accounts data files.

FIGURE 2.3

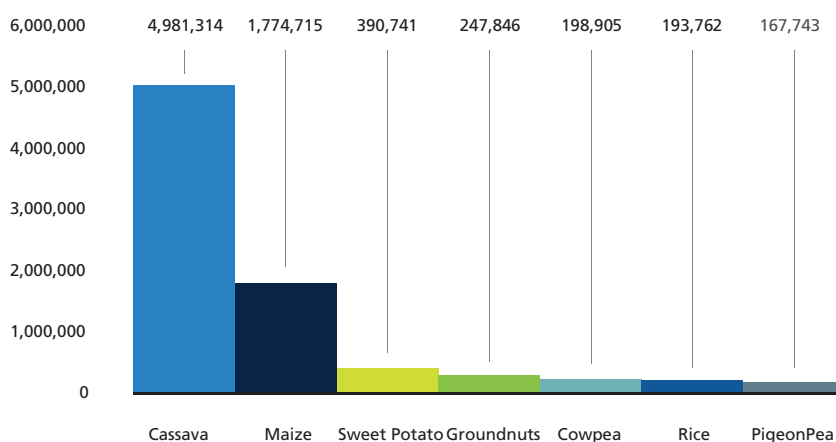
Cassava and maize production per capita in Mozambique 2008-18 (kg/capita)



Source: FAOStat accessed April 2020

FIGURE 2.4

Production of main crops on all medium and small farms 2017 (metric tons)



Source: FAOStat accessed April 2020

Moreover, cassava is the second most important crop for small and medium farmers in terms of total cropped area (Figure 2.5). Production per capita of cassava grew at just under 2 percent from 2015 to 2017, showing that cassava is more than keeping up with Mozambique’s high population growth rate.

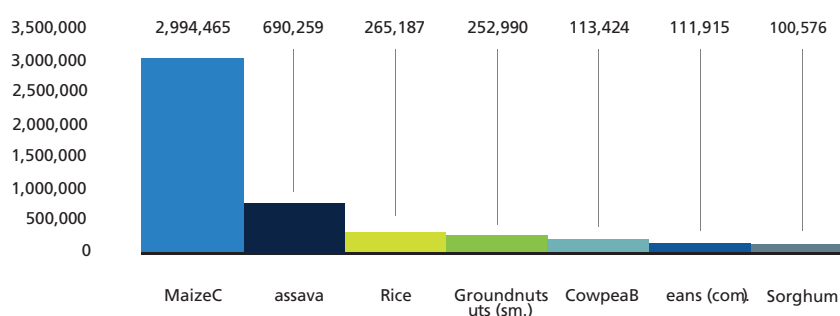
According to the 2017 IAI household survey, there were 0.69 million hectares of cropped area that included cassava in that year, 11.3 percent higher than the estimate for 2015. This suggests that between 2015 and 2017, area cultivated grew about 1.5 percent per annum faster than average yield.⁴⁵ Cassava is typically grown

⁴⁵ Factoring in annual population growth of 2.9 to 3.0 percent per annum over the 2015-2017 period added to about 1.0 percent per annum growth in per capita production.

in Mozambique on small areas of land of about one-quarter to one-half ha; according to the latest IAI household survey data, plots with cassava production on small and medium farms had an average recorded size of 0.74 hectares in 2017. Given widespread inter-cropping, these plots may also have been farmed at the same time for other crops.

FIGURE 2.5

Aggregate cropped areas of main crops on small and medium farms 2017



Source: Mozambique MADER 2020

Cassava is thus the main provider of calories in Mozambique. Mozambican farmers grow over 100 varieties country-wide (Donovan et al. 2011), including a wide array of both bitter and sweet varieties. To provide food under a wide variety of circumstances and time periods, most cassava farmers grow a diversity of cassava varieties and maturities at the same time in different plots. The type of varieties cultivated in each province depends on consumption demand, taste preferences, yield performance of the variety, crop duration to maturity, level of pest incidence (bitter varieties being more resistant), and availability of planting material.

Cassava is relatively resistant to the generally severe climate change impacts on agriculture in Mozambique. Crop yields are often threatened by a shortening growing season, greater water stress, and an increasing incidence of diseases, pests, and weed outbreaks (Niang et al. 2014). Studies on cassava resistance to climate shocks have found that cassava’s tolerance to high temperature and intra-seasonal drought leads to less reduction of productivity over time compared with maize, millet, and sorghum under similar shocks (Jarvis et al. 2012). Nevertheless, extreme weather conditions such as prolonged drought, excessive rainfall, and floods can decrease cassava output.

From 2007 to 2018, Mozambique cassava production grew at an average annual compound rate of 8.7 percent, but exhibited strong volatility along the way. For example, production suddenly dropped below 6 million mt in 2013 after 10 million mt in 2011. Part of this variation may be due to maize production in Mozambique reaching a high in 2012 (see Figure 2.3), supporting increased Mozambican maize exports in 2012 and 2013. Also, Mozambican farmers harvested less cassava for subsistence in 2013 and kept more in the ground for future use. Low cassava production in 2013 marked the end of a multi-year decline, followed by significant increases in cassava harvests thereafter and lower performance for maize (Figure 2.3).

Despite the high content of cyanide glycoside in bitter cassava, which influences the taste (McKey and Beckerman, 1993; Chiwona-Karlton et al., 2004), consumption patterns in Mozambique indicate that bitter cassava varieties are much more produced and consumed than sweet ones (Donovan 2011). Bitter cassava comprises more than 90 percent of overall production in Mozambique (Ibid.). Bitter cassava roots are typically processed artisanally

to into “rale”, a fermented porridge flour similar to West African garri, with cyanogenic glucosides reduced to acceptable levels for human consumption.⁴⁶

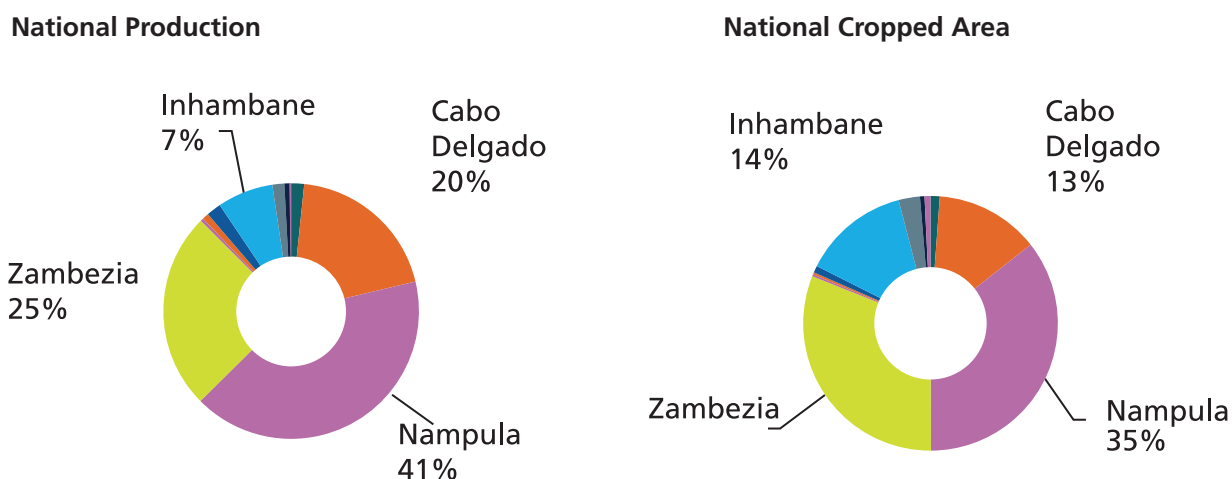
However, cassava as a food crop has other serious limitations beyond presence of cyanogenic glucosides. Rapid post-harvest deterioration following removal from the soil limits its marketability, and the roots are low in protein and micro-nutrients. Other major staple foods such as maize and rice have a higher protein content than cassava with fewer drawbacks.

B. DISTRIBUTION OF CASSAVA BY PROVINCE

Along with its high concentration of rural population, northern Mozambique accounts for over four-fifths of total cassava production, with two-thirds of total production and cropped area in Nampula and Zambézia Provinces (Figure 2.6). Yet while Nampula accounted for 41 percent of production in 2017, it accounted for only 35 percent of cropped area, suggesting significantly higher average cassava productivity in Nampula compared to Zambézia (Figure 2.6). Similarly, Cabo Delgado provided 20 percent of production on only 13 percent of cropped area. The southern provinces accounted for just over 12 percent of total production and just under 19 percent of cropped area. The higher productivity of cassava in the north is probably due to the greater pest resistance of bitter varieties typically grown there, as well as less intercropping and higher fertility of inland northern soils.

FIGURE 2.6

Shares of cassava production and cropped area by province, 2017 (small and medium farms only)



Source: Mozambique MADER 2020

The northern provinces are adjacent to the country’s 3 main trade corridors, the Nacala corridor (linking coastal Mozambique to Malawi and Zambia), the Beira corridor (linking coastal Mozambique to Zimbabwe), and the EN 1 (a key north-south road connecting the Nacala and Beira corridors). Nampula and Zambézia also accounted for two-thirds of total cassava cropped area country wide (Figure 2.6). These provinces produce both bitter and sweet types, but mainly bitter casava (Salvador et al. 2014; Donovan et al. 2011).

⁴⁶ Rale production involves peeling the roots, grating, drying (including through pressing), and fermenting, roasting and drying. Rale is

Although less productive per ha than in the north, the importance of cassava in southern provinces where it is grown is demonstrated by the share of land farmers dedicated in 2017 to this crop. In Inhambane, a coastal province, cassava is thought to account for more than half of total farm area cultivated. This is well above the national average of about one-fifth of national crop area planted to cassava and the one-third on the average smallholder farm in 2017 (Mozambique MADER 2020).

C. USE OF HIRED LABOR ON FARMS GROWING CASSAVA

IAI 2017 survey data reported in Mozambique MADER (2020) identifies farms that grow cassava along with other crops and the use of hired labor (permanent and seasonal) on the same farms; but it is not possible to determine how much hired laborers worked on cassava. Similarly, employment figures typically do not account for family labor, which also works on a large variety of tasks. If we attribute all family labor to cassava—or even only one-fifth of it, closer to the share of national area cropped with cassava—cassava would represent Mozambique’s number one employment activity. As shown in Table 2.1, 1,851,083 farms grew cassava in 2017, with households averaging 5.4 persons per farm (Mozambique MADER 2020).

The 2017 IAI data shows that households producing cassava employ on average 2 hired workers for cash, overwhelmingly on a seasonal basis (Mozambique MADER 2020), but this varies considerably across provinces. Nampula province alone had 1.5 million seasonal hired farm workers in 2017, or 2.7 per cassava-growing household. Again, like family labor, hired labor on small and medium farms tend to work on multiple tasks involving different crops and other products on each farm. The total number of hired (including seasonal) workers in farms producing cassava is around 3.7 million, although a much lower number in FTE terms. Employment is concentrated in the north, with the 3 northern provinces accounting for 80 percent of hired farm workers: Nampula, Zambézia, and Cabo Delgado (Table 2.1). We estimate that total hired (wage) employment in cassava in 2017 was around 300,000 FTE equivalents, added to a large amount of family labor.⁴⁷

⁴⁷ This calculation assumes (very conservatively) that 19 seasonal workers are equivalent to one FTE, following the same proportions in Table 2.1 (i.e. $106,857 + (3,608,962/19) = 296,802$). If the same logic were applied to family labor assuming two family agricultural laborers per household growing cassava spending 1/19 of time on cassava, we would get roughly another 200,000 FTE of family labor working on cassava for a total of about 0.5 million FTE workers cultivating cassava, but the conjectural, and most probably understates the amount of family work on cassava involved, especially by women.

TABLE 2.1**Use of hired labor on small and medium farms with cassava production (2017)**

Province	Number of households with cassava production	Hired Full-Time Workers	Hired Seasonal Workers	Total hired workers
Niassa	60,467	6,808	42,007	48,815
Cabo Delgado	265,491	17,997	660,952	678,949
Nampula	539,187	36,199	1,503,726	1,539,925
Zambézia	487,027	20,768	741,786	762,554
Tete	19,805	2,100	45,875	47,975
Manica	35,968	2,998	93,750	96,748
Sofala	73,888	2,366	202,955	205,321
Inhambane	177,535	10,056	162,752	172,808
Gaza	86,763	2,893	52,156	55,049
Maputo Provincia	86,932	2,134	60,340	62,474
Maputo Cidade	18,020	2,538	42,663	45,201
TOTAL	1,851,083	106,857	3,608,962	3,715,819
Workers per household		0.1	1.9	2

Source: Mozambique MADER 2020

D. STRUCTURE OF FARM SIZES

Farm-level production constraints differ between small and large farms and by region. These differences are helpful to understand when assessing potential job and income creation. The Census of Agriculture and Livestock (CAP) 2009/2010 distinguishes 3 distinct producer groups in Mozambique: ⁴⁸

- **Small farms:** Approximately 2.5 million small farms represent the very large majority of farms, with holdings on average of 1.5 ha but using 0.4-0.6 ha on average for cassava.
- **Medium farms:** Have a plot between 10-20 ha and using on average 1.2 ha for cassava (approximately 8,000 farms).
- **Large commercial farms:** Between 10 and 40 ha using on average 12 for cassava. Inhambane has more than a half of large commercial farms (65 out of 115).

The first 2 groups are often organized in associations, normally with about 20 to 30 farm members. Each member has his or her own field, but often the association shares a small plot of land to produce seed or

⁴⁸ The 2009/2010 CAP is the most recent agricultural census but is the only agricultural survey with sufficient disaggregation to address these plot size issues.

to demonstrate agricultural practices. Sometimes the association are organized in a “forum” that integrates between 7 and 14 associations (Costa and Delgado 2019a).

Association land is generally owned collectively. Although some associations managed to get DUAT approval,⁴⁹ it is common to find associations without it. It is sometimes difficult for small farms to legalize their plots (obtaining a DUAT) because they are unaware of their land use rights and how to formalize them, and often lack the financial and technical support necessary to assert those rights (Centro Terras Vivas 2014).

E. PRODUCTIVITY

As shown in Table 2.2, average African cassava productivity per ha is relatively low by global standards. African average cassava yield is 8 mt/ha, compared with Asia’s 22 mt/ha, or South America’s 13 mt/ha. Low African yields are mainly due to low input use, such as fertilizers and pesticides, slow dissemination of high-yielding varieties, and the spread of pests (IFAD 2012).

TABLE 2.2
Comparative average cassava yields 2000/02 to 2016/18 (mt/ha)

	2000-2002	2016-2018
Mozambique	6.0	8.0
Africa	8.8	9.1
South America	13.2	14.0
Asia	14.9	21.7

Source: From annual data in FAOStat, accessed April 2020. The figures are the annual averages for the three-Year periods shown.

Cassava yields have grown significantly in some parts of Africa over the last decade, mainly in the western coastal countries. Ghana achieved the highest yield growth in Africa, with average national yields increasing from 13 to 19 mt per hectare over 10 years. Nigerian yields decreased from 13 to 9 mt/ha between 2010 and 2018 (FAOStat 2020). It is not clear if this trend will continue and to what extent other factors, such as choice of varieties for higher starch, are affecting Nigerian yields (Premium Times 2013). Malawi, which has high productivity compared with other African countries, has the second highest cassava yields after Ghana in Africa. Average Mozambican yields in the last 10 years have varied between 5 and 9 mt/ha, yet with the highest compound annual yield growth rate among main Africa producers. While there is still significant room for improvement, this suggests that Mozambique has made significant progress in recent in term of catching up with African cassava competitor countries.

In Inhambane and Gaza, on the south coast of Mozambique, yields in 2017 were less than 5 mt/ha (Table 2.3). However, the *Instituto de Investigação Agronómica de Moçambique* (Mozambique Institute of Agricultural Research, IIAM) has led a large cassava sector development program in the south. The program has sped introduction of new varieties and improved pest control, factors expected to improve yields substantially.

⁴⁹ Land use license, please see Chapter 1.

TABLE 2.3**Mean cassava yields by province 2017 (mt/ha)**

Province	Tons/Ha
Niassa	10.1
C. Delgado	10.7
Nampula	8.4
Zambézia	5.8
Tete	10.6
Manica	22.6
Sofala	15.5
Inhambane	3.8
Gaza	4.0
Maputo Province	9.2
Maputo City	1.1
Small and Medium Farms in Mozambique, Average	7.2

Source: Mozambique MADER 2020

Productivity also varies significantly across the provinces of Mozambique, including the major producers in the north such as Cabo Delgado, Nampula, and Zambézia. Cabo Delgado has the highest productivity at 10.7 tons/ha, followed by Nampula's 8.4 tons/ha, and Zambézia's 5.8 tons/ha. Manica in the center exhibits outstanding productivity per hectare, but there were only an estimated 1,810 hectares of cropped area under cassava production in 2017, less than 0.3 percent of total country cropped area (Table 2.3).

Major growth in cassava productivity is possible from a technical standpoint.⁵⁰ Productivity levels in projects that supply inputs and extension advice to farmers has reached as much as 22 mt per hectare, but only on selected fields. An example is provided by a program implemented by The International Fertilizer Development Center (IFDC) in partnership with *Cervejas de Mocambique (CdM)*—a beer producer associated with SABMiller— and the Dutch Agricultural Development and Trading Company (DADTCO), that claims significant achievements from 2014 to 2017 (IFDC 2018).⁵¹

The International Fund for Agricultural Development's (IFAD) Pro-poor Value Chain Development Project (PROSUL) has developed a pilot cassava stem-seed multiplication system. PROSUL has helped increase productivity threefold on some farms, from a baseline of 6 mt per hectare to 17-22 mt per hectare (IFAD 2019). More than 12,000 farmers used improved technologies on 8,000 ha. Many increased yields to above 15 mt per hectare, showing that it is possible to achieve much higher yields. Furthermore, the program:

- Distributed 6 million cuttings of improved high-yielding cassava varieties to farmers;
- Established 3,106 demonstration plots;
- Conducted field days attracting 4,800 farmers (including 2,900 women);
- Built 2,427 collection centers to improve aggregation efficiency, train farmer, and sell inputs; and

⁵⁰ Note that increased physical productivity from increased use of purchased inputs may not always lead to improved profitability.

⁵¹ As per interview of DADTCO country manager by Carlos Costa.

- Introduced 2 fertilizers, a high-nitrogen blend to stimulate stem production and a high-potassium blend to stimulate root production (Ibid.).

2.4 CASSAVA-BASED WORK BEYOND PRODUCTION

A. POST-HARVESTING HANDLING, STORAGE, AND PROCESSING

Good practices in post-harvest handling and storage of fresh roots and leaves are vital to ensuring safety and quality of the final cassava product, especially for removal of poisonous cyanogenic glucosides (Iyer et al. 2010). For bitter varieties, the presence of these toxins requires processes to remove them, which typically involve elaborate grating, drying and fermentation. Reduction of postharvest losses can also help improve the quality of fresh cassava root. Some proven measures to prevent loss include use of improved cultivars with longer shelf life, application of proper agricultural practices during cultivation, proper handling during and after harvest, and use of appropriate processing techniques (Kader and Rolle 2004).

After harvest, the cassava root is transported to local storage places, processed, and the final product packed and stored until sold. Packaging and storage are the major postharvest handling factors to ensure food security and safety of the final product (Daramola et al. 2010). Packaging guarantees the quality of the root by protecting it from bruises and injuries and preventing excessive moisture (Akingbala et al. 2005). Mozambique has no regulations or general programs for packaging and storage of fresh cassava roots. This is an area that deserves attention, and operators at all levels should adopt more advanced storage and packaging methods similar to those being used in commercial value chains in Nigeria and Ghana.

Cassava processing in Mozambique has 2 vectors: non-mechanized and mechanized. The former includes traditional household methods of cassava processing to produce “rale” in the south and “karakata” in the north (a kind of porridge). In some cases, traditional processing involves peeling, chipping, and sun drying; the chips are then soaked, fermented, and dried to produce fermented flour. Flour production requires pounding the dried product in a mortar, a widespread and labor-intensive method used across the country. Most small farmers producing cassava process a significant part of fresh and dried roots at home this way. Mechanized processing is very limited. Micro and small mechanized processing units produce “rale” and flour, representing significant labor-saving. The few of these mechanized processing units in Mozambique are mostly found in the southern region, primarily in Inhambane Province.

Domestic end-markets in Mozambique for industrial starch and ethanol are small. The few existing industrial processors face high costs to source cassava due to low yields and long distances that must be travelled to buy enough volume. Supply chain inefficiencies drive up the cost of end products and make it more difficult for processors to compete with imports.

B. PRESENT MARKETS FOR CASSAVA PRODUCTS AND DERIVATIVES

Available cassava products for consumption in Mozambique are basic. Fresh and dried roots and leaves are overwhelmingly consumed at home as traditional foods. Fresh cassava roots are consumed much more in the southern and central parts of the country, where sweet varieties are available with low cyanogenic glycoside levels. Typically, households peel and boil fresh roots before eating sweet varieties. Most fresh and dried cassava and leaves are consumed directly by rural families. A small but growing percentage of roots and leaves are transported to main towns for urban families to consume, but the urban market potential for fresh cassava is constrained by the quick perishability of roots and lack of adequate packaging. Cassava leaves, a by-product,

middlemen, and many keep the dried cassava in their warehouses to sell when supply is low (Figure 2.7). Little cassava is used as livestock feed, and most of that is on-farm and not sold commercially (Donovan et al. 2011).

Farmers in the north and center of Mozambique typically sell fresh raw roots to local processors or consumers; in 2018 this sold for around 2-2.5 MZN/kg (US 3-4 cents/kg) in the north, and for slightly higher in the south. Processing is especially important in the north due to high cyanide content. Local processors, selling about 100-250 kg each of rale a week in season, charged about 13 MZN/kg for rough grade and 17 MZN for finer grade rale (US 22-27 cents/kg). Typically, 7 kg of raw roots are required per kg of rale. Local labor costs for the onerous job of peeling and other tasks were about 100 MZN/day (US\$1.51/day). For sweet cassava varieties in the south, local processing into cassava flour is feasible. It sold in season for 23 to 25 MZN/kg (US 37-40 cents/kg) in larger containers ex-rural-processor-gate, destined for urban areas.⁵²

Only a few mid-scale processors are left, most of them still based in the southern coastal region, where they developed due to proximity to the Maputo market. Also, the sweet cassava from this region is more easily processed industrially from fresh roots. The numbers of these medium-scale processors declined over recent years, reportedly due to several reasons: lack of reliable access to raw material beyond limited local availability, inadequate availability of staff for financial management and technical leadership, and recent cyclone damage.⁵³ This decline has noticeably reduced the availability of quality cassava flour and rale.

The present low quality and relatively high unit cost of Mozambican industrially processed cassava products prevents processors from accessing more demanding and more remunerative global markets for HQCF. Local HQCF production in Mozambique was estimated at about 100 mt in 2014. These small quantities of HQCF are processed by 10 to 15 small associations and micro-processors. HQCF is sold to small bakeries or used for local production of cassava-based cakes and cookies (Dalberg 2015).

Ethanol in Mozambique is used largely in the potable spirit distilling industry. Its potable form, extra neutral alcohol (ENA), is blended with water and flavors to make alcoholic beverages. One local pharmaceutical company uses ethanol in medications and to sterilize equipment, with 2015 annual demand estimated at 1,200 liters and expected to reach 12,000 liters in the future (Dalberg 2015). Attempts to produce cassava ethanol as fuel have not progressed as planned. *CleanStar* began producing cassava ethanol in 2010 for clean cook stoves in an initiative to address deforestation, land degradation, malnutrition, poverty, indoor air pollution, and carbon emissions (Costa and Delgado 2019a). But the *CleanStar* factory ceased operations in 2013, reportedly because of the company's inability to compete with ethanol from molasses (Ibid.).

In 2011, in Nampula Province, a *CdM*-led initiative began producing Impala beer using cassava wet cake as an ingredient. *CdM* used DADTCO for procurement and processing of cassava, and subsequently expanded their initiative to the southern province of Inhambane. DADTCO bought fresh cassava at the farm gate to process into wet cake with 2 mobile processing units. Impala beer made from cassava sells for about two-thirds the price of other domestic beers thanks to reduced taxation of beer made from cassava. DADTCO is the single large-scale off-taker for cassava on the farms concerned. This operation has allowed the small farmers involved to rely on selling their fresh roots production for a known, albeit low, price compared to the uncertainties of the spot market (Costa and Delgado 2019a).

DADTCO's activities accounted for a significant part of the industrial-scale use of 20,000 to 25,000 mt annually of processed cassava products in Mozambique at the time of interviews in 2018. Subsequently, *CdM* decided to replace cassava wet cake with dry starch—possibly including from cassava—because the fibrous wet cake created problems for beer making. DADTCO has already invested in new equipment for starch production to

⁵² From one-day field visits to seven processing sites in southern and northern Mozambique by Carlos Costa in 2018 (Costa and Delgado 2019).

⁵³ Reasons cited during interviews with processors by Carlos Costa (Costa and Delgado 2019).

explore larger markets other than domestic breweries, and also to produce cassava-derived products such as HQCF for more demanding markets. Dried cassava chips have been used informally for animal feed, but despite the large domestic feed market,⁵⁴ few animal feed processors are interested in adding cassava to their products.

Mozambique's present domestic demand for industrial cassava products is very small, but it may grow. A proactive jobs development strategy requires both looking at domestic demand and at potential export markets where demand is growing rapidly. Mozambique has a privileged economic relationship with South Africa, the main growth market for value-added cassava products within Southern Africa Development Community (SADC) countries. Tanzania and Malawi compete for selling cassava products to South Africa, but southern areas in Mozambique benefit from proximity and good road and rail links with South Africa.

2.5 POTENTIAL FOR PRODUCING INDUSTRIAL CASSAVA-BASED PRODUCTS IN MOZAMBIQUE

A. HIGH QUALITY CASSAVA FLOUR (HQCF)

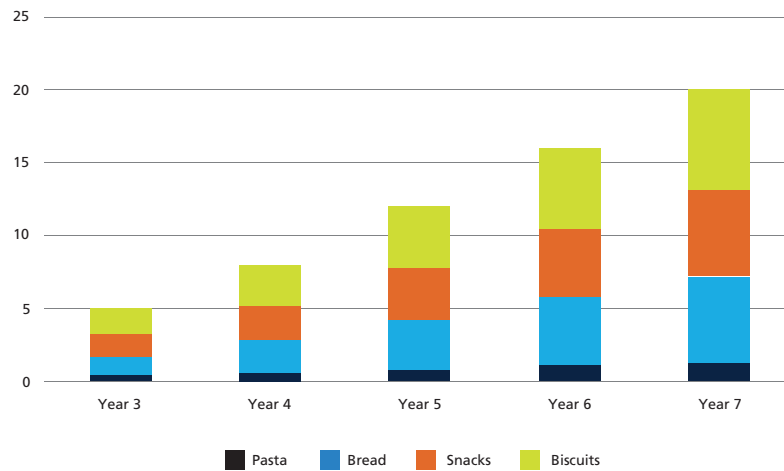
HQCF production for use in local bread, biscuits, and snacks has good long-term potential for value-added cassava products. Domestic potential for HQCF use as a substitute for wheat depends on taste habits and cooking characteristics of products. For example, cassava flour can replace up to 10 percent of wheat flour in leavened bread without significantly changing the characteristics of the product. HQCF can also replace 20 percent of wheat flour in biscuits and up to 50 percent in snack foods. In 2014, Mozambique's imported about 750,000 mt of wheat, converted into 580,000 mt of wheat flour (UN COMTRADE), accounting for almost all local availability. Approximately 65 percent of wheat flour is used in bread production, with 25 percent used for biscuits and snacks, and 10 percent used in pasta and noodles.⁵⁵ This translates into maximum use of HQCF as a substitute for wheat in food of about 90,000 mt annually in Mozambique.

Mozambique's use of HQCF in 2015 was just 0.1 percent of this, suggesting opportunities for growth (Dalberg 2015). Dalberg in 2015 estimated demand growth for HQCF of 20,000 mt by 2021 (Figure 2.8), assuming establishment of appropriate policies and incentives, still far short of the potential 90 000 mt. The leading driver of this demand was expected to be biscuits, at about 35 percent of the total (~7,000 mt), followed by bread and snacks at 29 percent each (~5,800 mt each), and pasta/noodles at about 7 percent (~1,400 mt). Unfortunately, these optimistic projections have not been realized and the commercial viability of HQCF is still unproven.⁵⁶ Mozambican Industrial cassava processors Mozambique are struggling to expand commercialization of value-added cassava products and derivatives.

⁵⁴ Philafrica, DADTCO's new owner, has invested in new equipment to process wet cake with low percentage of fibers to supply the beer company and to produce other cassava products such as HQCF. Source: Interview by Carlos Costa of Hubert Van Melick, DADTCO Mozambique country manager, 2018.

⁵⁵ UN COMTRADE data assessed in Dalberg (2015).

⁵⁶ The authors cannot find updated data beyond 2015 for total domestic HQCF use in Mozambique, but casual conversations with potential industrial users in Mozambique suggest little change in annual use since then.

FIGURE 2.8**Potential Mozambican domestic demand for HQCF (over 7 years in 000 mt)**

Source: Dalberg (2015).

Note: Years 1 and 2 are for start-up investment, with expanded use beginning to occur in year 3.

Building a profitable industrial cassava processing industry that creates marketing and manufacturing jobs for a variety of products will require attaining full capacity utilization at a much larger scale. This in turn requires larger and more uniform availability of cassava raw material. Producing more higher quality cassava requires much higher farm productivity to increase quantities and incentives for farmers to produce commercially. In addition, research and development is needed along different stages of the value chain to lower costs and improve product safety.

Research and development could follow the example of the Natural Resources Institute (NRI) University of Greenwich program titled *Cassava: Adding Value for Africa (CAVA)* (NRI no date).⁵⁷ CAVA and its spin-offs have enabled implementation of a major multi-country program to improve cassava processing in Nigeria, Ghana, Tanzania, Malawi, and Uganda; countries where, like Mozambique, cassava is the most prominent single food crop and smallholder agricultural production is prominent.⁵⁸ CAVA focused its research on improving HQCF processing technologies beyond substitution for wheat and examine potential for HQCF use in paperboard, plywood adhesives, and sugar syrups and other foods. This could substantially enlarge HQCF use and create large economies of scale (NRI no date).

The collaborative CAVA and CAVA2 program activities identified 4 focus areas within cassava value chains (NRI no date). First, it is necessary to overcome emergent pests and diseases, and more generally to boost productivity of cassava production, especially for sweet varieties. Second, the goal should be to add real value through improved processing and market development for real businesses, including keeping consumer costs affordable. Third, success will require managing spoilage within the value chain as over one-third of cassava production currently is lost (Fews Net 2018). Fourth, the capacity of developing country scientists and practitioners, including commercial actors in the cassava sphere, needs strengthening.

⁵⁷ And its successor (CAVA2) implemented through several institutes in Africa and the European Union Cassava Growth Markets project in African countries.

⁵⁸ <https://www.nri.org/latest/news/2019>

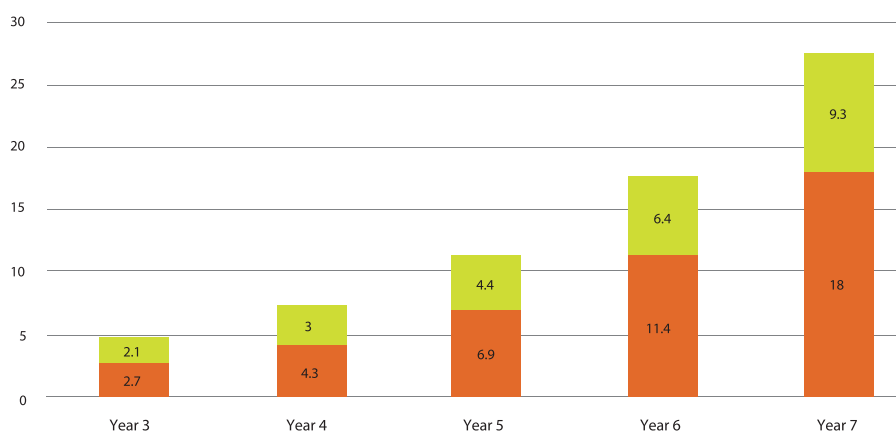
B. ETHANOL

Mozambique imports a relatively large quantity of ethanol, 49.2 million liters in 2013 (Dalberg 2015), but currently cassava is not being used for ethanol processing in Mozambique. Estimated addressable local and regional demand for cassava ethanol was about 27 million liters in 2020 (Figure 2.9) (Dalberg 2015). Domestic market demand was expected to drive this growth, accounting for about two-thirds of total demand, or about 18 million liters, most of it for production of spirits.

The *CleanStar* cook stove, and other experiences with ethanol in Mozambique, suggest several lessons (Costa and Delgado 2019a). To make commercially viable cassava-based ethanol, factories need a reliable supply of quality raw material at low cost. To get this in Mozambique, factories need to locate in a region where cassava is traditional and well-known by the surrounding producing and consuming communities, preferably without major competing outlets for marketed cassava. They will also need to drive vertical integration of their supply chain, which has not happened perhaps due to competition from imported ethanol. Specifically, they would need to promote arrangements with organized producer groups, assist with provision of basic inputs and technical assistance to these producer groups, and guarantee a secure outlet for cassava sales at a price agreed in advance that is competitive with alternative farm-gate markets for cassava (assuming that all prices are adjusted for the purpose of comparison for reimbursement of inputs provided by the company). Participating farm groups would need to take on collective responsibility for reimbursement of credit or other services provided by the company in the event of default by a member.

FIGURE 2.9

Potential demand for cassava-based ethanol in Mozambique (over 7 years in 000 mt)



Source: Dalberg (2015).

Note: Years 1 and 2 are for start-up investment, with expanded use beginning to occur in year 3.

The bottom line is that the cassava industry must create enough new value to pay farmers more than they would get otherwise. Based on interviews, industry argues for tariff protection against imports of ethanol or close substitutes.⁵⁹ However, technological progress along the entire supply chain is ultimately needed, and the case for infant industry trade protection, or other fiscal incentives, should be time-limited to avoid discouraging long-term innovation and efficiency.

⁵⁹ By Carlos Costa, 2018, reported in Costa and Delgado (2019a).

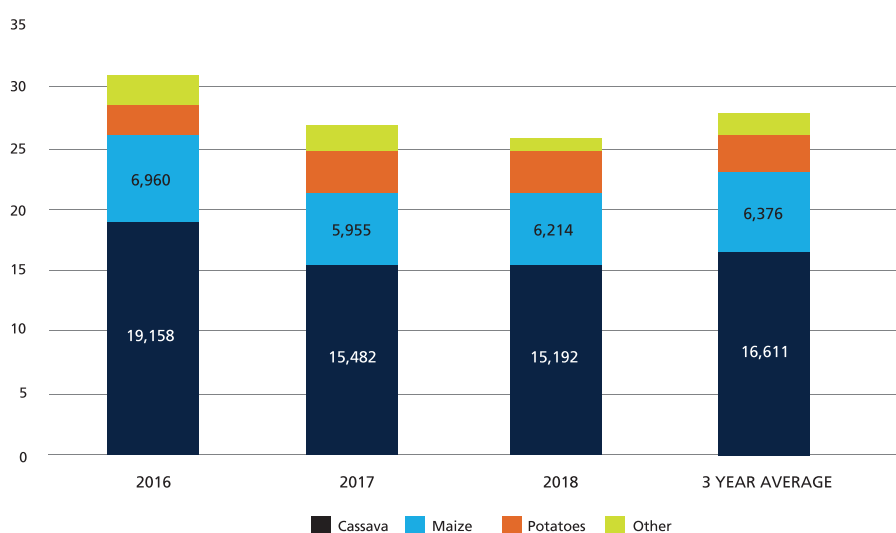
C. INDUSTRIAL STARCH

Based on Asian and West African experience, industrial starch may be the best long-run prospect for value-addition through industrial processing of cassava. Cereal and root crop sources of starch are widespread in the world, but plant-based starches are not perfect substitutes.⁶⁰ Cassava produces a native starch with good overall chemical properties to serve as inputs for many industrial processes using starch; these include processes producing diverse items experiencing accelerating global demand, such as, for example, high-end processed food products, papermaking, and lubrication of shafts during oil drilling (Dalberg 2015).

Mozambique’s domestic market for starch and derivative products is not large enough to sustain industrial processing. Imports of industrial starch and derivative products, mainly from South Africa, were 2,900 mt in 2013. These included native starch, glucose, syrups, dextrin, and modified starches for food and beverage companies and pharmaceuticals. Many of the large multinationals that are major consumers of starch elsewhere, like Nestle and Unilever, do not currently manufacture in Mozambique. Only one company makes pharmaceutical products locally, and it reports annual demand for starch inputs at approximately 1 Mt/year.

In contrast, the regional SADC starch and derivatives market led by South Africa is large and quickly growing. Imports of all starch products in all forms in SADC stood at 364,000 mt in 2013, driven by glucose and sugar syrups at 64 percent, native starch at 24 percent, and dextrin and other modified starches at 12 percent (Dalberg 2015). Cassava starch is in high demand in South Africa due to its favorable industrial properties and cost effectiveness. South Africa imported about 28,000 mt of industrial starch annually over the 2016-2018 period, almost two-thirds from cassava (Figure 2.10). These factors are contributing to cassava already being used in South Africa as a substitute for higher priced raw materials such as maize, wheat, and potato (Urban-Econ Development Consultants 2017). The demand for cassava flour, starch, syrups, and glucose is expected to continue to rise rapidly in South Africa due to urbanization, currency devaluation, and continuing fluctuation in grain prices.

FIGURE 2.10
South Africa industrial starch imports 2016-2018 (000 mt)



Source: Merchandise imports by country in SADC, TrendEconomy (2020)

Note: “Other” includes starch from wheat and other minor sources.

⁶⁰ The 2 major components of native starch are molecules of amylose and amylopectin; these are assembled to form a semi-crystalline starch granule that also contains small amounts of lipid and phosphate. The exact proportions of these molecules, other components, and the size of the granule all vary across plant-based sources (Burrell 2003).

Soon the regional market for starch products will increase due to more widespread use of starch for biodegradable packaging material. Biodegradable polymers gained significant attention from researchers decades ago for reducing pollution. In recent decades, one of the most important targets in the development of biodegradable polymer area is to produce cheap starch-based biodegradable polymer, such as that used to package snack foods. Native starch is suitable to produce biodegradable polymer material and provides abundant availability at low cost. Starch is extracted from varieties of crops such as maize, potato, sago, cassava, and wheat. Among these crops, cassava is the most widely grown to produce a sustainable and cheap source of starch globally, with properties superior to most alternative sources of starch in terms of ease of processing, plasticity, and neutral flavor and taste (Sin et al. 2011). Considering increasing global attention to plastics pollution, replacement with biodegradable products represents a huge potential global addressable market. Cassava producing countries may be able to take advantage of this opportunity.

The key to Mozambican competitiveness in the regional industrial starch market is to lower unit costs of raw material, process newly harvested roots in an expeditious manner, and supply a larger and more reliable scale. As in the case of perishability of fresh roots for food, time since harvest and root quality are also critical factors for industrial starch production. Roots need to be processed almost immediately after harvest since enzymatic processes accelerate deterioration within 1 to 2 days.⁶¹

The spot price for native cassava starch ready for further industrial processes in South Africa in mid-2017 was approximately Rand 8 (US\$0.62 at the time) per kg (Urban-Econ Development Consultants 2017). This gives a benchmark for assessing present needs for developing Mozambican competitiveness. Local retail prices in Mozambique for artisanal cassava flour were about US\$0.40 per kg during the same time period. Although the 50 percent-plus margin may seem attractive, current supply costs for Mozambican industrial starch delivered to the factory-gate in South Africa very likely exceed this when including costs such as searching for reliable buyers and sellers, monitoring quality, procuring, bulking, handling, and reliable commercial delivery across the border. Meeting South African demand would require establishing a reliable supply chain with consistent raw material at scale.

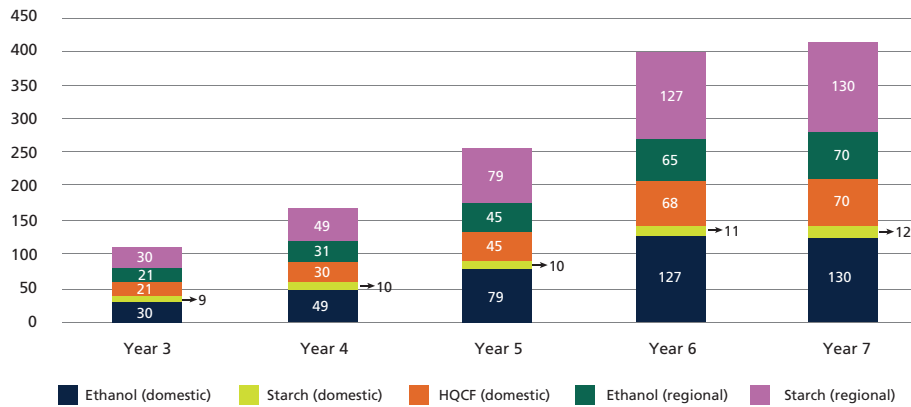
D. UPPER ESTIMATE OF ANNUAL FRESH ROOTS POTENTIALLY NEEDED BY INDUSTRY

In sum, the regional market for industrial cassava derivatives is increasing rapidly in southern Africa. Figure 2.11 summarizes an upper limit on potential industrial use of cassava raw material for HQCF, ethanol, and starch. As high as these figures are, they likely represent only one-third of latent potential if costs can be reduced. They also need to be understood in the context of Mozambique's position as the 11th largest producer of fresh cassava in the world. Dalberg (2015) estimates suggested that Mozambique could attain 362,000 mt of raw cassava in industrial processing within 7 years; yet 5 years later, there is little sign that it is happening. Progress will depend on establishing pro-active policies and investment to promote supply growth to match growing commercial opportunities.

⁶¹ See the commercial procurement viewpoint on this at: <http://www.cassavabiz.org/postharvest/starch03.htm>

FIGURE 2.11

Potential growth in the use of cassava as industrial raw material in Mozambique over 7 future years (for 7 years in 000 mt of raw cassava)



Source: Merchandise imports by country in SADC, TrendEconomy (2020)
 Note: "Other" includes starch from wheat and other minor sources.

2.6 ADDRESSING SUPPLY-SIDE CONSTRAINTS IN CASSAVA VALUE CHAINS

A. FARM-LEVEL PRODUCTION CONSTRAINTS

A review of the literature, as well as field experience, suggests several key issues apply to smallholder cassava farming systems in Mozambique. Diseases and insect pests have reduced yields and deeply affected cassava production.⁶² Smallholder and medium-sized producers, still accounting for more than 95 percent cassava production in Mozambique, have poor access to quality inputs such as disease-resistant stems, pesticides, fertilizers, and mechanized plowing.

Despite programs to produce better planting material, availability is limited and dissemination efforts have been ineffective, with only small groups of farmers engaged through NGO/donor value chain development programs. No private germplasm companies exist to multiply cassava stems; thus, distribution channels continue to rely solely on government and NGO initiatives.

Yields are quite low, with some estimates as low as 1.5 mt/ha, although on average 3-5 mt/ha. For many farmers, even basic agronomic practices, such as appropriate plant density and spacing, are not properly

B. PERISHABILITY AND COLLECTION ISSUES

Smallholders are also poorly organized and widely spread across difficult-to-reach rural areas. Traders are forced to source from a greater number of farmers selling small amounts, increasing the time and cost of securing adequate supply. Further, since cassava is both highly perishable after removal from the ground and can stay long

⁶² Examples are African mosaic disease, cassava bacterial blight, cassava brown streak disease, mealy bugs, cassava green mite, and termites and large grain borers that attack dry chips of cassava in storage (Donovan et al. 2011, IITA /SARRNET 2012, Bita and Gerats 2013).

periods underground, farmers normally delay or stagger surplus harvest (above immediate self-consumption) until they have buyers.

Raw cassava storage is one of the main constraints for both producers and traders. Raw roots contain 60 to 70 percent moisture and have only a 2 to 3-day shelf life after harvesting (Dziedzoave et al. 2006). Traditional delay of cassava harvesting prevents land from being used for other purposes. Furthermore, the roots can be infected with flavor-altering pathogens. Processes used elsewhere to avoid spoilage, such as waxing or freezing, are not used in Mozambique. Traders select roots suitable for sale in the fresh roots market and reject roots not considered sufficiently tender or juicy. Large quantities of roots may be rejected when the cassava is fully mature and too big for fresh root marketing. Traders cannot profitably use over-aged or diseased roots.

Due to low processing capacity, traditional farmers are often unable to process large outputs themselves and must sell their crop at very low prices to market traders to avoid spoilage. Traders often buy cassava on farms before it is harvested. In the southern region, “*Maguevas*”—women coming from the main cities—are the main cassava traders. They often agree on prices and quantities with farmers while the cassava is still in the ground as farmers resort to this when they need money. This represents an expensive form of credit as the bargaining power of individual farmers or communities is low.

C. FOOD SECURITY CONCERNS AFFECTING CASSAVA MARKETING

Clearly, own-farm cassava cultivation and on-farm, in-ground storage play a major role in food security for many Mozambicans, especially in remote northern rural areas. This suggests that efforts to develop the cassava sector cannot simply seek to raise cassava farm-gate prices to incentivize producers. Rather the focus needs to be on investment to increase productivity, and especially investment in public goods such as research and extension.

A less obvious but important link to food security involves the trade-offs in production and marketing between cassava and maize, particularly during drought years. In northern Mozambique, 50 percent of the population consumes both cassava and maize in shifting proportions throughout the year. During the lean season—that is, late in the rainy season when maize prices peak before the main maize harvest—northern rural people consume large quantities of fresh cassava, the only staple food they can harvest during this period.

After the maize harvest, when maize stocks are plentiful and prices low, maize flour accounts for a large proportion of the porridge consumed. As the dry season proceeds, cassava flour becomes increasingly prevalent in regional diets. Thus, Mozambique’s cassava producers and traders perform an important buffering role through smoothing market supply and demand—and thus reducing price volatility—for maize. This helps support regional food security during drought years through trade with neighbors (Donovan et al, 2011; Haggblade et. al., 2012). However, since maize is more subject to drought-related production decrease than cassava, this mechanism also transfers some of the volatility of maize production to cassava prices, as we discussed in the context of the impact of regional maize prices on cassava harvests in Mozambique in 2013.

D. FARM INCENTIVES AND UNIT PRODUCTION COSTS THAT DECREASE WITH SCALE

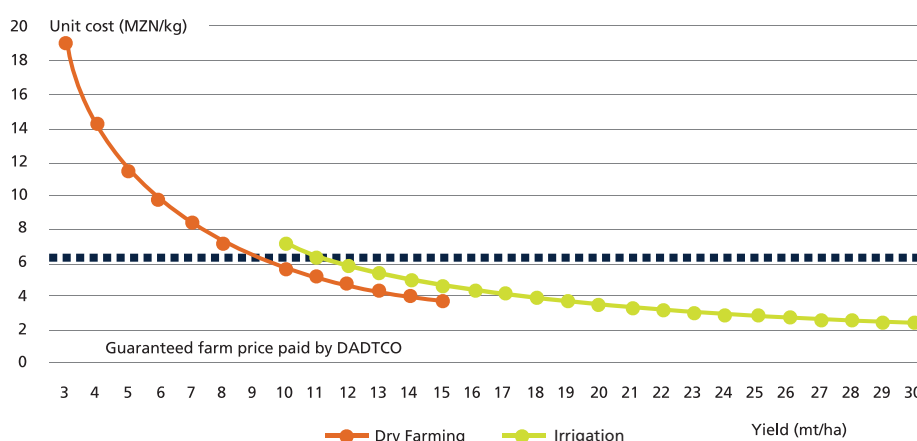
Low farm productivity is no doubt the “Achilles heel” of the entire cassava sector in Mozambique, especially for increasing industrial processing. Small farmers producing via traditional rainfed farming have high costs per unit but little incentive to invest in lowering them. Spot markets for smallholder cassava in Mozambique are presently unremunerative. In the case of DADTCO cassava processing, as seen above, farmers are paid between 2,000/2,500 MZN (meticaïs—at the time of writing US\$32 to US\$40) per mt (or 3 to 4 US cents per kg),

depending on whether root transport is included or not. At a physical yield of 9 mt/ha, this implies a maximum revenue of US\$360 per ha, or roughly half that amount of income per annum for the average small cassava farm producing 0.5 ha. This provides little incentive to grow cassava as a cash crop, with farmer sales coming mostly from production that exceeds family needs.

Some farmers are pushing DADTCO for a price twice as high, reportedly to cover their farm production costs and make a profit. DADTCO claims that the price, which is based on a cost-plus calculation, is at the maximum level consistent with a reasonable return to them. Rather, they urge farmers to seek lower unit grower costs through boosting production and achieving greater economies of scale to cover fixed and variable unit costs.⁶³

DADTCO—in partnership with SNV, a Dutch NGO—claims that farmers are achieving 20-22 mt/ha yields when using improved genetic material (from distributed cassava stems) and can also produce around 15 mt/ha when using local varieties.⁶⁴ However, these gains have not spread among all 4,000 farmers in the DADTCO program in the southern part of the country. Few farmers selling to DADTCO actually produce large enough quantities to offset fixed costs per ha and high labor requirements. Helping a large number of farmers to increase productivity is a long process, which requires strong technical support to farmers through a solid network of extension services.

FIGURE 2.12
Cassava unit production costs (MZN/kg) decline with increasing yield (mt/ha)



Source: Calculated by Carlos Costa based on figures collected by him from interviews of cassava stakeholders in Inhambane Province 2018

All other industrial cassava initiatives must cope with the same problem. The CleanStar/NDiZLO ethanol processing initiative, for example, reported that it closed due to inability to procure enough raw material at a price that the company could afford to pay. There were also 2 other possible caveats associated with this outcome: (a) the processing unit was located in Dondo in Sofala Province, a railroad town that while convenient to the major port of Beira is also low in surrounding cassava production, and (b) the cassava buying agents for the ethanol venture faced fierce competition from the CdM beer company in buying cassava; CdM/DADTCO procuring cassava in the same zones benefitted from substantial fiscal incentives.⁶⁵

⁶³ From interview with Mr. Van Melick, DADTCO manager, Nov. 2015.

⁶⁴ Under funding by the PROSUL project of IFAD.

⁶⁵ From interviews by Carlos Costa with Telma Venichand, former Sales and Marketing Director, and Emmet Costel, operations manager at the CleanStar/NDiZLO company. Also see Costa and Delgado (2019).

Based on present market dynamics, rainfed smallholder farms can expect to incur costs between MZN 19.0/kg and MZN 5.7/kg (30 US cents to 9 US cents per kg) respectively for yields of 3 to 10 mt/ha (see Figure 2.12). With irrigated systems, yields can achieve 30 mt/ha or more; if the yields vary from 10 to 30 mt, unit costs will range from MZN 7.0/kg to MZN 2.3/kg respectively (Ibid.). Even under the presently improbable case of producers consistently achieving 15 mt/ha, unit costs will remain near the current average farm-gate output price. Thus, positive farm incentives to grow commercial production of cassava for industrial processors in Mozambique will require not only raising yields, but also finding additional ways to improve producer margins. This will likely include lowering costs beyond the farm in moving raw material from harvest to processing.

E. PROCESSING AND MARKETING ISSUES IN EXPANDING CASSAVA VALUE CHAINS

The main constraint for industrial cassava processing is inability to secure an adequate supply of fresh root to run factories, given irregular supply and high unit costs of raw material. Without reliable raw material supply chains, processors will not be able to operate at the minimum capacity needed to lower average costs enough to both pay farmers more per unit and allow a profit for themselves. There are significant constraints to overcome. The small volume of cassava production from individual areas at any one time raises unit procurement costs due to the need to travel for small amounts. It also increases post-harvest losses because fast processing is critical, and low and irregular volume does not encourage investment in immovable mechanized equipment.

Looking farther along the value chain from the farm to the market, cassava market information is also not easily available to individual firms, especially for value-added products with tight product specifications and markets in other countries. Food safety rules for cassava are lacking, as are clear ways to link current cassava sector practices to known international processes, such as HACCP (Hazard Analysis Critical Control Point).⁶⁶ Further, investment in cassava-specific public goods, such as in research related to productivity research and extension, is weak

Finally, as in other manufacturing sectors in Mozambique, skilled labor and experienced managers are scarce. Infrastructure is poor and transport costs for a bulky, low-value, highly perishable product are high. Commercial lenders charge high interest rates due to uncertainty about exchange rates and other macroeconomic variables. Electricity networks and clean water systems in rural areas are largely lacking.

2.7 GOVERNMENT POLICY WITH RESPECT TO CASSAVA

A. FROM THE 2007 CASSAVA STRATEGY TO PEDSA IN 2011

Cassava remains critical to Mozambican food supply, with the average person consuming some form of cassava every day. However, nearly all consumption is still of traditional, informally processed foods, largely within producing households. Policy to date has had limited success in promoting formal value-addition opportunities. However, over the last decade, the GOM has demonstrated growing interest in exploiting the potential of cassava products for human consumption and derivatives for industrial use.

Cassava smallholder farmers in Mozambique face a number of problems including inadequate access to improved planting materials and to service providers (inputs, extension) as well as inability to get remunerative prices and inconsistent private sector demand for cassava. Concerned about these issues, the Mozambique Ministry

⁶⁶ HACCP is the main systematic approach in the world to the identification, evaluation, and control of food safety hazards; it embodies principles to reduce food safety risks. A HACCP Plan is a written document based upon the principles of HACCP that delineates the procedures to be followed in a specific situation. The HACCP System for a given entity is the implementation of the HACCP Plan. See Jaffee et al. (2018).

of Industry and Commerce (MIC) prepared a Cassava Development Strategy in 2007, with support from the European Union (EU) and the Food and Agriculture Organization (FAO) (Mozambique, Ministry of Industry and Commerce [MIC] 2007). The strategy aimed to develop the cassava value chain to improve food security, create more and better jobs, and increase the incomes of farmers, processors, and traders. To do this, the aim was to increase investment in the sector to seize domestic and regional market opportunities for value-added cassava-based products.

The main elements of the 2007 MIC Strategy for cassava were to:

- Create an enabling environment to support the role of cassava in both food security and income generation.
- Identify and develop market opportunities for cassava products.
- Support development of cassava value chains, including production, processing, and marketing to meet identified market opportunities for improved traditional products (flour and rale), high-quality industrial cassava flour (HQCF), and livestock feed.
- Promote research on cassava-based production of industrial products with long-term potential, including surveys to identify market demand for such products and funding for financial feasibility studies for private sector investment (Mozambique MIC 2007).

The GOM prioritized cassava projects in agriculture development programs and accelerated support to government-funded cassava research, germplasm replication, and extension programs to improve genetic material for planting and make it available to farmers.

In 2007, the then President of Mozambique requested scientists to develop technologies for mixing HQCF with wheat flour to reduce the import component cost of bread. Following this, the MIC promoted use of HQCF as a partial substitute for imported wheat flour. Further driven by a spike in the price of wheat in 2010, the Government again asked research institutes and end-users to explore adoption of HQCF in bread and other products. No formal policy was established, and the pilot flour promotion projects have not been scaled. While some local bakers still produce cassava breads and other products, efforts are scattered, and investment remains low (Dalberg 2015).

Over the last decade, MIC launched a series of studies and task forces aimed at exploring prospects for more formal cassava commercialization. The GOM also promoted biofuels legislation to encourage domestic production from commodities such as cassava.⁶⁷ Finally, the Government, through MASA at the time, included cassava as a priority food crop in the Agricultural Sector Strategic Development Plan (PEDSA) 2011/2020, recognizing the socio-economic importance of cassava in Mozambique's economy (MASA 2010).

B. FISCAL POLICIES IN RELATION TO CASSAVA SINCE 2011

In 2011, the Mozambican parliament passed legislation to lower the tax on beer made from roots or tubers, particularly cassava, from 40 percent to 10 percent. The low tax was intended to make the new beer competitive and encourage farmers to produce more cassava. The excise break on the Impala beer has been critical in enabling CdM to sell the beer at about 70 percent of the price of a mainstream beer (Ibid.). This fiscal advantage, still in force as of writing, has been a major driver of demand and popularity of the Impala brand.

⁶⁷ Personal communication to Carlos Costa from Marcelina Mataveia, May 2009.

To date, cassava policies in Mozambique have successfully incentivized the cassava beer industry, although that may be changing, and it seems that further fiscal incentives may be needed to encourage broader industrialization and access to export opportunities such as for starch and ethanol.

C. FOOD-SAFETY POLICIES GOING FORWARD

Since rural families consume most cassava directly, homemakers—normally women—who prepare cassava-based foods are responsible for controlling food safety. Even if there were official standards, consumer education would be more important than enforcement. For the most part, home food preparers are aware of the issues. Yet Mozambique has registered cases of people dying or contracting severe diseases by ingesting highly toxic cassava products with cyanogenic glucosides such as linamarin and lotaustralin.

The presence of cyanide in cassava can also endanger animals that consume cassava-based feed. As cassava in Mozambique is increasingly consumed farther away from where it is produced, there is increasing need for legislation to regulate and enforce cassava product safety (cassava roots, processed products, and cassava leaves). This is especially the case for industrially processed cassava.

Contrary to Malawi and Zambia, Mozambique has no food safety policy or standards for commercially processed cassava foods. Commercial cassava processors recognize the need for food safety standards to ensure consumer safety, but also to protect processing firms from litigation (Haggblade et al. 2012). Given the danger to human health from improperly processed bitter cassava, large-scale commercial food and feed industries require quick, effective tools for testing cyanogenic glucoside content in raw materials and final products (Brimer 1994; Abban, Thorsen and Brimer 2011).

2.8 CONCLUSIONS AND RECOMMENDATIONS FOR A RENEWED STRATEGY FOR CASSAVA DEVELOPMENT

A. CASSAVA’S EVOLVING ROLE IN MOZAMBIQUE AGRICULTURE

Cassava cultivation is arguably the main agricultural work activity in Mozambique—and definitely a major use of labor nationally by any yardstick. The most recent agricultural household survey in Mozambique (2017 IAI) found that cassava accounted for over 100,000 permanent waged jobs and nearly 3 million seasonal waged jobs in primary production (Mozambique MADER 2020). This led to a conservative estimate of 300,000 FTE waged jobs in cassava production. A further 1.5 million household members claimed to be self-employed at least part time growing cassava (Ibid.), compared to 5.4 million persons listed as agricultural self-employed in the IOF 2014. The tonnage of cassava produced annually on Mozambican farms exceeded the weight of all other crops combined, even though the cropped area was significantly smaller than that of maize. Cassava is the main provider of calories to the national population, accounting for 30 percent of total calories from staples. Further, the prevalence of cassava cultivation in northern and central Mozambique, where maize is also an important part of food supply, contributed measurably to stabilizing regional food prices in the first half of the 2010s. This resulted from Mozambicans shifting to higher cassava harvesting and consumption in years with high prices for maize in adjoining countries, allowing greater exports of Mozambican maize to those countries.

Cassava is likely to continue to be a principal food source in Mozambique for the foreseeable future, especially for rural people, many of whom are the poorest in the country. Any public policy intervention needs to be beneficial (or at least do no harm) to the several roles cassava plays in the livelihoods and food security of the poor, such as food, employment, store of value, climate hedge, and inter-temporal income smoother. Cassava

is relatively resistant to severe agricultural climate change impacts. Cassava's tolerance to high temperatures and intra-seasonal drought leads to less volatile production over time in Mozambique compared with grains like maize, millet, and sorghum. Cassava harvest time is flexible, with unharvested storage is possible (underground) for up to 30 months. This introduces flexibility and thus added resilience to agricultural systems that also depend for daily food supply on extremely time sensitive crops such as maize. At the same time, creating more and better jobs at scale from agriculture going forward will benefit from advancing the development of the most prevalent crop in the country as a commercial raw material. This suggests that the key to cassava development is to identify interventions that benefit simultaneously the food security, resilience, and the growth roles of cassava.

Presently, cassava is overwhelmingly grown by smallholders, who produce more than 90 percent of the cassava that is sold. This poses considerable challenges to industries seeking reliable supply of cassava raw material of predictable quality. Farm-gate prices were very low from the farmer point of view compared to estimated farm costs. At typical smallholder average yields of 3 to 10 mt in Mozambique, average costs were reported to be US\$0.30 to US\$0.09 per kg, compared to spot market cassava purchase prices of US\$ 0.03 to 0.04 per kg at the farm gate. Boosting smallholder yields is necessary to lower unit production costs to a level consistent with a commercialization strategy.

Demand for cassava as a traditional food source resilient to climate shocks will continue to grow at least as fast as the rural population, or about 2.1 percent per year, for some time. Overall population growth is higher, at about 2.9 percent per annum,⁶⁸ suggesting that if traditional supply expands at the rate of rural population growth, overall demand and prices may grow somewhat faster due to the increasing importance of urban demand. Eventually, experience in other countries suggests that as urbanization proceeds, demand for products with easier transport options and lower processing and preparation demands will eventually begin to cut into this growth, but any negative impact on relative prices for cassava is years away.

Potential opportunities in cassava are as a domestic industrially processed food staple or as a non-food industrial material for export. But to take advantage of these opportunities, the sector must lower unit costs of production and bulking, as well as address cassava's post-harvest problems of high perishability in raw form, bulky weight before drying, and food safety concerns. Markets for processed foods and industrial starch from cassava and regional demand in southern Africa are growing. Factory gate prices for starch as raw material in South Africa are double starch processor selling prices at factory gates in southern Mozambique. Yet this margin is likely still not enough to cover high unit transfer costs in Mozambique due to very high transport and handling costs for small and irregular quantities.

The entire cassava value chain would benefit from boosting the amount and quality of production of cheaper raw material by better supporting emerging small and medium-scale farmer production and expedited handling of perishable output. Farmers need access to better planting material, adequate inputs, and credit. To take advantage of these improvements, farmers must be able to control their own land, which also must be usable as collateral for commercial loans. Processors need access to credit and larger and more reliable supplies of raw material to help overcome weaknesses in transportation infrastructure.

B. EMPHASIZE THE PRODUCTIVITY GROWTH OF EXISTING GROWERS FOR MUTUAL BENEFIT

In recent years, industry and GOM interest has grown in prioritizing cassava for both food and raw material for industrial products. The number of stakeholders in cassava development is large and the policy climate is favorable to new initiatives. Government, farmers, civil society, traders, industrial companies, investors, and

⁶⁸ Both growth rates are from World Bank World Development Indicators, for 2018.

development partners are all showing interest in improved cassava planting material, extension services, and other productivity initiatives.

Yet cassava as grown in Mozambique remains a bulky, low-value crop, and cassava requires considerable effort to process within a very short time window following harvest. Smallholder cassava farmers are mostly in remote locations with poor infrastructure, mostly in the northern part of the country, and typically have limited experience with formal commercial relationships. More than four-fifths of cassava produced is consumed by the same people who grow it on their own plots. While not specific to cassava production, nor justified by the desire to develop the cassava sector alone, success in using cassava to improve food security and transform agriculture requires improving roads, water, and electricity systems in cassava production areas.

Cassava is genetically complex and subject to several diseases and pests that hamper productivity growth. The spread of pests is a major factor in the insufficient supply of raw cassava to processors, especially for sweet varieties, requiring intensification of pest control measures. It is crucial to develop improved seed-root stem production and distribution systems for pest-resistant cassava varieties. This is a “win-win” prospect for all parties interested in cassava, large and small.

Mozambique’s National Institute of Agronomic Research (IIAM) should collaborate with international specialized institutes, such as the International Institute of Tropical Agriculture (IITA, and peers in Africa, Asia, and Latin America to acquire, test, and multiply promising resistant varieties with higher starch content and productivity. Together with other stakeholders, the GOM should encourage development of a private or public-private partnership (PPP) germplasm distribution system to facilitate distribution of new varieties among farmers. Some work on improving planting material is under way, but more is needed. In addition to cooperating better with peers in other countries, IIAM and its partners need to undertake more intensive research on breeding and more extension work, and educate producers on the use of new cassava cultivation techniques. Lessons from science-based cassava development strategies in West Africa (especially Ghana and Nigeria), Southeast Asia, and Latin America provide useful insights.

Even with improved cultivars, more and improved extension services to the multitude of remote small farms is needed. While the primary emphasis is on food security, it is also important for industrial development. Large cassava farms need to control pests and diseases on their own farms, but also need smallholder neighbors to control pests on their farms. A network of field service providers near major smallholder farm growing zones is needed to deliver technical “hub” services, including technical assistance and capacity-building. Small cassava farmers, many of them women, also need help to purchase inputs and acquire the knowledge to use them correctly.

It is tempting to assume that there is potential for profitable industrial corporate cassava processing in Mozambique of HQCF or industrial starch, because the processors might be able to buy low-cost, high-quality raw material from high-density, large plantations—as is the case in parts of Latin America and Asia. Yet such hopes for industrialization are unlikely to be fulfilled in the near term in Mozambique. Land access and capital investment is not easy to arrange for raw material production through large commercial operations. Commercial, large-scale production initiatives for other crops and forest products have been difficult to implement in Mozambique, and cassava must compete with profitable alternative uses for land and capital, such as horticulture. For the time being, it is more realistic to increase raw material supply by improving collective smallholder activities in low-infrastructure areas, as happened for commercial cassava production in Southeast Asia. This approach also aligns better with the GOM’s food security and rural income concerns.

Smallholder cassava farmers are largely unorganized, and the few cassava-relevant farmers’ associations are weak. Farmers may fear—as has been the case with other crops—that large-scale commercial cassava production could displace smallholders from their land. Farmers should be encouraged to organize in associations to better

brand their product and facilitate access to service provider support and finance. Support for farmer groups to access land rights by DUAT acquisition will reinforce both trust and farmer capacity to practice commercial farming. The initial focus should be on improving smallholder farmers' capacity to produce and reliably supply high-quality, fresh roots for sale in local markets, and then gradually to contracts for supplying more formal processing units.

C. ESTABLISH PUBLIC-PRIVATE-PARTNERSHIPS (PPPS) TO EXPLOIT COMMERCIAL CASSAVA OPPORTUNITIES

Focusing on smallholder growers does not preclude promotion of national-level industrial processors through PPPs. If well implemented, such activities do not harm smallholders while potentially promoting significant spinoffs that improve smallholder production. PPPs are most useful where no single actor has all the competencies required to address the interconnected issues in each situation or policy area. PPPs are also more effective when all parties feel that they hold important and complementary roles within the partnership arrangement, and that parties' benefits from involvement in the PPP cover overall economic costs and align with their own goals and objectives.

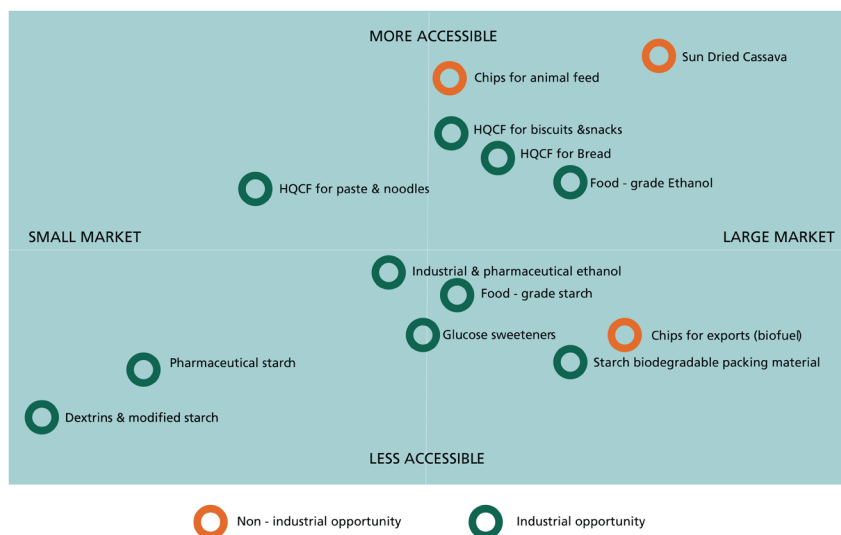
Government and other stakeholders can encourage the creation of PPPs under the Mozambique legal framework to intervene in the cassava value chain. Such encouragement might or might not involve financial support from GOM or a development partner. Where financial advantages are provided out of the public purse, these agreements should be subject to a contract to achieve agreed targets by specific dates, and lay out transparent, monitorable verification procedures. In addition, it is best to cast a wide tent, allowing entry by third-parties to enhance outcomes. The *CdM/DADTCO* beer brewing partnership provides a good example, whereby third-party operators such as IFDC established a bilateral agreement with DADTCO to enhance smallholders' capacity to supply cassava fresh roots to DADTCO reliably (Costa and Delgado 2019a).

Yet the use of cassava wet cake for beer also illustrates the limitations of using tax breaks to support a policy objective through a private company. Lowering the 40 percent tax on beer made with cassava by three-quarters was essential for consumer success through lower beer prices, with no harm to beer producer revenues. Yet, it also undercut other companies' attempts to procure cassava raw material for other industrial purposes in the same zone, such as ethanol for cooking. This also applies to use of HQCF in wheat bread. Without fiscal incentives—essentially a transfer of state funds to cassava processing interests—the commercial viability of using cassava for industrial use is low under current conditions. The need for subsidies in the domestic market also weakens the business case for investment in developing exports such as industrial starch and HQCF for regional markets. Fiscal subsidies should always be transparent and temporary.

Nonetheless, commercial potential for cassava is projected to grow. International consultancy Dalberg assessed the opportunities in Mozambique for private-sector development of value-added cassava products in 2015.

FIGURE 2.13

Commercial cassava opportunities in Mozambique ranked by potential market size and degree of physical accessibility of the opportunity



Source: Dalberg 2015

Figure 2.1.3 suggests priorities to follow in industrializing the cassava value chain in Mozambique. The main opportunities claimed involve HQCF, wet cake, cassava chips for feed, and pharmaceutical grade ethanol for domestic use. Demand for cassava-based products would have to increase; bakeries would need to source HQCF to replace wheat, breweries would need to demand wet cake, while the pharmaceutical, distillery, and cook stove sectors would need to source ethanol from cassava, and animal industries would need to source cassava chips for animal nutrition. The common need is to boost the amount and quality of production of cheaper raw material by better supporting small and medium-scale farmer production. Farmers need access to better planting material, adequate inputs, and credit, which requires that farmers be able to control their own land.

Analysis underlying Figure 2.1.3 (Dalberg 2015) and separately (Costa and Delgado 2019) suggests that in most years demand for HQCF, ethanol, and wet cake will require either protection from competing imports (especially for ethanol) or tax breaks (HQCF and wet cake). The viability of cassava chips for feeding likely depends on what else is available and is unlikely to compete successfully with food use in Mozambique on a large scale. Industrial starch shows potential, mainly for export, if production and transport costs could be lowered; it is worth further consideration mainly because global demand and prices are rising, including in neighboring South Africa (Dalberg 2015; Costa and Delgado 2019a).

D. ESTABLISH AN INSTITUTIONAL PRESENCE TO PROMOTE THE ENTIRE CASSAVA VALUE CHAIN

Fortunately, most of what is of value to smallholder cassava growers aligns with the interests of industrial cassava processors and other actors in the cassava value chain. The main priority remains to increase farm productivity and reduce post-harvest losses. Beyond this, the profile of the subsector needs raising and coalitions across stakeholder groups need creation. Nigeria, Ghana, and some Asian countries with more developed cassava sectors provide successful examples.

This involves adoption of an evidence-based “Master Plan to Develop Cassava Value Chains”. Nigeria’s plan adopted measures such as support to contract farming systems, but their flagship initiative also promoted blending of HQCF in wheat flour for bakeries, beginning at 10 percent substitution before growing (Dalberg 2015). Successful implementation of a similar Plan in Mozambique would require effective governance from funders, primarily the private sector and Government, and buy-in from producers and market agents. Thus, an effective Master Plan requires an institutional Cassava Platform to mobilize stakeholder coordination and buy-in, and to monitor and evaluate Plan implementation over time. The Platform should create a shared vision of goals among all main stakeholders for cassava and derivatives, an agreed roadmap to achieve those goals, and an evidence base to assess progress.

A Cassava Platform could build in a mechanism to provide feedback on regulatory issues, such as food safety, legislation on biofuel production and use, and environmental and regulatory issues in processing. It could be an advocacy voice for intensifying pest control and for producing and distributing improved seed-root stems, including to smallholders. It could facilitate information flows with other countries on research findings and analysis by linking relevant agencies, such as IIAM and Instituto de Normaço e Qualidade de Moçambique (INNOQ), with civil society, potential investors, and policymaking entities.

An institutionalized Cassava Platform would also help preserve institutional memory for the industry and monitor cassava prices and opportunities for stakeholders. It could also provide a contact point for interested investors and support the Mozambican industry through direct trade promotion and better trade information flows. Finally, a Cassava Platform could bring attention to trade-offs between competing stakeholder interests if they arise and develop options for minimizing conflicts while maximizing synergies.

E. CAREFULLY CONSIDER AN INFANT INDUSTRY APPROACH TO PROMOTING CASSAVA-BASED INDUSTRIALIZATION

This is the most controversial topic related to promoting cassava processing, and with good reason. The industry in Mozambique has advocated actively for protection measures (Costa and Delgado 2019a); for example, using fiscal policy such as tax breaks to incentivize use of cassava products and derivatives in food processing, as for cassava beer. Government could also enforce an existing but neglected policy to replace 10 percent of wheat flour with HQCF in all bakeries. Another example is requiring blending of gasoline with 10 percent ethanol (E-10) made only from local cassava or placing a tariff on ethanol imports. Realistically, it seems unlikely that HQCF would be used in bread making without enforcement, and the same is true for the blending of local cassava-based ethanol in gasoline. Infant industry arguments need to establish transparently that the subsidy or protection involved encourages investment that achieves economies of scale or scope, and that these industries will become self-supporting without public help.

Fiscal manufacturing incentives based on cassava can only promote efficiency and scaling if conducted alongside credible, publicly available analysis of outcomes with respect to public objectives such as more and better jobs or higher farm incomes. This also requires assessment of alternative means of using the same public funding for inducing similar public goods through less distortive means, such as increased research and extension to raise farm productivity. Furthermore, a clear exit strategy is also needed to prevent the subsidy from continuing indefinitely without showing progress on increasing efficiency. Mozambique has not met these difficult requirements, but some suggest that West African experience shows it is possible to accomplish (Sanni et al. 2009).



3. CASHEW, A TRADITIONAL EXPORT CROP GOING UPMARKET

3.1 CASHEW AND THE POTENTIAL FOR MORE AND BETTER JOBS IN MOZAMBIQUE

Cashew has a large role to play in terms of income generation and jobs creation in Mozambique, especially in poor rural areas and for manufacturing. Approximately 1.3 million Mozambican farm households had cashew trees in 2014-15, and well over one-fifth of all agricultural households (or 840,000 farms) harvested and sold cashews from their trees that year (Ricaldi and Cunguara 2018; Mozambique MASA Inquérito Agrário Integrado (IAI) 2015).⁶⁹ Women headed 30 percent of these harvesting households. Overall, approximately 3.4 million people reported deriving some income from cashew production, adding US\$80 to US\$120 per capita to the annual net income of growers (Ibid.). The 2015 IAI survey also reported that 965,676 persons claimed self-employment in cashew as their major cash income source. Furthermore, 150,573 persons worked as hired permanent laborers on 3.3 percent of cashew farms, and cashew households reported hiring 1,805,023 persons as seasonal labor (Ibid.).⁷⁰

Other agents along the cashew value chain include input suppliers, local independent traders that procure from farmers, local small-scale processors, processor and exporter representatives, financiers, transporters, large scale-processors and raw cashew nut (RCN) exporters (MEDA 2011). Available data does not allow for an accurate estimate of the total number of jobs involved, nor the share of these that are permanent and waged. A conservative guess would be that the cashew value chain creates 1 post-harvest FTE job per 1 to 2 mt of RCN harvested during the cashew harvest from October and January,⁷¹ or roughly 70,000 to 140,000 jobs for one-third of the year given primary production of 140,000 mt. On an annualized basis, this translates to about 23,000 to 47,000 FTE jobs. Finally, as shown in Table 3.2, the industrial cashew processing sector contributes about 17,498 waged manufacturing jobs to cashew value.

⁶⁹ Very young trees or very old trees or trees with significant pest and disease problems do not yield enough usable nuts to be worth harvesting, explaining the smaller number of households that harvest trees compared to owning them.

⁷⁰ These figures imply that the somewhat less than 28,000 cashew-producing households that hired permanent labor employed on average 5.4 persons each on a permanent basis. The very high numbers on seasonal employment on cashew suggest that some of these agreements involved only brief stints at peak times. Data from the as yet unpublished 2017 IAI survey (Mozambique MADER 2020) appear to show 360,999 workers (self-employed, part-time hired and full-time hired) working on 169,749 small and medium farms households having cashew trees (Mozambique MADER 2020). Since this sample is estimated to be 24 percent of applicable households, simple extrapolation for the 2017 IAI would show 1,500,000 people working on cashew that year on 707,288 small and medium farms actively producing cashew. However, there is no way to know what share of their time was spent on cashew compared to other tasks or how representative the data collected is of all cashew growing households in Mozambique.

⁷¹ One job per ton of RCN is more representative of the upstream side of gathering and artisanal processing, whereas the one job per two tons is more indicative of the downstream side of transport and wholesaling.

The final market for Mozambique cashew nuts is overwhelmingly as a high-end snack or confectionary ingredient in international markets. As such, its potential to grow incomes or drive better jobs depends both on international demand and Mozambican competitiveness versus competing suppliers.⁷² For much of the 20th century, Mozambique was a leading global producer of cashew nut, responsible for about one-third of world production in 1975 (FAOStat). Mozambique is presently the 5th largest producer in Africa, but its share of world production has fallen to well under 3 percent. In the last 15 years, RCN production in Mozambique has grown at roughly 4 percent per annum,⁷³ while world production has grown by 5.6 percent per annum. Thus, while Mozambique has grown its production appreciably, its global market share of production has decreased. While India has maintained its large share in the sector, Brazil, Vietnam, and most recently Cote d'Ivoire, have ramped up cashew output and market share rapidly. Cote d'Ivoire, for example, produced more than 4 times as much RCN in 2018 as Mozambique.

In 2017, national production of RCN in Mozambique was still only three-quarters of the 1975 level, but production is gradually catching up (USAID 2018). A key advantage for Mozambique is that most of its harvests follow the Southern Hemisphere cycle of October to January.⁷⁴ Mozambique's main competitors in West Africa and Asia, which together account for more than 80 percent of global cashew production, follow the Northern Hemisphere cycle of February to May. Asian processors are reportedly willing to pay a 15-20 percent premium for Southern cycle cashew due to shortages (Mishra and Martin 2016). Ninety-five percent of RCN production was by smallholders in 2014 (FAO 2014). Key challenges in primary production are replacing aging trees with improved root stock and stepping up anti-fungal spraying to increase yields from the current low average of 3 kg/tree.

Aging, pre-independence primary processing plants closed in the mid to late 1990s. This followed the controversial removal in 1995 of a protective export tax that discouraged raw cashew nut exports and lowered farm-gate raw nut prices, which favored processors at the expense of growers. Subsequently, Law 13/1999 established a variable export tax in 2001, currently set at 18 percent of f.o.b. value.⁷⁵ Farm gate prices in Mozambique expressed in US\$ are lower than in competitor countries. Mozambique only processes about one-third of RCN production, and most RCN is still exported unprocessed (Macauhub 2020, Mozambique INCAJU 2020). While RCN production growth is modest, domestic processing capacity has expanded rapidly in recent years (USAID 2018).

⁷² As will be discussed below, international cashew markets are distorted by policies from major players such as India seeking to protect their own growers, suggesting that international trade liberalization and diversification are also potential drivers of more and better jobs in Mozambique's cashew sector.

⁷³ This is calculated from FAOStat, accessed May 14, 2020, computing 3 year averages for 2003 to 2005 and 2016 to 2018 for cashew nut in shell for Mozambique and the world. The compound annual growth rates are computed between the mid-points of the 3 year periods, to mitigate the effects on estimated growth rates from high annual fluctuations. INCAJU and FAOStat data are the same for Mozambique except for 2018, where INCAJU has a significantly higher estimate of Mozambican production (Mozambique, Instituto de Fomento do Caju (INCAJU) 2018). Using this in the same calculations raises Mozambique's estimated growth rate over the 2003/2005 to 2016/2018 period to 4.4 percent, still well below the world growth rate over this period. On the other hand, some large traders feel that the FAO world data, which is largely based on the sum of nationally reported figures, over-estimates global production. For example, Indian production was estimated by India and FAO in 2018 to be approximately 800,000 metric tons of RCN, while industry players estimate real supply to be closer to 700,000 MT (Antonio 2020). The same traders feel that major price-makers like Vietnam also tend to under-estimate volatility in their production reporting to avoid volatility in export prices. Not surprisingly, data in the 2018/19 International Nuts and & Dried Fruit Council (INC), a private sector publication,

⁷⁴ This is true for northern Mozambique, where most national cashew production comes from. The harvest in parts of southern Mozambique, accounting for only a small share of national production, follow northern hemisphere norms of harvests from February to May.

⁷⁵ There were discussions in Government circles as recently as late 2019 about reducing the export tax to 14 percent as a means of raising grower prices for RCN, but this was reportedly fiercely resisted by a domestic processing industry facing high trade barriers for processed kernels in key export markets such as India. As of writing in June 2020, it seems likely that the Mozambique export tax on RCN will remain at 18 percent for the indefinite future.

To generate higher incomes and new jobs in Mozambique, the entire cashew value chain requires better raw cashew nut quality and out-turn, which will maximize potential value-addition for international markets. This can be expressed as getting more and higher-quality kernels per 80 kg bag of RCN, and improvements in labor productivity in both production and processing. In turn, these goals require significant improvement in grower incentives, more producer and processor access to working capital, inputs, technology, and relevant grower advice, especially for the prevalent smallholder context. Further, we argue that business as usual is not likely to lead to needed changes; a new institutional push mobilizing all stakeholders will be necessary.

Cashew production and unit quality require good fungus and pest management, which requires tree trimming and spraying with fungicides and insecticides. Fertilization, soil management, and water management are also important activities. Any strategy to boost cashew production must address these key issues (Dendena and Corsi 2014). Increasing global demand for organic products suggests that input policies in Mozambique should evaluate using biological inputs to expand organic cashew production.

There is potential to create several thousand higher-paying jobs in domestic cashew processing, the part of the value chain most associated with formal sector jobs and on which current jobs policies are most focused. However, potential job creation and job improvement in cashew growing, marketing, and input provisioning are much larger, given the roughly 1 million farms involved in primary production. Beyond the farm gate, thousands of small and medium traders work as intermediaries, wholesalers, retailers, and exporters. Furthermore, rural areas in Mozambique contain substantial underused labor, at least outside peak cropping times; broadly distributed cash from cashew sales are critical to expanding local consumer demand for services and handicrafts that will increase local employment.⁷⁶

Industrial processing has received the most attention in terms of waged jobs. The sector has experienced upswings and downswings over about 30 years after privatization of main processing units. Support from donor-funded initiatives has helped revitalize industrial cashew processing over the past decade, with the processing sector comprising 24 factories in 2017. The top 15 factories employed 17,500 workers in 2017, 57 percent women (Technoserve 2017).⁷⁷ The marketing sector also includes RCN domestic trading and exports, as well as selling to specialty outlets for white, roasted, and flavored kernels, and sales of smaller quantities of cashew nut shell liquid (CNSL) and some alcoholic beverages derived from the cashew apple (Costa and Delgado 2019b).

Cashew is one of the most regulated value chains in Mozambique. Heavy Government intervention has led to mixed results. Mozambique has not been particularly successful with its export tax policy to discourage export of RCN as compared with processed products; while processing has grown steadily, and parts of Mozambique's processing sector are again among the most developed in Africa, primary RCN production has not grown and still trails the rate of growth of most African producers (USAID 2018). The GOM decided recently to maintain law 13/1999 on export taxes while reformulating accompanying regulations.

The Instituto de Fomento do Caju or Cashew Development Institute (INCAJU), the State Agency in charge of supervising the cashew business in Mozambique, is funded in large part through the RCN export tax. Its main role for 2017/2020 has been to implement the activities previewed in the GOM's Cashew Master Plan (Mozambique INCAJU 2017b), including several interventions to develop the value chain in all dimensions, create and improve existing jobs, and promote processing of new products. INCAJU's main task is to create a business-friendly environment to attract investment in the cashew sector and generate new and better jobs along the entire value chain (Ibid.). As the next section illustrates, current production and potential differ by region of the country.

⁷⁶ The technical terms for this effect is "consumption growth linkages", discussed in Chapter One, and also reviewed in World Bank (2007). In remote areas, their net addition to employment can double or more the initial income impacts from cashew sales.

⁷⁷ Processing units range from big factories to artisanal enterprises. The usual figure cited for larger industrial installations is 10 larger factories and 7 smaller formal factories, with the remainder of operations going down in scale from there.

3.2 SOUTH, CENTER, AND NORTH MOZAMBIQUE CASHEW VALUE CHAINS

A. PRODUCTION AND SALES

In general, the structure of Mozambique's cashew value chain is similar in the southern and northern Provinces, including involvement of smallholder farmers in production. Nationally, households with cashew trees have on average 29 cashew trees (Mozambique MADER IAI 2020). Just under half of the cashew trees in Mozambique are in the central region, where households have a mean average of 61 cashew trees each, significantly higher than the mean in the south and north, which have a mean of 19 and 20 cashew trees per household, respectively (Ibid.). This is likely because Mozambique's few larger cashew plantations are concentrated in the central region. Within the central Provinces, Zambézia accounts for 55 percent of central region production. However, the northern region is responsible for approximately 60 percent of total national production, involving more than one-half million households, or 44 percent of all smallholder farmers involved in cashew production (ibid.). In addition, the RCN produced in the northern region is considered to be the best quality produced in Mozambique (Costa and Delgado 2019b).

TABLE 3.1

Number of small units involved in cashew production by gender of head 2014

Regions	PROVINCES	N° of farms of all types	N° of farms with cashew trees	N° of farms headed by women with cashew trees	% of farms with cashew trees	% farms with cashew trees headed by women
Northern	NIASSA	168,926	5,406	1,746	3.2%	32.3%
	C. DELGADO	414,029	184,243	56,931	44.5%	30.9%
	NAMPULA	739,457	382,299	81,430	51.7%	21.3%
	Sub-total	1,322,412	571,948	140,107	43.8%	36.5%
Central	ZAMBÉZIA	688,439	251,969	72,315	36.6%	28.7%
	TETE	358,210	1,433	400	0.4%	27.9%
	MANICA	194,036	32,598	8,247	16.8%	25.3%
	SOFALA	228,983	54,956	15,443	24.0%	28.1%
	Sub-total	1,469,668	340,955	96,405	26.1%	25.1%
Southern	INHAMBANE	199,354	165,065	66,026	82.8%	40.0%
	GAZA	194,669	105,900	41,725	54.4%	39.4%
	MAPUTO	775,971	123,379	39,852	15.9%	32.3%
	Sub-total	1,169,994	394,344	147,602	30.2%	38.4%
TOTAL		3,962,074	1,307,248	384,114	33.0%	29.4%

Source: Mozambique MASA (2015)

Producers act individually or in collective associations, which in turn are integrated into a forum (group of associations), and from there into unions (groups of forums). Associations typically have between 25 to 35 members. Each producer typically cultivates a mix of cash and food crops according to climate suitability and land available. Cashew trees complement livelihoods, although sometimes providing producers a substantial part of their income. Commercially-oriented and organized plantations are rare, with their share of total production under 5 percent.

On average, households are able to commercialize 80 to 100 kgs of RCN each season, providing an income between US\$60 to US\$80 per household annually (USAID 2018). This provides these households with a significant portion of their overall cash income. There are 43 million trees countrywide, according to INCAJU, but only half are productive (Mozambique INCAJU 2017b). Part of the households' income from trading cashew products comes from the cashew apple, and rural families often prepare alcoholic beverages from it, often selling or exchanging this for labor during harvest time.

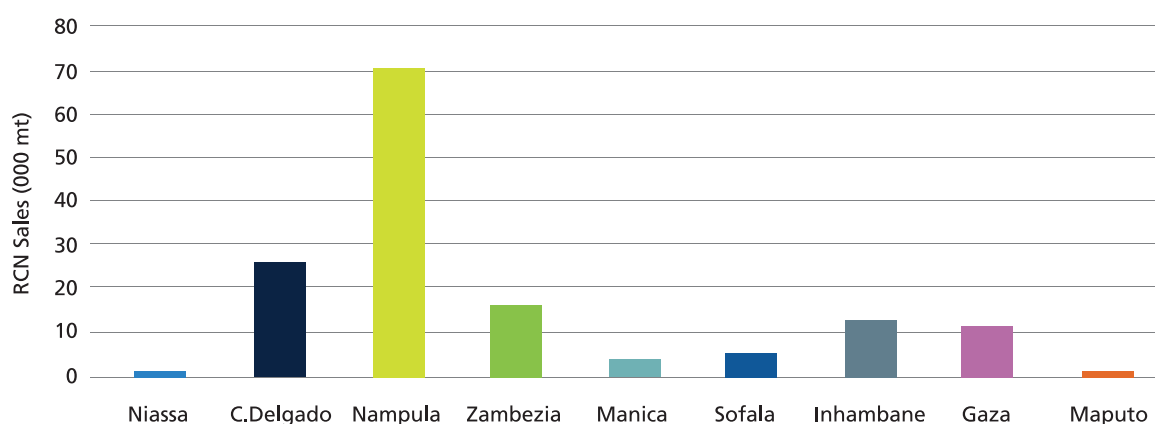
Figure 3.1 shows the importance of the central and northern regions of Mozambique for RCN farmer sales, particularly in the case of Zambézia, Cabo Delgado, and Nampula Provinces. Total national RCN commercialization by farmers in 2019 season was 142,000 mt, a substantial increase from the 130,000 mt reported for 2017-18 (Mozambique INCAJU 2019). Nampula accounts for just under half of national production. Measured in terms of larger size and nut content per kg of RCN (out-turn), the northern region also produces higher-quality raw cashew nuts compared with the southern region.

Cashew orchards in Mozambique are mainly composed of a common tree variety (red or yellow cashew apple) 5 to 6 meters high with a large canopy and a gestation period lasting about 5 to 6 years. INCAJU tried to introduce new varieties, particularly the Brazilian dwarf, to gradually replace old trees with more productive varieties and lower gestation periods. However, the program for Brazilian dwarf seedlings based at INCAJU's Nassuruma research station ended as realization grew that native trees were more tolerant to the climate and provide more prolific seedling breeders (Mozambique INCAJU 2018). As a result, INCAJU now produces common tree seedlings in Nassuruma and several other districts to replace the old trees. Recently, INCAJU has been encouraging the use of polyclonal seeds⁷⁸ thought to be more effective than native seedlings and other conventional seeds (Technoserve 2017).

Cashew orchards are subject to climate shocks such as drought or floods. In the short run, they may not seem as vulnerable as standing field crops, but the farmers who tend them still rely on the same field crops for food, supplemented by income from cashew. Further, old and untrimmed trees are especially vulnerable to high winds, especially with rain-sodden root balls that render trees prone to tipping.

The particular vulnerability of cashew to climate shocks derives from the fact that production is spread along coastal zones in the parts of the country most affected by cyclones, including Nampula, Zambézia, Sofala, and Inhambane provinces. Cyclones can affect the entire coast, but often with higher winds along the northern area. They typically occur from October to April every 1 to 4 years. Cyclone Idai in 2019 ravaged agriculture along its path, mostly in Sofala and Manica. Idai, along with the smaller cyclone Kenneth in Cabo Delgado, reduced national maize and rice production by an estimated 15 to 20 percent in 2019 (World Bank 2019c). Negative impacts on RCN are yet to be assessed, but they will likely be significant. Given the rise and likely increased frequency of climate shocks in Mozambican cashew growing zones, resilience of cashew value chains will require use of "climate-smart" infrastructure and emergency food distribution contingency plans.

⁷⁸ Polyclonal seeds are a special kind of seed that have been engineered to retain only the best characteristics from a set of cashew trees.

FIGURE 3.1**Distribution of Mozambican farm sales of RCN by province (2018-2019)**

Source: Mozambique, INCAJU (2019)

B. PROCESSING

As shown in Table 3.1, most of the cashew processing industry, like cashew growing, is concentrated in the northern region, where 93 percent of processing activity employs 98 percent of total cashew processing workers. The southern region has only 7 percent of national installed capacity and employs only 2 percent of cashew processing workers. Since rebirth of the private industrial processing sector at the beginning of the new millennium, investment in the processing industry in the southern region has been modest. The main explanation seems to be inadequate RCN supply, its low quality, and a higher cost of labor. Wages in the southern Provinces of Mozambique are relatively more affected than in the north by labor emigration to Maputo and to South Africa.

Cashew production and trading is mostly concentrated in 5 provinces (Table 3.1). Smallholder cashew producers, and those who collect cashew from abandoned or unallocated trees, dominate the first stage of the value chain. They are typically organized into associations, but usually these producer organizations deal with many other crops. Farm-level organizations exclusively dedicated to cashew production are rare, but a Union of Cashew Producers exist in both Zambézia and Nampula Provinces.

The average plot size, including all crops, for the small and medium farmers with cashew trees is 0.99 ha. The highest regional average is in Manica (2.3 ha per plot) and the lowest in Maputo City (0.4 ha per plot) (Mozambique MADER IAI 2020). Most farmers intercrop their low-density cashew stands with other crops such as maize, cassava, beans, sesame, and groundnuts, depending on the agro-climatic conditions. They also grow peas and legumes that return nitrogen and other nutrients to the soil.

3.3 WHY SCALE MATTERS IN CASHEW PRODUCTION

A. FARM-LEVEL PRODUCTION CONSTRAINTS FACED BY SMALLHOLDERS

INCAJU regulations distinguish just 2 groups of cashew farmers by size; smallholders tend trees on less than 5 ha of ground using family and remunerated community labor, while commercial farmers include anyone operating more than 5 ha of cashew plantations (Mozambique, INCAJU, 2018). Smallholder farmers by this definition account for 95 percent of Mozambican cashew output (Ibid.). The 2015 IAI survey defines small and medium farms as being under 50 ha, and by this definition they accounted for 96.8 percent of total hectareage of cashew orchards (Mozambique MASA 2015).

Orchards with a high quantity of old and neglected trees predominate; these have poor yields and produce lower-quality output. According to INCAJU, the national mean productivity per tree is about 3 kg, with a median of only 1.6 kg/tree (Mozambique INCAJU 2017a). This low productivity is the result of limited renewal (replanting or pruning) of trees and minimal use of fertilizer, spraying of fungicides, or other yield-enhancing management options. This lack of attention adds to effects from cyclic droughts, floods, and cyclones that afflict cashew production zones. Farmers that apply fertilizer and spray have stronger and more productive trees, with an average yield of 4.5 kg/tree (ACDI/VOCA 2016).

TABLE 3.2

Distribution of Mozambique post-harvest cashew value chain activities by regions.

Provinces	Installed Processing Capacity (tons) *	Nº of Workers in AICAJU member Formal Sector Cashew Processing (2018/19) *			RCN Traded (1000 T) (2019)**
		Men	Women	Total	
Niassa	-	-	-	-	0.01
Nampula	90,600	7,115	9,238	16,353	30.66
Cabo Delgado	6,000	320	480	800	64.97
Northern Provinces	96,600	7,435	9,718	17,153	95.69
% of total	93%	98%	98%	98%	74%
Zambézia	-	-	-	-	17.40
Tete	-	-	-	-	-
Manica	-	-	-	-	1.40
Sofala	-	-	-	-	1.62
Central Provinces	-	-	-	-	20.42
% of total	-	-	-	-	16%
Gaza	6,000	120	180	300	5.09
Inhambane	1,000	15	30	45	8.33
Maputo	-	-	-	-	0.16
Southern Provinces	7,000	135	210	345	13.58
% of total	7%	2%	2%	2%	10%
Total	103,600	7,570	9,928	17,498	129.69

* AICAJU interview with processors by Carlos Costa in 2018.

** Mozambique, INCAJU (2018)

*** Mozambique MASA (2015)

Smallholder farmers incur higher unit costs to treat their trees compared to large-scale farmers because their lesser holdings are more widely dispersed and sometimes far from where the owners live. Further, the typical smallholder orchard is quite old, with inadequate investment to boost low productivity and curtail disease risks. Use of inputs such as improved seedlings, and services such as spraying, are key to productivity. Until recently, the state agency INCAJU helped subsidize producers' use of these inputs, which many producers may not have had access to otherwise. However, this practice undoubtedly inhibited development of a commercial services sector to carry out the same functions. As we will show, overcoming these problems will be a major challenge going forward to revitalize and create jobs in the cashew sector.

Most smallholder-managed trees are large and overgrown as they are not pruned, and there is a high incidence of fungal disease. One-third of trees nationally are affected by the most severe tree disease, oidium, a fungus causing large yield losses. The treatment, typically sulphur dusting, is not done systematically in smallholder landscapes, which makes control by farmers in a community particularly difficult. On-call technical assistance services for smallholders are nearly nonexistent, which contributes to low usage. Furthermore, the public sector (INCAJU) does not have the capacity to meet the need for these services at scale. Smallholders are also limited by the small nursery network INCAJU manages, with some installations located outside the main production zones.

B. POOR FARM RCN PRODUCTIVITY

Farm income depends on the weight of RCN per tree, per plantation area, and RCN quality, which influences selling price. The price processors can pay is linked to obtainable processing yield from farm output. Processing yield and quality depend on the shelling outturn, measured by the kernel outturn ratio (KOR), measured as the weight of peeled nuts in pounds (lbs) obtained from an 80kg bag of RCN.⁷⁹ Quality, and thus price, depends on KOR, the average size of the nut, the absence of evidence of insect or fungal damage, and freshness as indicated by nut color.

In general, larger nuts are more valuable. Nut count per kg is typically inversely correlated with nut size, implying that lower nut count per kg of kernels is a relatively more valuable kg of kernels.⁸⁰ Nut color (white, pale ivory, pale ash-grey, light yellow) also influences wholesale prices in world markets, with white being sought after. Color is primarily a function of the time between harvest and processing, with nuts being white at harvest and turning yellow in storage (Hemlata 2006). These quality indicators more broadly are a function of a wide range of factors, including the variety of cashew tree, growing conditions, husbandry, harvesting practices, post-harvest drying and storage, and shelling and peeling (Dendena and Corsi 2014). Table 3.3 below shows the position of Mozambique compared to other producers in terms of quality measures of RCN production. A low KOR (bad) and low-to-average nut count (fair to good) relative to other countries depresses international export prices for RCN in Mozambique from what they could be given the international price advantage of harvesting during the southern hemisphere season.⁸¹ The low KOR is linked to the same factors that depress the RCN yield per tree (3 kg); this low productivity combined with lower prices depress farm revenue from where it could be.

⁷⁹ Processing yields are conventionally given in lbs. per 80 kg bag of RCN. For example, a 54 lb. yield is equivalent to 306 g kernels per kg of RCN, or a Kernel Outturn Ratio (KOR) of 31 percent, which is excellent. A low KOR (below 25 percent) indicates poor yield of RCN in terms of weight of recoverable kernels per 80 kg bag of RCN, discouraging for processors. See: <http://www.hpcashewnuts.com/blog/raw-cashew-nut-selection-process/>

⁸⁰ More nuts per kg of kernels implies a smaller average size of nuts and thus lower value per kernel. This translates to a lower value per kg of RCN for a given KOR level; see: <http://www.hpcashewnuts.com/blog/raw-cashew-nut-selection-process/>.

⁸¹ As shown by the significantly higher export price for Tanzanian RCN, also a southern hemisphere season seller, which has a less favorable nut count per kg of kernel than Mozambique, but a higher KOR.

Despite heavy support from Mozambican authorities, INCAJU efforts to improve tree productivity have not achieved envisaged results. Lack of farmers’ investment—for whatever reason—of time, effort, and disposable capital to spray trees with fungicides and keep them trimmed leads to low productivity. Thus, while there are concrete technical issues and solutions, farmer incentives need to be larger. Improving farm cashew productivity requires use of knowledge, quality inputs for fungicide treatment and fertilization, and more labor intensive and chemical-free strategies to produce cashews for the organics market. Gradually regrouping tree cultivation in collective clusters can help lower unit costs for crop treatment and security. Fair trade certification can help improve some smallholder incomes, but results to date do not indicate this represents a major solution to improve smallholder livelihoods. Finally, old trees limit the potential of the cashew sector, and Mozambique needs to replace half of its national orchard with more than 20 million new trees.

TABLE 3.3

Processing yields, KOR, and average nut count across major producers circa 2015

Countries	Yields (lb of kernel/80kg RCN) (RCN Out-turn)	KOR (%)	Avg. nut count per kg of kernel (approximate order of magnitude)	US\$ f.o.b. export price received per mt of RCN
Guinea-Bissau	53-54	31	230	\$1,375
Indonesia*	52-53	30	200	n.a.
Tanzania*	50	29	200	\$1,698
Cote d’Ivoire	48	27	205	\$1,305
Benin	48	27	195	\$1,367
Cambodia	48	27	180	n.a.
Mozambique*	46	25-26	185	\$1,377
India	46	26	200	\$1,622
Nigeria	45	25	200	\$1,225
Vietnam	42	24	190	\$1,504
Brazil*	37	21	170	n.a.

Source: Compiled from Ricau (2019); Rabany et al. (2015), World Bank (2010), and USAID (2018).

Notes: The nut counts here are approximate estimates by Carlos Costa from different sources.

“*” = sells in Southern Hemisphere harvest period for potential 10-20% premium.

“n.a.” = comparable data not available.

“f.o.b.” = “free on board”, the standard place on export value chains where export prices are computed, typically loaded on board a vessel for export before any extra charges, insurance and freight costs are added.

C. PROSPECTS FOR COMMERCIAL RCN PRODUCTION

The few commercial cashew farms in Mozambique—about 400 in 2015—represent only 5 percent of total cashew production. They tend to be much larger individually and—compared to traditional smallholders—more concentrated spatially with each other and in terms of having the trees of an individual plantation grouped together (Mozambique MASA 2015). Smallholders in cashew-growing zones tend to have widely dispersed individual farms and the trees belonging to individual farms are also widely dispersed across village lands. Commercial farms can often obtain higher yields, averaging 4.5 kgs of RCN per tree, by introducing new trees

from selected seedlings and polyclonal seeds. They can attain average yields of up to 11 kilograms of RCN per year, and the productive lifespan of their well-maintained trees can reach upwards of 50 years (Technoserve 2017).

Commercial cashew farms are classified into 2 groups: small commercial farmers with up to 1,000 trees, and medium-to-large commercial farmers owning plantations with more than 1,000 trees and a few with up to 100,000 (Mozambique MASA 2015). The larger commercial farms are in the Provinces of Cabo Delgado and Nampula in the north, and Gaza and Inhambane in the south. Access to seedlings, polyclonal seed, pesticides, and fertilizer inputs is facilitated by having trees in one place for adequate maintenance, often with better access to roads. Commercial farms also use both permanent and seasonal waged labor, which makes them subject to national labor legislation.

Medium-to-large plantation operators tend to be more proactive than smallholders in seeking access to improved practices for improved productivity per tree and per ha. This also applies to seeking biological inputs to create the basis for future organic certification of production (see example in Box 3.1, also MozaCaju 2015). Commercial entrepreneurial plantations may be a more viable entry point for new practices and inputs because of greater size and density and easier access to capital. In theory, larger properties linked to processing also could more easily exploit economies of scope from selling nut kernels along with wide variety of by-products, such as cashew apple juice.⁸²

Adoption of improved practices on larger farms can influence nearby smaller farmers by demonstrating yield increases. In at least one case, a large cashew processor, Condor, has begun a smallholder aggregation project, providing technical assistance, land preparation services, and improved seeds and chemicals. Greater concentration of production spatially through organized plantations, small farm cooperatives, and vertical integration can also stimulate development of linked agricultural SMEs for service provision.

Investment in cashew trees could provide long-term household income for more than 30 years and sometimes up to 50, depending on care and variety, and may require little care once mature. However, it takes a few years for new trees to begin contributing to income or even to repay initial investment. This can be a significant hurdle to smallholders.

In sum, concentrated production of cashew on larger units allows adoption and development of:

- Better technologies.
- More application of inputs (pesticides, fertilizers, among others).
- Disease control mechanisms.
- Quality control systems.
- Productivity improvement techniques.
- Post-harvest procedures improvement.
- Better conditions for certification of organic production and fair-trade systems.
- Better conditions to develop new products (such as industrial processing of cashew apple into juice).

⁸² The authors are not aware in Mozambique of any operating examples at the present time.

BOX 3.1: FIRM-LEVEL DATA SOURCES

Box 3.1: Examples of commercial operations targeting organic cashew in Mozambique

Medium-to-large commercial farms

- *Ouro Verde* (Cabo Delgado) with 5,000 trees, is planning to increase to 26,000. It has prospects to provide extension services to surrounding smallholders through outgrower schemes, and to involve them in producing certified organic and fair-trade cashews. The company has already obtained organic certification for its 1,000 ha plot, and is working to extend it to selected farmers with sizable additional plots.
- *Jacaranda* (Nampula), a banana producing company with a 25,000-tree cashew plantation, is planning to convert it to organic production.
- *Alpha Agricola* (Nampula), with a large plantation of over 100,000 trees, is planning to install a processing unit for organic processed cashew.
- Individual farmers, several with average plantation sizes of 10,000 trees, are willing to increase production and establish cooperatives to increase RCN to the extent necessary to make joint local processing feasible.

Farmers organizations/cooperatives

Although the number of cashew cooperatives are negligible, a significant number of farmers' organizations produce and commercialize RCN and derivatives. Several NGOs have helped farmers to join fair trade systems, and more recently to use biological fertilizer to facilitate certification of organic production. For example, the NGO Helvetas partnered with a Swiss company to support involvement of 3,500 smallholders in the south of Cabo Delgado province in the sale of cashew certified as fair trade and organic.

Source: Interviews by Carlos Costa.

Conversely, traditional smallholder cashew production in Mozambique often has led to:

- Few farmers willing to invest in planting new trees due to the long wait required for returns.
- Lack of financial capacity for medium to long-term investment with uncertain return.
- Difficulties securing hired labor for tasks requiring skills unavailable in the local informal labor market.
- Danger of RCN theft from widely dispersed trees and seedlings, a considerable risk in Mozambique smallholder systems (MEDA 2011).

In conclusion, cashew plantations represent profitable medium to long-term investments if productivity can be increased about 50 percent over present national mean yield per tree, and with access to value-added marketing channels beyond bulk, low-quality RCN sales. Medium-to-large cashew plantations can lower unit costs of securing, harvesting, warehousing, and transport due to a higher concentration of trees. In addition,

concentrated plantations lower the unit cost of collecting fresh cashew apple, a highly perishable but potentially valuable by-product, and of storing apples for processing without damaging quality.

Furthermore, commercial farmers, unlike smallholders, will not need to spread inputs among a relatively small number of trees dispersed across many widely separated locations. They can also more easily secure capital and expertise to build facilities such as warehouses and processing units near or within their plantations. Organizing more smallholder farmer groups also represents a promising way to promote cashew production. Collective action allows the use of more uniform cultivars, better technologies to care for trees, application of inputs and disease control measures at lower unit cost, and better efficiency in post-harvest procedures for perishables such as cashew apple.

3.4 PROCESSING

Shelled cashew nuts are kernels that have had the hard, outer shell removed, while semi-processed cashews have had both the outer shell and the inner wrapper of the kernel removed. When roasted, semi-processed cashew is referred to as fully processed. Currently, cashew processing in Mozambique is characterized by the existence of different type of enterprises, ranging from a large number of micro and small units using manual mechanical cutting machines and mostly labor-intensive methods, to medium-to-large processing units with significant capital investment using semi-automatic equipment. Nevertheless, total processed output is dominated by a few large processors.

In global industrial processing, one mt of RCN typically yields 220 to 240 kg of kernel; about 35 percent broken kernels represents an acceptable outcome, although the proportion can be as low as 15 percent or as high as 45 percent (Azam-Ali and Judge 2001). In Mozambique, kernel, the main product, represents about 20 percent of direct product by weight of RCN from cashew processing. But processing yields several other by-products: shell (70 percent by total weight), which is further processed into cashew nut shell liquid (CNSL)⁸³ and de-oiled shells; *testa*⁸⁴ (3 percent); and rejected kernels (3 percent) (USAID 2018).⁸⁵

The Mozambican Association of Cashew Industries (AICAJU) in 2018 represented 10 major processors and 7 smaller industrial processors (AICAJU 2018). AICAJU has traditionally focused on restricting exports of RCN and has lobbied effectively to create and maintain the 18 percent tax on RCN exports over the last 2 decades. This is motivated by perceived necessity to ensure adequate supply of raw material to members at lower cost than if free RCN exports were allowed.

A. EMPLOYMENT AND VOLUMES IN CASHEW PROCESSING AND MARKETING BY SIZE OF OPERATION

The greatest part of processed output is in the formal sector, where 24 cashew processing factories in 2015, including the 17 larger AICAJU members, employed over 17,500 workers.⁸⁶ In 2017/18, the Mozambican formal sector

⁸³ Made from cooking compacted crushed cashew shells at high temperature.

⁸⁴ The protective outer seed coat that tightly covers the cashew kernel.

⁸⁵ The slightly lower share by weight of kernels in RCN in Mozambique compared to the cited global industrial norms should not be interested as evidence of the lower quality of Mozambican RCN, since it not clear if the global conversion figures include 3 percent rejected kernels in aggregate kernel weights from one kg of RCN. If they do, the two estimates of the share by weight of kernels would be the same.

⁸⁶ Estimate by Carlos Costa using a Technoserve database and confirmed by stakeholder interviews in the industry, see the Acknowledgements for list of persons interviewed. Consistent with Mozambique MASA I

industry processed 53,717 tons of RCN, or approximately 41 percent of national production (Mozambique, INCAJU, 2018).⁸⁷ Mozambique was the largest cashew processor in Africa that year. Cote d'Ivoire had a larger processing capacity than Mozambique, and much larger RCN production, but due to very low capacity-utilization did not surpass Mozambique in terms of processed volume (INC 2019). Instead, Cote d' Ivoire mainly exported its cashew as RCN rather than kernel.

However, according to a May 2020 AICAJU statement, Mozambican factories in 2020 are expected to process less than 35,000 mt of RCN, a drop of 40 percent in one year (Club of Mozambique 2020). The purported reason is lack of raw material, implying that Mozambican RCN is shipped elsewhere other than domestic formal processors.⁸⁸ AICAJU notes that it currently has only 10 processing members, and some of these stopped processing in August 2020 due to the lack of raw materials Furthermore, AICAJU notes that Mozambican processing plants are now facing higher India and Vietnamese competition for buying Mozambican RCN (Club of Mozambique 2020).

Three large multi-national processors and kernel exporters—*Olam, ETG, and Condor*—and one large domestic company, *Gani Comercial*, dominate the cashew processing market in Mozambique. They employ two-thirds of cashew processing industry waged-labor and are responsible for 96 percent of reported formal exports. Installed medium and large-scale processing capacity is now over 100,000 mt. Yet, processors are regularly operating well below that capacity at between 40,000 and 60,000 mt/year, even while continuing to add capacity at the same annual rate over the last 20 years (AICAJU Annual Reports). Sadly, OLAM, the largest industrial cashew processor in Mozambique for 22 years employing 3,000 workers nationally, announced on February 9, 2021, that it would terminate future operations in the country due to “recurring difficulties in sourcing quality raw material in the necessary volumes”, a situation further aggravated by low international prices under demand contraction associated with COVID-19 (Club of Mozambique, 2021).

In parallel to the large industrial processors, the informal sector integrates tens of thousands of small operators in small and micro-sized artisanal units, most of them attached to rural households. These arrangements are responsible for a significant portion of kernel traded in the less demanding (in terms quality and food safety) domestic market (USAID 2018).

B. INITIATIVES AND CONSTRAINTS FOR IMPROVING SMALLER-SCALE AND ARTISANAL PROCESSING

By the beginning of 2000, before the present export tax, most large, old companies had closed. An INCAJU-led, USAID-supported (Technoserve) project provided an initial loan and technical support to 1 business to install new small and medium processing units in cashew producer rural zones in Nampula, Zambézia, Cabo Delgado, Inhambane, and Gaza (Technoserve 2017).

The “Technoserve model” was subsequently used to support other small cashew processing businesses, which by 2008 were employing 3,000 people and processing nearly 5,000 mt of RCN in units handling less than 2 mt of RCN each per year. While these enterprises served the domestic market with packaged shelled and roasted products, sometimes flavored, they put less emphasis than the large-scale formal sector on cleaning, humidity control, grading, and sorting.⁸⁹

Later, due to difficulties in making the business profitable, these small units began to collapse due to:

⁸⁷ Using INCAJU's higher (than FAO) estimate of total national production for 2018.

⁸⁸ This is in part due to the policies of major customers and competitors, as will be discussed below.

⁸⁹ Estimate by Carlos Costa using a Technoserve database and confirmed by stakeholder interviews in the industry

- Difficulties in competing with large industry and exporters for RCN raw materials because of lack of access to working capital.
- Frequent interruption of processing due to shortages of raw material.
- Processing most of the time below breakeven scale.⁹⁰

Larger units with capacity over 2 mt per year took over as the smaller units folded. The larger operations were also more suitable for meeting international market quality and quantity demands.

Yet another segment of the processing industry is based on artisanal micro-processing, with each facility having annual capacity of less than 100 tons per annum, most much smaller. Viability of micro-processing is very fragile; it is largely determined by the ability of micro-processing firms to buy reliable supplies of RCN and then finding a market for kernels in competition with larger enterprises. NGOs often play an important role in establishing and supporting these processors.

Rural initiatives to create jobs and income for the poor, such as Mozambican Association for Development Help from People to People (ADPP) and the Mozambican Associated Farmers' Cooperative Initiative (IKURU SARL) received funding and technical support from development partners to install 10 micro-processing factories, each with a capacity of 50 tons (MEDA 2011). The units were able to process cashew satisfactorily, but they struggled with marketing. They subsequently joined the *Consortium Ozivacaju* company—in which the processors held 49 percent of shares and a combination of ADPP and the Mozambican Association for Rural Development (AMODER)⁹¹ held 51 percent—with IKURU providing some working capital.⁹² This arrangement was unsuccessful, as the new company lacked working capital for purchasing raw nuts. An alternative approach was then tried, with the micro-processing units providing a processing service for a large processing factory, but this was not effective due to inadequate transport to the factory and quality issues (Webber and Labaste 2010).

Micro-processing units not only lack essential management and access to finance but have difficulty meeting market cashew quality needs. The segment can only serve the low-end domestic market, and its viability depends on involving farmers with direct access to RCN to process their own production, likely also with marketing help from NGOs.

3.5 MARKETS FOR CASHEW

A. EMPLOYMENT IN CASHEW MARKETING

Conventional wisdom holds that there are 70,000 to 140,000 informal sector seasonal jobs in post-harvest processing and marketing of cashew products, on top of about 17,500 FTE waged jobs in industrial cashew processing in Mozambique (MEDA 2011, USAID 2018). Based on the output portrayed in Table 3.4, it is reasonable to conclude that at least one-third of informal jobs are associated with informal exports. The domestic final market for cashew-derived products in Mozambique is very narrow and presently not willing to pay for quality. Cashew kernel, a sophisticated and expensive commercial product, is typically sought after by consumers in comparatively wealthy markets. The generally low income of most Mozambicans inhibits cashew nut consumption.

Almost all domestic cashew sales are in upscale urban areas, and cashews are only one product among many sold by outlets, which would likely remain in business without cashew. Thus, the cash market for Mozambique's

⁹⁰ Based on informal stakeholder interviews by Carlos Costa, see the Acknowledgements section for details.

⁹¹ A Mozambican micro-finance organization.

⁹² Based on informal stakeholder interviews by Carlos Costa.

cashew producers and processors is overwhelmingly for exports in some form (98 percent plus). Statistical difficulties, likely associated with RCN export tax avoidance, make it difficult to separate informal domestic uses of RCN from unregistered, untaxed exports.⁹³

Furthermore, there are significant variations over years in the degree of processed legal exports. Table 3.4 roughly estimates the proportions of total Mozambican RCN utilized in main cashew product markets in 2018/2019, with absolute changes from the previous year. The 17 percent share of RCN (as opposed to kernel) legal exports in Table 3.4 represents registered, taxed RCN exports. Perhaps about a further 37

percent of RCN disappearance in 2018/2019 is unregistered, untaxed RCN exports. In short, there was very large growth in illegal RCN exports and decline in legal exports between 2017/2018 and 2018/2019.

TABLE 3.4

**Estimated uses of Mozambique RCN in 2018/19
(parentheses indicate absolute change in shares from previous year)**

RCN processed industrially and exported (as registered with the government) as kernels without roasting (*)	45 percent (+5%)
Kernel roasted, flavored, and packaged for domestic market by commercial companies (*)	1 percent (no change)
RCN exported legally as RCN (*)	17 percent (-33%)
RCN in unregistered export trade (and very minor home use), with a significant part through the border with Tanzania (**)	37 percent (+28%)

Sources: (*) Mozambique, INCAJU (2018, 2019). The sum of the first two lines is the red line point for 2019 in Figure 3.2. (**) The residual from INCAJU estimates of total farm production after registered uses in top three lines of the table, equal to the light blue line point for 2019 in Figure 3.2.

The implication is that between one-third to one-half of informal RCN marketing jobs—about 23,000 to 70,000 jobs—are in highly informal activities, likely associated with unregistered RCN export. In addition to being difficult to estimate the actual numbers, it is also difficult to study how to improve worker conditions. This illustrates a seldom mentioned consequence of domestic industry protection—it becomes more difficult to improve work conditions for those in unregistered (illegal) activities. The next section demonstrates the uncertainties involved.

B. TRENDS IN PROCESSED, UNPROCESSED, AND UNREGISTERED USES OF MOZAMBICAN RCN

Figure 3.2 gives a ten-year perspective on the mix in domestic formal processing versus other uses of Mozambique’s RCN. Figure 3.2 portrays annual fluctuations in legal exports of kernels and RCN (the sum of the green and red lines in Figure 3.2) and inflows through less transparent, other outlet channels for RCN (the light-blue line).

Formal sector RCN processors grew their output between 2014 and 2019, although not quite as fast as overall growth in cashew farm-gate sales, as shown in Figure 3.2. However, preliminary results for 2020 suggest a precipitous decline

⁹³ The most accurate information sources here are the reports of INCAJU’s provincial stations back to the central database of INCAJU, see for example INCAJU (2019).

in processed cashew exports by almost half (Club of Mozambique 2020). This is represented by the steep dive in the red line for 2020 in Figure 3.2, presumably matched by commensurate growth in the green and/or blue lines. Besides a disastrous outlook for the formal processing industry, this illustrates the volatility of international cashew markets dominated by a small number of large destination export markets in countries willing and free to escalate tariffs on processed imports.

C. EXPORT MARKETS

Export markets have always driven Mozambican cashew nut production and processing. The global market for cashew products includes packaged snack foods of fully processed nuts. More than 80 percent of cashew consumed globally consists of peeled, roasted, and salted kernels. Therefore, the largest share of Mozambican RCN uses by volume (45 percent, Table 3.4) was in the form of kernel exports in 2018/2019. Most cashew exported as kernels are exported in semi-processed form,⁹⁴ to be roasted abroad. The tiny national roasting industry represents less than 2 percent of RCN processed domestically (Mozambique, INCAJU, 2018).

Between 2017 and 2019, Mozambique exported over 80,000 mt of cashew as RCN for US\$116 million in revenue, at an average price of US\$1.45 million per mt. Seventy-six percent of the total went to India and 24 percent to Vietnam. In the same period, Mozambique exported 24,000 mt of processed cashews, leading to revenues of US\$155 million, or an average price of US\$6.46 million per mt. Semi-processed cashew nuts went to Europe (36 percent), the U.S. (30 percent), Lebanon (9.0 percent), South Africa (9.0 percent), Vietnam (10 percent) and India (6.0 percent) (Macauhub 2020, citing INCAJU sources).

Since producing one kg of kernels requires at least 4.2-4.3 kg of RCN, the effective average export receipts per kg of exported kernels in 2017-2019 was US\$ 1.50 per kg, whereas in unprocessed RCN form it was equivalent to US\$1.45 per kg of kernel. Thus, the effective price of kernel exports represented only a 3.3 percent increase over RCN exports on a pure kernel weight basis. Since the costs and margins of processors in Mozambique surely exceeded 3.3 percent of the f.o.b. export price of RCN, it seems clear that continued exporting in processed form represented an implicit income transfer from the RCN export value chain to the kernel export value chain, most likely from farmers to industrial processors.

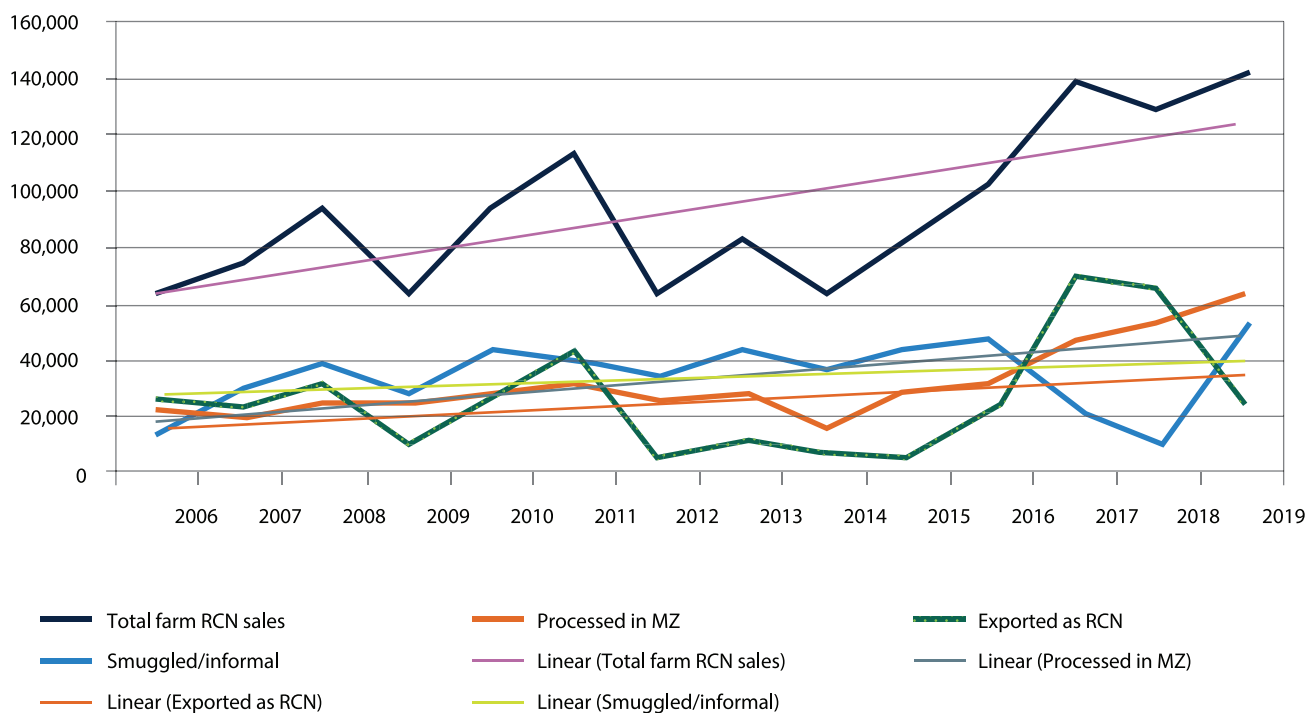
Semi-processed kernel exports tend to go to large wholesale companies such as the Kraft group, Costco, Global Trading, and Intersnack. They roast, salt, or otherwise flavor kernels to sell under their trademarks. This is a quality-sensitive market largely destined for Western Europe or North America. CNSL has a small industrial export market: it is used to synthesize a wide variety of resins such as polyesters, phenolic resins, epoxy resins, polyurethanes, acrylics, vinyl, and alkyds.

After considerable aggregate growth in world cashew exports over the last decade, Vietnam had a 53 percent share of global exports by volume of shelled product, and India had a 23 percent share of the global market (Figure 3.3). Because of their processing capacity, India and Vietnam are also large RCN importers, primarily from Africa. In 2016, 75 percent of Indian RCN imports came from West Africa and 24 percent from East and Southern Africa. Similarly, Vietnam imported 55 percent of its cashew imports from West Africa and 27 percent from Eastern Africa, while in Brazil, also a processor country, 100 percent of its RCN imports came from West Africa. In turn, Vietnam, India, and Brazil accounted for 75 percent, 11 percent, and 6 percent, respectively, of U.S. shelled cashew imports (INC 2019).

⁹⁴ Semi-processed (shelled and peeled).

FIGURE 3.2

Registered RCN processing (almost all for export as kernels) and registered exports of RCN versus unregistered uses (mostly untaxed exports) of RCN in Mozambique 2006-2019 (all quantities rendered in terms of RCN; 4.3 kg RCN = 1 kg kernels)



Sources: INCAJU statistical data in the annual PES reports 2015 to 2019 see http://incaju.co.mz/?page_id=528

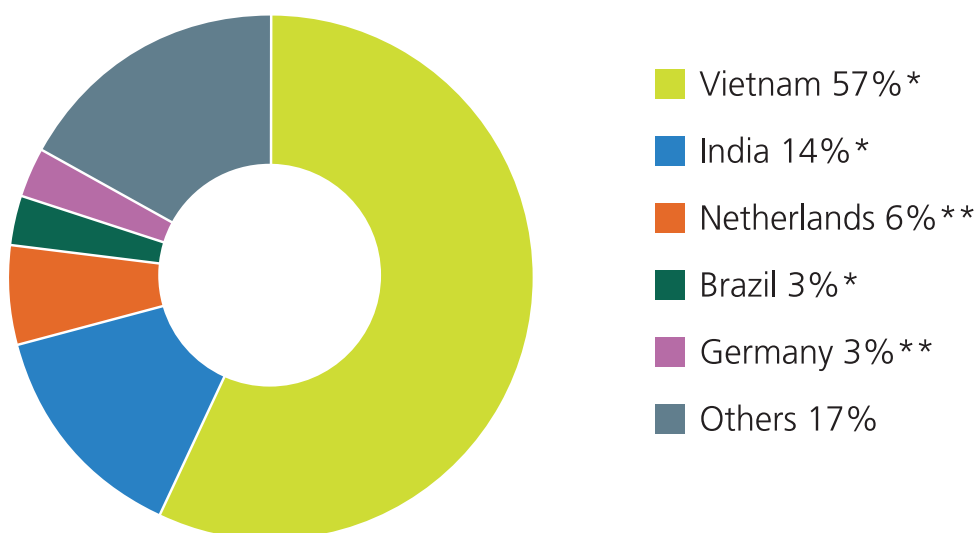
Note: The difference between total farm sales of RCN and two uses shown are the unregistered uses, mainly including unofficial (and thus untaxed) exports of RCN. Years shown are the second year of a season overlapping two years; for example, 2019 = 2018/2019.

The U.S. is the largest export destination for processed nuts (kernel) from most of the RCN-processing countries, and the number one importer worldwide of processed cashew. India is by far the number one market worldwide for consumption of processed nuts. Unlike in the U.S. or Europe, Indian consumers mostly purchase cashew kernels unroasted (consumption of 246,805 mt of kernel in 2016).

As importers, they are followed by the U.S. (142,908 mt) and China (49,571 mt). Germany and the Netherlands are important transit countries, while the U.K., Vietnam, Australia, Netherlands, Canada, and France complete the top 10 importer countries. Between 2012 and 2016, the largest absolute consumption growth occurred in the U.S. and India—with growth in the Indian market for broken cashew pieces growing due to use in confectionery for religious commemorations—followed far behind by Germany, Vietnam, and the UK (Trade for Development Center 2018).

FIGURE 3.3

**Share of world processed cashew exports in 2018
(% shelled metric tons)**



Source: International Nut and Dried Fruit Council (INC), Statistical Yearbook 2019/20.

Notes: *Processing country; **Processing and transit country

The market for quality food nuts is expanding globally, and cashew is beginning to assume a lead position. In high-value export markets, steps after import of semi-processed cashew include roasting, flavoring, packaging, wholesaling, and retailing, accounting for roughly one-half of total value (on c.i.f. basis⁹⁵) added to the point of consumption (Mishra and Martin 2016). Developments in the international market for quality processed nuts have strong implications for potential growth of the cashew business in Mozambique. The domestic artisanal value chain will remain important for smallholder farmer livelihoods in cashew zones and thus for poverty alleviation. However, the artisanal segment is not, and will not be, large enough to induce significant overall cashew industry or jobs growth in Mozambique.

D. DOMESTIC MARKET FOR ARTISANAL AND SEMI-COMMERCIAL PRODUCTS IN URBAN AREAS

The informal domestic market is dominated by smallholder farmers, cashew collectors, and small-scale traders, who commercialize home-processed kernel or kernel from informal roasters. Most of this takes place along main roads and is marketed by informal vendors to passing vehicles or in specific rural and urban markets. Most of the product is sold with little attention to hygiene and food safety. There is also an urban market for flavored roasted kernel, prepared by more formal roasters who sell their product in simple commercial packaging to supermarkets and other formal retailers, but also without following food safety standards. A third small group of roasters includes small formal-sector companies exploring mainly foreign markets, but also serving some small niche domestic opportunities in big cities.

⁹⁵ "Charges, insurance and freight", the standard valuation price of an export once arrived at the national border of its export destination.

Some smallholder farmers produce cashew apple-derived beverages, such as fresh juice, and more frequently fermented (alcoholic) beverages in larger quantities. These can be sold or exchanged for labor or other services in specific situations, such as for land preparation or during the harvesting season.

Perishability is an issue for smallholder production and artisanal producers, which means that industrial processors dominate large urban markets. Large-scale industrial processors have also found profitable markets for other cashew processing by-products such as CSNL for industrial applications, but which is not feasible for artisanal processors to make (MEDA 2011; USAID 2018).

E. POTENTIAL WORLD MARKETS FOR RCN GOING FORWARD

In 2018/19, according to FAO (and thus the sum of all national statistics) worldwide production of cashew nuts (in-shell basis) was 5.9 million mt, up from 4.4 million mt in 2015 (FAOStat, accessed May 14, 2020). However, according to the private sector International Nut & Dried Fruits Council (INC), the 2018/19 world crop amounted to 830,000 mt of shelled and peeled kernels, equivalent to about 3.5 million mt of RCN (INC 2019).⁹⁶ Both sources agree that the 2018/19 crop is significantly larger than a decade earlier, INC by about one-third and FAO by almost one-half. Worldwide, the market for RCN is becoming more competitive due to efforts of companies in every producing country to increase productivity and market share. Transit countries that add processing to re-exports are also making significant efforts to ensure access to reliable, low-cost RCN raw material supply.

Interviews with cashew executives in Mozambique⁹⁷ confirm a reported consensus that world RCN production will reach 5.0 million mt in 2020, between the FAO and INC estimates, and will reach 7.6 million tons in 2025 (Trade for Development Center 2018). West Africa is growing its production very fast, and Africa may soon be the main continent supplying RCN. Cambodia is expected to have the largest growth in RCN production in Asia; by 2025, its annual RCN output should reach 1 million mt (ibid.). Vietnam and India are also expected to continue requiring imports of large amounts of RCN to keep their places as the main global cashew processors.

Even with increased enforcement of RCN export taxes, factories have not been able to process at close to full capacity.⁹⁸ This is apparently because processors are obliged to supply their factories with RCN for the whole year in a short period of 4 months due to the harvesting season calendar (October to February in most of the country). This requires availability of abundant raw material of adequate quality, as well as high levels of working capital in a short period of time, both of which can be difficult to access. Failure to purchase in this period implies losing the entire year.⁹⁹

The profitability of the processing industry is sensitive to the margin between the cost of procuring RCN and revenue from selling processed kernels. A slight increase in the cost of RCN or decrease in export kernel prices can cause significant losses. This is in a context where export prices for both RCN and kernels are naturally volatile due to weather, but also due to the changing policies in price-making countries such as India and Vietnam.¹⁰⁰ These countries, like most major cashew producers, follow a northern hemisphere production cycle, unlike most of Mozambique. Processing profitability is significantly higher on international markets during the southern hemisphere production cycle, when Mozambique domestic RCN prices are low and kernel export price opportunities are more attractive. Seasonal differences in the profitability of processing encourage lower capacity utilization at lower-return times of the year.

⁹⁶ The INC figure for RCN appears to be based on its actual tracking of shelled nuts trade and an assumption that it takes 4.2 kg of RCN to get one kg of shelled nuts.

⁹⁷ Listed in the Acknowledgements.

⁹⁸ Capacity utilization has been reported variously as fluctuating across years between 50 and 70 percent, with approximately 70 percent utilization in 2017 and less than 60 percent in 2018 (Antonio 2020).

⁹⁹ Interviews of members of AICAJU by Carlos Costa.

¹⁰⁰ Price-making as suggested by their large market shares for exports of processed kernels in Figure 3.3.

Most Mozambican processing plants are located in rural areas, where cashew processors must compete with other crops during the harvesting season to access seasonal labor. Wages for seasonal labor in the processing industry are not competitive with the opportunity cost of labor at that time, and it is not profitable to retain seasonal laborers year-round. This prevents processors from working at full capacity during periods of peak agricultural labor demand in the areas where they are located.

Processors seek high-quality RCN in adequate quantities, even well above their installed processing capacity, selecting the better nuts for the very quality-sensitive (kernel size and color) export market. Yet, the quality of RCN delivered to processors has declined markedly since the 1970s, according to interviews with processors. This is probably a consequence of poor orchard care, such as lack of pruning and spraying and the advanced age of trees, causing their vulnerability to diseases such as oidium and anthracnose. The 2015 IAI survey showed that only 4 percent of cashew producing households season-sprayed their trees, despite INCAJU subsidies (Ricaldi and Cunguara 2018).

This situation produces a vicious circle where poor incentives and little technical support lead to orchard neglect, in turn leading to low RCN prices, which again reinforces low incentives. Interviews with processors and traders suggest that most Mozambican smallholder producers do not invest time or the cost of inputs, such as fungicides, into their trees, getting only what they can from the virtually abandoned trees. Smallholders claim that farm gate RCN prices are too low to make it worthwhile to take better care of their trees (Antonio, 2020; USAID 2018). INCAJU's decision to stop providing subsidized inputs will likely aggravate this situation. To renew and significantly increase the number of productive trees with higher KOR, and thus increase availability of good quality RCN, Mozambique will need policies and public investments to re-incentivize producers.

F. POTENTIAL MARKETS FOR CASHEW BY-PRODUCTS

CNSL is the only cashew by-product formally processed (in low quantity) in Mozambique for export. Cashew shell cake is not presently commercially exploited. A few processors use cake as a fuel supplement in their own installations. Initiatives to use it as a stove fuel in rural areas to reduce wood burning have not succeeded (interviews with AICAJU processors). Cashew kernel testa, used in poultry and ruminant feed and for coloring leather red during tanning, is not commercialized.

The juice from the cashew apple is potable and can be consumed or used to produce other beverages, including alcohol. Smallholder farmers around Mozambique use a small part of their apple production for juice and alcoholic beverages, but most production from the cashew apple goes entirely to waste. Unlike Brazil, there is no industrial-level commercial use. The main factor preventing Mozambique from developing the cashew apple industry is related to the high spatial dispersion of trees. Cashew apple is very perishable; it must be treated within 24 hours after being collected, making it not presently viable to collect enough quantity at one time and place for commercial processing. Consequently, the domestic market for cashew apple products is very small and of low quality, not meeting the minimum quality standards needed for commercial sales. Bottled or packaged cashew apple juice sold in formal outlets in Mozambique is imported from Brazil.

G. POTENTIAL MARKETS FOR SEMI-PROCESSED AND ROASTED PACKAGED KERNELS

The export market for semi-processed kernel from Mozambique is likely to remain attractive longer term, with minor reservations. India is a major market, but it presently imposes high import duties on cashew kernel to encourage processing of domestic RCN. The current official tariff rate on kernel imports as of June 2020 in India is 70 percent, up from 45 percent in January 2020 (Antonio 2020). In fact, protection has further increased through imposition in February 2020 of a minimum

c.i.f. import price of US\$10.38 per kg for shelled cashew kernel, while Indian traders were offering Indian domestic processed cashew kernels at US\$3.60 per kg, and Vietnam cashew exports to the world market were slightly cheaper.¹⁰¹

According to the Trade for Development Center (2018), the main forecasts regarding the leading world markets for the period 2019-2025 for cashew kernel are:

- (a) Production and processing powerhouse Vietnam will likely continue to register double-digit domestic consumption growth rates from very a low base, as the Vietnamese cashew nut industry aims to increase low local consumption. Meanwhile, Vietnamese exports will remain large and cheap,¹⁰² discouraging other exporters. The large import demand from North American and European countries will grow at above average rates, supported by scientific studies suggesting the health benefits from consumption of cashew nuts (Rico et al. 2016).
- (b) Because of the increasing concern for healthy and nutritious food around the world, evidenced by the rising number of vegans and vegetarians, it is also expected that the market for organic cashew will increase substantially.¹⁰³
- (c) Indian consumers will continue to increase their already massive kernel consumption, as well as that for broken pieces for confectionary, particularly during festive times.¹⁰⁴

The Netherlands and Germany are important transit countries for the European market. Approximately 70 percent of Dutch cashew imports are re-exported to other European countries (Trade for Development Center 2018). A significant part of imported semi-processed kernels in Germany (almost 30 percent) is also sold to other European countries as processed cashew. The U.A.E. plays a comparable transit role in the Middle East region.

In Europe, the U.S., the Middle East, and Japan, there are a number of large snack food buyers that source multiple full container loads of cashew from the original producing countries directly. Companies such as Planters (Kraft Foods), Ann's House of Nuts, Intersnack, the Nut Company (the Netherlands), and Costco buy directly from exporters. According to the main Mozambique AICAJU processors, most of these companies are buying semi-processed kernel directly from Mozambique to roast under their own brand.

3.6 POLICIES AND REGULATIONS AFFECTING COMPETITIVENESS FOR MOZAMBICAN CASHEW PRODUCTS

A. PRESENT COMPETITIVE SITUATION

Semi-processed kernel is Mozambique's main processed cashew export product; it is shipped in boxes containing 2 bags of 25 kgs each to Europe, the U.S., and Canada. To supply those demanding markets, Mozambique has to produce high quality kernel meeting demanding quality and food safety standards.¹⁰⁵ Traditionally, Mozambique has been a high unit-

¹⁰¹ Source: <https://www.globaltradealert.org/intervention/72220/import-tariff/india-minimum-import-price-on-cashew-kernels-raised>, and Economic Times (of India) Feb. 24, 2020, available at: <https://economictimes.indiatimes.com/markets/commodities/news/processed-cashew-output-likely-to-increase/articleshow/73132613.cms>

¹⁰² As mentioned, at \$3.30/kg of whole shelled kernel in February 2020.

¹⁰³ Business studies targeting the food trade forecast compound growth rates for global spending on organic food and beverages to grow on the order of 13 percent a year from 2015 to 2025 from an already high base greater

¹⁰⁴ Mozambican exporters and INCAJU were in discussion in May 2020 with Indian importers on how to supply broken pieces for the India market—which uses large amounts of these for confectionary during holiday periods—perhaps through a special tariff exemption for on the order of 4,000 mt (Antonio 2020).

¹⁰⁵ Often private standards in developed markets are higher than already high public standards (Jaffee et al. 2018).

cost producer compared to competitors, with average RCN processing costs in Mozambique estimated at US\$386/per mt (Technoserve), compared to US\$208 in Vietnam, US\$281 in India, and US\$317 in Tanzania (USAID 2018).

Mozambique's largest processing units have now adopted semi-automatized technologies to improve efficiency and to reduce skilled labor costs. To become more competitive in the most remunerative export markets, Mozambique will have to install cost-effective food safety management systems to comply with internationally recognized standards. Systems will need to embody internationally recognized policies, procedures, practices, controls, and documentation that ensure that food sold by a business is free from contaminants and safe to eat. For these exports, the Mozambique cashew processing industry will require Hazard Analysis Critical Control Point (HACCP) international certification.¹⁰⁶

Scope to improve the competitiveness of Mozambican cashew abroad is limited by the fact that Mozambique is a "price taker" in global RCN markets. This means that Mozambique's level of production volume is not large enough for it to affect international prices. The implication is that a ceiling on Mozambique export prices is imposed by the supply-demand balance in the global cashew markets. Faced with this, the competitiveness of cashew processed in Mozambique in world markets is limited by the fact that 31 percent of the unit cost of production of semi-processed cashew in Mozambique is in processing itself, not in the cost of raw material. For comparison, in Tanzania 21 percent of the cost is from processing, it is only 15 percent in India, and 12 percent in Vietnam (USAID 2018). In addition to low capacity utilization in Mozambique and high cost of working capital, another factor for high unit processing cost is that Mozambique still has a number of smaller and less efficient processing plants (Ibid.).

B. FISCAL AND TRADE POLICY ISSUES AFFECTING THE CASHEW BUSINESS

Especially given world price restrictions on Mozambican cashew prices, internal policies that affect domestic producer and processor incentives affect the competitiveness of the Mozambican cashew value chain compared to other countries. The main example is the 18 percent export tax on RCN exports in Mozambique, which decreases the cost of RCN to Mozambican processors at the expense of Mozambican farmers. Given the price limitation posed by the world market, the tax has the effect of decreasing Mozambican farm gate prices.¹⁰⁷

In addition to cashew export taxes in effect for 2 decades, Mozambique recently introduced regulations that seek to reinforce the domestic processing industry and increase transparency. Regulations include mandatory processor and trader registration; designation of firms allowed to export RCN; Right of First Refusal for purchasing RCN that allows domestic processors to have first call on all RCN supply; and a mandatory (minimum) "reference price" for RCN at the farm level of 34 MZN/kg (about US \$0.50), intended to minimize the potential for extra-normal trader margins (Antonio 2020).¹⁰⁸

The export tax also creates uneven enforcement, as witnessed by the high share of recorded "informal", mostly untaxed RCN exports (see Figure 3.2). This creates a climate for lack of transparency and fairness across firms. Complying with other trade policies and rules is also often difficult for companies as correct information about documents needed and regulations is hard to access.

¹⁰⁶ For detail, see Jaffee et al. (2018).

¹⁰⁷ While imposing the export tax guarantees that Mozambican producers are paid less than they could be, it does not necessarily follow that farmers will be the beneficiaries of lifting the export tax. In 1995, Mozambique began to allow unrestricted export of unprocessed cashew nuts to India under World Bank pressure in the belief that peasant producers would gain higher prices from the free market. But it did not happen—as a monopoly buyer, Indian importers collectively pushed down the price paid to Mozambique and traders within Mozambique pocketed larger margins (Aksoy and Yagci, 2012, also see: https://www.africa.upenn.edu/Urgent_Action/apic-021901.html).

¹⁰⁸ Although not mentioned by Antonio, this may have been motivated at the time by an intention to lower the export tax to 14 percent, and memories of what happened after lowering the export tax in 1995 (see previous note). In any event, the level is subject to discussion with stakeholders and could be amended in the event of need (Antonio 2020).

This is also the case with respect to imports of equipment and intermediate goods for Mozambican exporters. Clearing agents at importing points are susceptible to corruption, causing difficulties when importers refuse to pay bribes (from company interviews). High-interest working capital, customs tariffs, onerous import formalities, port handling charges (unloading of containers, transport to consignee's warehouse or vehicle, transport to the operations site, among others) all add to the high cost of cashew production. A recent debt crisis caused Mozambique's Central Bank to tighten procedures to access foreign currency even further.

Firms also cite value-added tax (VAT) reimbursements as particularly problematic. While agricultural goods and food are normally exempt from VAT, Mozambique regulations require that virtually all enterprises pay VAT on transactions and then seek reimbursement from the government tax authority as appropriate. It can take a long time and significant effort to get reimbursed. Smallholders are also expected to participate in this system, either as formally registered businesses or under the Simplified Tax for Collective Entities (ISPC) provision, a simplified regime for firms (mostly micro businesses) with turnover below MZN 2.5 million. Not surprisingly, most of them prefer to remain in the informal economy, without registering, paying taxes, or providing commercial invoices. Fiscal inspections and fines also burden many cashew sector firms, and companies spend substantial time dealing with inspections, which reportedly become more frequent during fiscal tightening.

The less transparent and the more cumbersome regulations and enforcement are, the greater the scope for corrupt practices on the part of implementing regulators and public officials. Companies in the sector all agree (based on company interviews) that a simple and transparent system is needed, with clear guidelines that apply to everyone. This would include using standardized international product codes to avoid confusion or malfeasance at the border. Companies interviewed particularly stress the need to harmonize fiscal inspection procedures and establish clear guidelines to curb petty corruption connected to inspections.

C. INFRASTRUCTURE AND REGULATIONS

Some policies and policy-induced outcomes stand in the way of cashew production quality. Major examples are low public investment in infrastructure leading to high marketing costs, inadequate research and extension for cashew preventing productivity growth, and unmotivated producers facing low residual RCN prices once high domestic processing costs and taxes are removed. The risk is that without change, competitors outside Mozambique will continue to take Mozambique's global cashew market share.

Most processing units are located near main national roads; some are in small villages, although most are located in urban areas such as Nampula in the north. Investment in cashew value chains is greatly influenced by availability of crucial infrastructure necessary for business success, such as reliable electricity, access roads, and water. Other business environment issues also influence investment, such as labor regulations, enforcement of commercial contracts, and general adherence to the rule of law.

Mozambique has an underdeveloped electrical power system, with only 1 in 4 people nationally and less than 2 percent in rural areas having access to on-grid electricity (World Bank 2016b). Power for factories is unreliable, especially outside the capital zone, and is the source of many operational inefficiencies. Current electricity regulations and pricing by the parastatal *Electricidade de Moçambique* (EDM) are intended to provide incentives both for all business operators to use energy efficiently.¹⁰⁹ Yet, the main energy issues that arose during executive interviews were lack of transparency in transactions, unpredictable prices, and a lack of timeliness. According to interviewees, prices quoted seem irregular, with representatives of EDM often not being able to explain changes in customer charges.

¹⁰⁹ Although large business users pay much lower (of the order of one-half to one-third) per kWh tariffs than households or small farming users, unit rates rise for increased usage per time period within the major size categories; see: <https://www.edm.co.mz/en/website/page/electricity-tariffs>

Mozambique's fundamental challenge in terms of transport is low road coverage, especially in rural areas. The country has one of the lowest rural road coverages in Africa (World Bank 2019b). The median walk time to any form of transport or transit for hire in rural areas—a proxy for access to roads—was 1 to 1.5 hours in 2018 (World Bank 2019a). In 2016, only 17 percent of the rural population lived within 2 km of an all-weather road (World Bank 2016b). This translates into high transfer costs and contributes to lack of competitiveness of the country's agricultural export sectors. This includes the cashew value chain, which is largely supplied by RCN produced by smallholders in remote rural areas. Developing the road network is required to provide rural areas with access to domestic and regional markets.

Mozambique has vast freshwater resources, but very little irrigation or flood control. Irrigated farmland in use in 2016 was only about half of developed irrigated land capacity at the time, and only 3 percent of the estimated potential of nearly 3 million irrigable ha (World Bank 2016b). There is no record of irrigated cashew plantations. Cashew orchards in Mozambique are severely affected by the high spatial and temporal variability of precipitation across the country. Mozambique is vulnerable to both drought and floods, as well as to irregular water supply to populations and businesses, but growing seedlings to replace old cashew trees is highly dependent on watering in the early years of their maturation.

Lack of warehouse space in cashew producer zones hampers introduction of more efficient systems, such as quality sensitive commercial procedures needed to allow fair remuneration to farmers for higher quality product. Strategic placement of key infrastructure such as warehouses would allow concentrating harvests from different remote locations in a given area to improve post-harvest practices, maintain product quality, and reduce unit bulking costs.

Improving RCN quality at harvest at competitive unit cost is much easier in larger contiguous plantations. Plantations of a perennial tree crop require security of rights; lack of secure access to land rights represents the primary constraining factor for investors seeking to develop large plantations. This is a broader problem affecting the entire economy.¹¹⁰ A main problem for commercial investors is that the multiple step process for gaining access to land leaves too much room for interpretation of the land law, leading to rent-seeking behavior by officials. Although there has been no change in formal land rules, the GOM seems inclined toward easing current agribusiness investors' burdens. As discussed in Chapter 4 on plantation forestry, success is also likely to require more productive firm engagement with nearby communities on the land.

Since most cashew processing factories are located in or near rural areas and have seasonal demand for labor, they compete for labor with agriculture during key times of the year, such as during weeding and harvesting of main field crops. It is also difficult for formal processors to engage labor informally, as done by many farms. Further, it can be difficult for industrial processors to deal with onerous administrative issues associated with formal employment within the timeframe of seasonal employment often needed in post-harvest processing. Finally, employers also have difficulties dealing with problem workers, as strict labor regulations force employers to maintain low performers.

Finally, all cashew processors need to buy large quantities of RCN from smallholder farmers and are occasionally obliged to establish advance buying/selling contracts. These contracts are difficult to enforce as most operators (processors, traders, and farmers) do not trust implementation of the commercial legal framework, especially as regards smallholders.¹¹¹ Operator experiences vary, but the major contract problem they cite is the time it takes to sort out a problem.

¹¹⁰ See discussion of DUATs in Chapter 1

¹¹¹ More generally, the World Bank's 2020 Doing Business report ranks business contract enforcement in Mozambique as problematic in general (at 39th in Sub-Saharan Africa); see: <https://www.doingbusiness.org/en/rankings?incomeGroup=low-income>); this is the case even before dealing with the particular issues involving contracts with smallholder farmers.

3.7 PROCESSOR-IMPLEMENTED IMPROVEMENTS FOR INCREASING COMPETITIVENESS

A. INSTITUTIONAL NEEDS SUCH AS GRADING, STANDARDS, AND FOOD SAFETY

Over almost a century of operations, processors in Mozambique have tried almost all worldwide cashew processing technologies. Until recently, cashew processing in Mozambique was nearly all a labor-intensive, high-volume, low-margin business. Today, the processing industry uses a broad mix of different technologies, with accompanying variation in efficiencies. Several larger processors have adopted modern, semi-automatic technologies to lower unit processing costs, but they also improve the uniformity and handling of the product.

Presently only 3 of the larger processing units operate at International Organization for Standardization (ISO) and HACCP levels, which allows them to distinguish the quality of their products. Improving national processing competitiveness for export markets requires that cashew nut processing plants be equipped with automatic shell cutting and peeling equipment to balance between capital and labor. This increases overall efficiency and significantly raises labor productivity. To improve the reputation of the national “processed in Mozambique” label, at least 95 percent of processors should be certified as implementing quality management systems such as ISO 22000, HACCP Good Manufacturing Practices (GMP), and HACCP Good Hygiene Practices (GHP).

Kernels “grading” is a function of color, size, and shape. Mozambique follows cashew quality specifications from the Association of Food Industries’ (AFI) Nut & Agricultural Products Section,¹¹² which prescribes 27 different grades. These apply specifically to the American market but kernel buyers worldwide commonly use them. They are also reflected in the commercial quality standards developed by the United Nations Economic Commission for Europe (UNECE) Working Party on Agricultural Quality Standards for the European market. This Working Party’s mission is to facilitate international trade, encourage high-quality production, improve profitability, and protect consumer interests.¹¹³ The India Cashew Export Promotion Council of India (CEPCI) has also developed its own specific standards with 33 different grades, but in practice uses only 26.¹¹⁴

MozaCaju has assisted some processing units to install food safety management systems compliant with international HACCP standards, as certified by the *Société Générale de Surveillance* (SGS). These food safety management systems include policies, procedures, practices, controls, and documentation to ensure that food is contaminant-free and safe to eat. Being recognized for meeting these standards helps a product gain recognition for this in terms of higher prices.

However, cashew processing factories in Mozambique have only recently begun implementing HACCP procedures. All industrial processors must become certified to guarantee the food safety of their products. This will require that some replace current low-efficiency, retroactive quality-control processes with proactive identification of food safety hazards and best management practices. Besides helping meet tightening international standards, the systems also often improve operational efficiency and reduce processing waste.

B. INCREASING OPPORTUNITIES IN ORGANIC AND FAIR-TRADE SEGMENTS

One option for Mozambique is to promote diversification of its cashew value chains to sell a higher portion of kernels to high-end markets. Global awareness is increasing of the health benefits of nuts in general, including cashew. Nuts contain protein, “heart-healthy” fats, minerals, and vitamins. Consumers are increasingly incorporating nuts into daily diets as a healthy alternative to snacks such as crisps, extruded snacks, and animal protein (Freitas et al. 2012).

¹¹² See: https://www.afius.org/Resources/Documents/AFI_Specifications/cashews-part-i.pdf

¹¹³ See: https://www.unece.org_cashew_kernels_2013.pdf

¹¹⁴ See: <https://cashewindia.org/cashew-kernels>

Trends include growing consumption in high-end markets for natural (unroasted and unsalted) nuts, and flavored or coated cashew nuts. Taste rather than the health benefits of nuts may be the main reason for sustained demand, but consumers are also looking for new products due to increased health and nutritional awareness. Europe (Netherlands CPI), the U.S., Canada, and India increasingly are using cashew kernels as a roasted-and-salted snack, and new products such as cashew milk are emerging as an alternative to cow's milk due to purported health benefits.¹¹⁵ Vegan consumers often include nuts in daily meals to add protein, and they are replacing dairy milk with almond, cashew, and other milks. These alternative milks are also key ingredients in plant-based yoghurt and cheese.

Where health benefits are the selling point, organic certification of cashew products is more likely to catch on. Most cashew production in Mozambique is grown with low or no chemical inputs, and farmers still can improve cashew yields significantly by organic means. These include applying organic fertilizer, managing pruning and organic pest control on trees, and improving harvest and post-harvest practices. In addition, a legal framework will need to be created along with a stakeholder platform for organic value chains.

At present, there is no certified cashew organic production in Mozambique. However, INCAJU and NGOs such as HELVETAS—through the *Amendoim, Cajú e Negócios* project (AMCANE, or Small Business Sustainable Peanut and Cashew) launched in 2018—as well as Technoserve and the Aga Khan Foundation (through their recently closed multiyear MozaCaju project) have conducted organic trials in medium-to-large private commercial plantations¹¹⁶ (Helvetas 2018, Technoserve 2017). These plantations were created to produce conventional RCN, and most of them have already used chemical products, but the owners agreed with CSOs to implement the organic trial on part of their holdings, with the possibility of converting to all organic practices in the future or to invest in new organic cashew plantations. These trials in northern Mozambique (Nampula and Cabo Delgado) are still in early phases with results so far inconclusive.

Mozambique has also implemented several programs to promote fair-trade certification among farmer organizations over the last 14 years. There are a large number of farmers' organizations in Mozambique, a notable legacy of its past economic and political history (CARE and ActionAid 2017). The first farmer fair-trade initiative in Mozambique began in 2006, when the *IKURU* Agriculture Trade Company obtained fair-trade certification for its groundnuts and cashews (100 tons). That same year, *Ecocert*, a French agency, provided organic certification for the groundnut, sesame, and soy crops.¹¹⁷ The benefits of certification emerged quickly as producer prices increased by 25 percent.

Later, several other organizations promoted the spread of fair-trade practices among smallholder farmers, but most initiatives did not last long after civil society promoters left. Thus, Mozambique experience with conventional fair-trade certification remains negligible. The country still has very few certified producers and processors and final products exported under this system have not been adequately differentiated in markets from uncertified products, making it hard to obtain a financial premium for a certified product. A notable but small exception is the Mozambique-based Sunshine Nut Company, which has the social mission of supporting orphans and other causes. Since 2015, it has sometimes supplied small amounts of high-quality roasted, flavored, and packaged kernels to international outlets such as Ahold and Whole Foods.¹¹⁸ The Sunshine Nuts Company is not presently certified organic, but clearly operates based on fair-trade practices.¹¹⁹ For Mozambique to succeed in spreading fair-trade certification to smallholder-based cashew value chains, it should concentrate on chains selling to markets offering price premiums for fair-trade certification, such as the U.S, Netherlands, Germany, UK, Italy, UAE, Canada, Australia, France, Sweden, and Switzerland.

¹¹⁵ See: <https://www.healthline.com/nutrition/cashew-milk-benefits>. In this market, it probably also helps that the end product can be made out of high-quality kernels by consumers with a blender and clean water.

¹¹⁶ Interviews by Carlos Costa of plantation owners and Helvetas officers in December 2019. Also see Mozacaju (2018).

¹¹⁷ See: <https://www.ecocert.com/en/certification>.

¹¹⁸ See: <https://sunshinenuts.com/sunshine-approach/history/>.

¹¹⁹ In terms of its social mission and approach, if not in terms of formal certification of procurement prices and practices.

3.8 IMPROVING FARM INCENTIVES FOR RCN PRODUCTION THROUGH PUBLIC INTERVENTIONS

As with any agribusiness, commercial success in cashew processing depends on the quality and reliability of the end product, which depends greatly on the quality of the raw material, the lack of which currently prevents progress in Mozambique. Even if Mozambique had the most efficient cashew processing industry in the world, it would not succeed without improving the quality and quantity of RCN raw material at reasonable and stable cost. The cashew industry will have to ensure that RCN processed in Mozambique is of good, competitive quality compared with producers in other countries. As discussed, RCN quality in Mozambique is problematic compared to competitors. It is vital to all stakeholders in the cashew value chain to support policies to improve quality. This is mainly a matter of producer decisions and practices in the face of alternatives available to them. Thus, quality improvement in RCN supply essential to processor success depends foremost on changing the nature of smallholder participation in the value chain.

A. VARIETAL RESEARCH, INPUT USE AND DISEASE CONTROL, AND FARMER ACCESS TO SERVICES

In 1998, the GOM introduced 3 programs for increasing production and productivity of cashew through the Institute for Cashew Promotion (INCAJU): (a) a phytosanitary program, (b) integrated cashew management, and (c) promoting small and medium cashew processing. However, the public mandate for basic cashew research in Mozambique remained under the *Instituto de Investigação Agronómica de Moçambique*, (Mozambique Institute for Agricultural Research, or IIAM). There has been little cashew research or extension from IIAM. Recent reform of INCAJU responsibilities as the umbrella agency for cashew issues led to a shift of cashew research. A new INCAJU initiative aims to identify, develop, and certify 4 types of cashew clones, in line with varietal research in Latin America and Asia (Mozambique, INCAJU, 2017a).

Over the last 2 decades, the cashew sector has benefited however from several programs financed by different international development organizations, mostly focused on production of seedlings to replace old cashew trees. INCAJU has added a program to multiply and distribute grafted seedlings to farmers at a subsidized price. In 2017, smallholder farmers purchased a grafted seedling at US\$0.08, farmer associations paid US\$0.17, while commercial farmers paid US\$0.34 per seedling (Mozambique, INCAJU, 2017a). INCAJU's restructuring represents a gradual transition to a private organization, which will provide the same services on a commercial basis.

The advanced average age of cashew trees in Mozambique predisposes orchards to diseases, such as anthracnose, a powdery mildew disease (PMD), and pests such as *helopeltis*, coconut, and mealy bugs. Continued large incidence of PMD and other diseases significantly decreases yields from cashew trees. INCAJU has long implemented a program to support fungicide and pesticide application to cashew trees, conducted by private service providers under contract to INCAJU. The cost of chemicals is 100 percent Government subsidized, with farmers paying only for the spraying service. For 2017, the spraying cost was set at US\$0.76 per cashew tree in northern and central regions, including Nampula, and US\$1.02 in the southern region. INCAJU claims to have facilitated spraying of 5.5 million trees per year, on average, during the last few years up until 2017 (Mozambique, INCAJU, 2017a).

INCAJU also does not plan to assist in replacing chemicals used for spraying with bio-based products, despite a variety of CSO-implemented trials under their authority (Mozambique, INCAJU 2018). While the transfer of the administration of the program to the private sector under subsidy had been planned to happen gradually, INCAJU recently also announced its plan to suspend completely the subsidy for spraying as soon as possible.¹²⁰

¹²⁰ Announcement made by INCAJU May 8, 2020. See: <https://clubofmozambique.com/news/cashew-sector-in-mozambique-government-plans-to-suspend-subsidies-for-pesticides-noticias-159666/>.

Some farmers organizations deal explicitly with cashew, but the large majority of smallholders cultivating cashew remain outside these structures. There still is a long way to go before farmers organizations will be able to provide services on a commercial basis that farmers need to produce and market quality RCN or kernels. Even where they exist, farmers organizations have little experience in managing fungicides and pesticides, especially bio-pesticides (CARE and ActionAid 2017). There are no associations with processing capacity; all production by members is sold to cashew processors or to traders. Anecdotal reports about efforts by farmers organizations to promote fair-trade certification likewise have not been encouraging; individual members perceive that any net gains from fair-trade certification do not seep through to them.¹²¹

Coaching and technical support to farmers have been crucial for adopting best practices. These activities have been conducted through the Ministry of Agriculture and Food Security (MASA), now the Ministry of Agriculture and Rural Development (MADER), which is represented in the districts by District Services of Economic Activities (SDAEs). These organizations hire extensionists to cover the entire agriculture sector and not a single specific product or value chain. Cashew farmers are only supported on cashew issues when cashew-specific programs are in place.

B. INCREASING FARM GATE PRICES

The most obvious way to address low farm incentives for cashew is to implement policies to increase the profit margin for the producers or reduce their risks. This would include addressing current policies that lower farm gate prices. One of the justifications for the cashew export tax is that it finances INCAJU service provision, but INCAJU activities are being curtailed along with subsidies to growers. Average procurement costs that industrial processors paid in Mozambique in 2015 are estimated at US\$1,256 per mt of RCN delivered to the factory gate, with an average farmgate price of US\$529 per mt that year (USAID 2018). This implies that farmers are only getting 42 percent of the average price paid for RCN by industrial processors, with the remainder going to middlemen and transporters.

Farm gate prices from 2005 to 2013 fluctuated between US\$300 to US\$600-plus per mt, with a tendency to increase over time in keeping with inflation (FAO 2014). The 2015 factory gate procurement cost in Mozambique of US\$1,256 per mt of RCN compares to US\$1,633 in Tanzania, US\$1,494 in Guinea Bissau, and US\$1,941 in India (USAID 2018). Either bulking and internal transport costs in those countries are much higher than in Mozambique, or—more likely—their farmers are paid more.

Internal transport costs in Mozambique are at least as high as for competitors, so differences in bulking and transport costs likely cannot explain the price differentials with competitors. RCN quality in Mozambique is low, which may account for part of the reason for lower Mozambican RCN factory door prices, but the differentials between quality grades are not big enough between countries to explain the gap in factory door prices. Further, from 2005 to 2013 Mozambican cashew farmers received about 50 percent of the f.o.b. (export) price of RCN exports, but only 8 percent of the f.o.b. price of processed kernels (FAO 2014). Since the KOR in Mozambique is about 26 percent, indicating that it takes just under 4 kg of RCN to get 1 kg of kernel, the share of farmers in the f.o.b. value of kernel exports of 8 percent is disproportionately low.

It is thus clear that Mozambican farmers receive less per kg of RCN than either internal calculations or comparisons with neighbors suggest should be the case (USAID 2018). The evidence up to 2014 is that processors and internal traders in Mozambique earned excess margins on cashew trade (FAO 2014). Introduction in 2019 of a farm gate reference price policy for RCN by the Government is designed to address the perception that trader margins are excessive (Antonio 2020).¹²² With Mozambique being a “price-taker” internationally for cashew, and in the absence of direct domestic subsidies or other internal competitive trade distortions, an 18 percent export tax on RCN lowers

¹²¹ From interviews with selected farmer organization members and processors by Carlos Costa.

¹²² For historical perspective on this issue in the mid-1990s, See: https://www.africa.upenn.edu/Urgent_Action/apic-021901.html

the maximum that processors can pay farmers by the same amount. This is even before processors subtract already high average processing costs compared to competitors. In addition, since cashew is mostly exported, Mozambique's highly volatile exchange rate adds volatility to producer prices in Meticaís.

Low cashew farm returns (farm gate price times yield, minus farmer costs) in Mozambique perpetuate a vicious circle of low farmer incentives to invest in and maintain cashew holdings, leading to low quality and eventually low quantity output. Improving processor efficiency can be understood as improving processor profits, but also as providing leeway for increasing returns to farmers without whom they cannot continue to operate. Efforts are underway to increase processor efficiency, but even if wildly successful they would not likely allow processors to increase RCN prices enough to offset the 18 percent RCN export tax.

Taking all of the above into account, 5 peculiarities in Mozambique stand out with respect to farm gate cashew incentives:

1. There is a significant financial (albeit illegal) incentive for farmers to try to sell to outlets that export RCN but do not pay export tax. The illegal operations presumably pay more per kg than legal exporters who do pay tax but get the same prices from processors in other countries. Illegal export agents are also typically associated with Asian companies that can provide less expensive working capital for procurement (USAID 2018). Illegal exporters can thus afford to pay more than intermediaries selling to regulated domestic processors.
2. It is not clear who benefits from untaxed RCN exports and how they are able to do it. By law no one can export RCN exempt of taxes; those who do it are breaking the law. However, INCAJU and other government entities lack enforcement capacity. In any event, large amounts of RCN are smuggled yearly, much of it through neighboring countries. The prices realized in illicit trade of RCN are likely less than could be achieved under open free export of RCN.
3. There is a vicious circle involving low farm productivity, low prices, and consequently low willingness to invest in higher productivity that would increase farm revenues. Farmers have little liquidity, and until recently little incentive to invest in inputs and services previously subsidized by INCAJU. This has prevented development of effective farm demand and private supply for inputs and services. Even if private markets develop for inputs, it will likely be some time before most smallholders will be able—or even willing, if RCN prices do not increase—to par
4. Processors operate at only 50 to 70 percent annual capacity (and even less in 2020); this raises their costs (Antonio 2020), which reduces what they will be willing to pay farmers given their lack of control over the export prices they face. A variety of factors keep capacity utilization low. Processors in Mozambique solely process domestic RCN, and they need to procure their entire year's supply in the domestic harvest season from October to January, inevitably reducing capacity utilization at some other times of the year. Furthermore, many operators lack working capital to cover the full year, due to high commercial loan costs, seasonal labor constraints, and irregularities in electricity supply. Finally, 2017 was a banner year with international kernel prices at least 20 percent higher than at present. Much of the processing scale-up occurred after the rise in international prices starting in 2015 (CEIT Data 2020) (Figure 3.2); this led to over-capacity as global demand and prices slackened later on.
5. India continues to play a dominant role in setting international cashew prices for the cashew quality grades Mozambique exports. India is a "price-maker" for cashew because of its disproportionately large size as both a producer and importer. This means that India can drive a hard bargain with cashew suppliers in the markets where Mozambican exporters have traditionally sold. This was particularly evident in 1995

when, after Mozambique did away with its cashew export tax under Structural Adjustment conditionality from the World Bank, Indian importers and middlemen in Mozambique captured a significant part of the benefit (Aksoy and Yagci 2012). However, the rapid rise of other global market players over the last few years has given Mozambican processors more sales options, but only if they can improve quality while decreasing unit cost.

3.9 CONCLUSIONS AND RECOMMENDATIONS ON A RENEWED STRATEGY FOR CASHEW DEVELOPMENT

A. SUMMARY OF MAIN CONCLUSIONS FOR CASHEW

The final market for Mozambique cashew nuts is overwhelmingly as a high-end snack or confectionary ingredient in international markets. Its potential to grow incomes or drive better jobs depends on both international demand and Mozambican competitiveness versus alternative suppliers to consuming markets. World demand for cashew has grown rapidly in the past 2 decades, with consumption growing at over 5 percent per annum globally. Real world prices follow a relatively stable long-term trend but are volatile across years due to fluctuations in annual output in the larger Asian producers and global disasters such as the COVID-19 pandemic. Fluctuations in annual income growth—and thus consumption of a luxury good—in India, China, and the importing OECD countries also contribute to the volatility of prices, as does volatility in the nominal exchange rate in Mozambique.

Fifty years ago, Mozambique was the dominant international exporter of cashew, but it presently accounts for only 3 percent of global production despite a revival of the processing sector in the last 15 years. RCN production in Mozambique grew at roughly 4 percent per annum from 2003 to 2018, while world production has grown by 5.6 percent per annum. Thus, while Mozambique has grown its production appreciably, others have grown even faster, and Mozambique's global market share of production has continued to decrease. India has maintained a large role in the sector, and Brazil, Vietnam, and most recently Cote d'Ivoire, among others, have ramped up cashew output rapidly. Cote d'Ivoire, for example, a relative newcomer to cashew 15 years ago, produced more than 4 times as much RCN in 2018 as did Mozambique.

A key advantage for Mozambique is that most of its national harvest follows the Southern Hemisphere cycle of October to January. Mozambique's main competitors in West Africa and Asia, which together account for more than 80 percent of global cashew production, follow the Northern Hemisphere cycle of February to May. Asian processors are willing to pay a 15-20 percent premium for Southern cycle RCN at harvest due to global shortages in that season.

The quality of Mozambican RCN is generally poor in comparison to global and even regional rivals in terms of weight, number, and color of kernels per 80 kg bag of RCN. Orchards are not well maintained, trees are dispersed, and the national orchard is aging beyond the point of being productive (about 50 years). Improvements will require better tree trimming, regular spraying with pesticides and fungicides, and replacement of aging trees with new stock. Fertilization and soil and water management are also issues. Achieving these goals will require significant improvement in grower incentives and producer and processor access to adequate working capital, inputs, technology, and advice relevant to the prevalent smallholder socio-economic context.

Cashew plantations represent a profitable medium to long-term investment if the sector can increase productivity by 50 percent over the present low national mean yield per tree of 3 kg of RCN. Profitability also requires gaining access to value-added marketing channels beyond bulk sales of low-quality RCN. Medium-to-large cashew plantations can lower the unit costs of security, harvesting, warehousing, and transport due to the concentration of trees. In addition, concentrated plantations lower the unit cost of collecting and storing fresh cashew apple, a highly perishable and potentially valuable by-product used in beverages.

To participate in rapidly increasing global demand for organic products, Mozambique should seriously consider going from little input use currently to using biological inputs. The higher cost and lower effectiveness of biological inputs compared to synthetic chemicals implies that a price premium for RCN output must be secured through organic certification, and this requires a minimum scale of operations and institutional marketing arrangements.

Twenty years of protecting the Mozambique cashew processing industry through an RCN export tax has allowed at least some firms to re-build, modernize, expand capacity, and become more efficient. This provided significant growth in waged manufacturing jobs to about 17,500, the majority held by women. This process became more vigorous with the rise in global cashew kernel prices starting slowly in 2013 and rising rapidly in 2015, before peaking in 2016, then plunging from 2018 onwards (CEIC Data 2020). In June 2020, international cashew kernel prices attainable by Mozambique were at least 20 percent lower than they were in the same season in 2016 for comparable grades and markets.¹²³

However, RCN export tax policies favoring legal tax-free sales to domestic processors at prices lower than untaxed (illegal) sales of RCN abroad have decreased farm-gate RCN prices to the point that most producers are no longer willing to invest capital or labor to maintain tree productivity. Orchards have become older, less managed, and productivity has decreased as fungal diseases and insect pests have become more widespread and more serious. Abnormally high world cashew kernel prices in 2015-2017 provided a lifeline to the sector, but also stimulated a world-wide supply response. Mozambique risks continuing to lose market share and to have difficulty in coping with a market downturn unless significant technical progress occurs on farms (Antonio 2020). Improvement in quality of both raw material and exported commodities are the only feasible routes to both maintain and improve Mozambique's cashew business prospects over the long-term.

While larger plantations or coordinated collective smallholder action might promote economies of scale to improve quality and yield, they are not likely to happen under current incentives. The strategy to improve quality to date has been to empower a parastatal (INCAJU), theoretically funded largely by the export tax, to take on research, input supply, and extension facilitation for smallholders. However, the financial burden to INCAJU was high (INCAJU Annual Report 2019) and very hard to sustain as receipts based on legal RCN exports have plunged. Success at improving smallholder orchards has been modest, and risks worsening now that INCAJU has had to scale back its program to subsidize inputs for farmers.

Yet, the considerable rise in Mozambique's RCN output following a temporary spike in world RCN prices in 2016-2017 suggests that the country has capacity for on-farm supply response to rising prices, similar to other global producers. Policy reforms and institutional development to raise the share of RCN export f.o.b. prices going to farmers needs to be accompanied by broad emphasis on raising the quality of Mozambican RCN. This can only come from producer investment in their tree stock and from processor, trader, and farmer organizational support to private sector entities to provide inputs and extension services. INCAJU can and should continue to coordinate these activities, but success will require broader participation, buy-in, and funding.

As is common during times of conflicting interests and fiscal constraints, cashew industry stakeholders have looked to changes in policies to provide one-shot solutions. Building on in-depth assessment by FAO (2014) and USAID's Support Program for Economic and Enterprise Development (SPEED+) (USAID 2018), policy discussions in 2019 assessed the feasibility of gradual phase-out of the RCN export tax. This seemed an effective approach for raising farm incentives, starting with an immediate reduction from 18 percent to 14 percent, then steadily decreasing over 5

¹²³ Cashew prices differ greatly across degree of processing, grade, and season at the best of times, even without disruptions such as Covid-19 or major tariff changes in countries such as India. Comparable publicly available global export price time series are hard to find; such information is commercially valuable and typically requires large payments to business data services to access. The affirmation of 20 percent lower prices in June 2020 compared to June 2016 is based on anecdotal scanning of published commercial reports in news media in India and Vietnam.

years to 0 percent. Based on SPEED+ model analysis, reducing the export tax to 14 percent was expected to increase in farm-gate prices by an estimated 10 percent, increasing to around 30 percent as the tax is completely phased out and processors “right-of-first refusal” on RCN sales eliminated (USAID 2018).

However, this is more complicated in actual implementation. To ensure that potential gains from reducing the export tax pass through to farmers, RCN procurement markets must be competitive, a precondition that is not clearly present, nor fully modeled. Furthermore, phasing out fiscal export tax protection will pressure processors’ operating margins by at least 10 percent due to the higher cost of RCN farmgate prices (USAID 2018). In theory, the increased quantity and quality of domestic RCN procured would offset processor’s margin losses over time. However, there are reasonable concerns as to whether domestic processors can survive long enough for this process to play out.

Further complications arise from the fact that other countries are not standing still. In addition to changing strategies, Mozambique will have to proactively engage trading partners to retain its place in a distorted global market. INCAJU and Mozambique’s private processors have succeeded commendably in diversifying sales away from India and in upgrading cashew quality to some extent. Nonetheless, India is likely to remain the main importer of Mozambique RCN and a significant importer of kernels—despite 70 percent tariffs—for some time to come. Current government-to-government talks guaranteed a market for 4,500 mt of broken cashew from Mozambique in 2020. Broken kernels are an inferior grade product used in India for confectionary during the festival season, with higher prices for equal weights of half kernels than of smaller pieces. While helpful, this negotiated deal will not solve Mozambique’s structural problems.

B. RECOMMENDATIONS

Thus, our analysis of the cashew sector in Mozambique leads to 5 main recommendations:

1. The Mozambican cashew industry is at a turning point, business-as-usual will destroy both production and processing of RCN, and some hard choices will need to be made and implemented soon to support future prosperity. Mozambique cannot afford to let the cashew sector slip into irrelevance; there are too many jobs and livelihoods at stake. At least 840,000 rural households have invested considerable capital and skills and need to at least maintain and hopefully grow the share of their livelihoods derived from RCN production. The sector also has potential to expand to another 500,000 households that control but do not presently harvest old cashew trees. About another 70,000 to 140,000 mainly informal and seasonal (4 months-plus) sector workers depend on cashew marketing and artisanal processing, in addition to about 17,500 formal sector industrial processor FTE employees.
2. The only way for everyone in the cashew value chain to be better off is to raise the productivity and resilience of all agents in the chain and quality along the way, but with a focus on primary production. Progress on productivity, resilience, and quality will require public sector action. All three require first and foremost investments by farmers in trees and tree maintenance. Revitalization of INCAJU will be key in this regard as it takes on new regulatory, policy coordination and policy implementation functions while divesting from old functions such as contracting for direct input supply and extension. It will be important to support INCAJU to serve its primary regulatory and policy-oriented role, and as a public partner that provides a focal point and catalyst for a private sector seeking to buy and sell cashew inputs, research, extension, and marketing services. INCAJU will also need to engage more resources in market development and diversification outside Mozambique.
3. Policy reform and institutional development is needed to raise the share of RCN export f.o.b. prices going to farmers. This will necessarily involve reductions in export tax protection of domestic processors. Fiscal help will also be needed from other parts of the Government to facilitate transition from the old way of

doing business to a more viable new form. An example would be removing tariffs and taxes on inputs and equipment processors use to produce export products such as cashew kernel. There is also a need to review the practice of levying VAT from RCN sales by farmers and processor sales, or at least improve the mechanisms to return the VAT proceeds in a timely fashion to farmers; this is already supposed to happen for agricultural products, but the process currently requires lengthy procedures.

4. Fourth, the transition of INCAJU from a top-down parastatal to a dynamic public partner in a broad coalition of sectoral interests will require an equitable shift of funding sources for INCAJU to the entire sector, from the present situation that farmers that bear the incidence of the export tax carry most of the burden. This will be easier to achieve if all stakeholders in the cashew sector perceive value from INCAJU's new roles and if they genuinely have input into INCAJU activities. A direct approach to furthering these objectives would be to establish seed funding for a broad-based cashew stakeholder platform, bringing together farm groups, other civil society, Government, and the private sector. This would institutionalize processes INCAJU has tried to promote through occasional "cashew conferences", but with a more participatory and formalized format, improved evidence base and institutional memory, and transparent follow-up.



4. PLANTATION FORESTRY, COMMUNITY-LEVEL ACTIVITY TO SECURE THE RESILIENCE OF RURAL VALUE CHAINS

4.1 INTRODUCTION: OBJECTIVES AND ISSUES FOR PLANTATION FORESTRY IN MOZAMBIQUE

This chapter looks at possibilities for creating and improving jobs through plantation forestry and associated value chains in Mozambique. It will examine traditional large-scale approaches in the broader context of productive land use in the country and the diverse stakeholders affected by increased plantation forestry. It will explore why high hopes for massive job creation through large-scale plantation forestry have not come to pass, with attention to problems related to interactions with local communities. On the other hand, the need for increasing resilience of overall land use through planting trees has continued to increase. Thus, the chapter will look at alternate models for pursuing plantation forestry with local communities that both create jobs and scale-up forest planting..

Four main insights will be examined:

First, rapidly growing forest-product demand in Mozambique looks as if it will continue to outstrip sustainable supply from domestic sources, with negative consequences for the sustainability of harvests from domestic natural forests. Imports of forest products are also likely to continue to grow.

Second, plantation forestry is not likely to replace growing informal harvest of natural forest products in Mozambique. Hopes in this regard have been misplaced in terms of area planted and jobs created. This is largely because the needs and desires of those already on the land have not been sufficiently considered. In addition, plantation forestry operations have moved increasingly into more populated rural areas, which aggravates negative interactions with those already there.

Third, the best hope for major improvements in the number of jobs, livelihoods, and resilience come from better integration of plantation forestry with smallholder agriculture, which continues to account for the large majority of both population and land use in Mozambique. “Climate smart” agriculture under Mozambican smallholder conditions first and foremost requires using “mosaic forestry” practices in association with cropping, livestock, land use planning, and effective governance, including community participation and buy-in (Lipper et al. 2018). Paradoxically, the continued viability of smallholder agriculture in Mozambique depends to a significant extent on the fuller integration of community-level plantation forestry in agricultural areas.

Fourth, the Government of Mozambique (GOM) recognized in 2009 the possibility and need to use plantation forestry as part of national REDD+ strategy to mitigate climate change.¹²⁴ This potentially opens a path for providing public funding for private efforts to build plantation forestry into productive smallholder-dominated landscapes. Such funding recognizes the non-monetized ecosystem benefits forests confer, which are vital to agriculture as well as to the population more generally. Public policies to promote community-level plantation forestry must address the need to add biomass in agricultural landscapes; this is needed to counter biomass loss from tree clearing for crops and livestock and associated depletion of soil fertility and water availability from increased run-off after tree removal, especially on slopes (GCEC 2014).

4.2 ECONOMIC RATIONALE FOR PLANTATION FORESTRY AND DASHED HOPES

A. DEMAND FOR WOOD IS GROWING RAPIDLY

Demand for wood products is rapidly growing globally, propelled by emerging and developing countries, especially for pulp in Asia, pulp and logs in Latin America, and charcoal and logs in Africa. One 2012 projection is for a tripling of demand by 2050, while a widely accepted forecast estimates increases of anywhere from 28 percent for sawn-wood to 192 percent for recycled paper products for pulp to 2060 (ISU 2015; WWF 2012; Elias and Boucher 2014). Soaring demand for agricultural products such as palm oil and rubber have added to pressures to clear tropical forests, especially in Southeast Asia (GCEC 2014).

In Mozambique, as elsewhere, newly deforested land primarily for pulp, timber, and charcoal is typically converted to agricultural use rather than left to slowly regenerate into forest (GCEC 2014). About 7.6 million ha of global forests are permanently converted each year to other uses.¹²⁵ This is even more the case where a primary motivation for clearing timber was gaining title to new land (IPCC 2014).

TABLE 4.1

Export tax rates for timber products

Tariff Reference	Product type	Tax (%)
4403	Raw wood (logs) even peeled, or roughly squared	20
4404	Sharp stakes not sawn	20
4407	Unaligned boards and planks (wood sawn or chipped lengthwise trump card or peeled, not planed or sanded with thickness greater than 6 mm)	15
4406	Sleepers (wooden sleepers for railways, tramways)	5
4409	Aligned boards, slats and parquet strips (wood shaped along any of its edges, ends or faces, planed or sanded)	5
4418	Bars, carpentry for construction work, excluding cell panels, floor panels and shingles (shingles and shakes)	3

Source: Mozambique, Assembleia da República. 2016

China has grown its timber trade with African countries significantly over the last decade and is now the largest external market for African timber exports. China absorbs 96 percent of Mozambique's timber exports, primarily as

¹²⁴ The United Nations Reducing Emissions from Deforestation and forest Degradation Plus (REDD+) program set up in 2005 originally only steered donor finance to national efforts to prevent degradation of natural forest in an effort to avoid release of carbon sequestered by the trees being harvested. It was only in 2009 that external funding became available to support planted forests as a means of increasing national efforts to proactively sequester carbon through new tree planting.

¹²⁵ Calculated from FAO 2016; this is the estimated annual average for 2010–2015. Reforestation and afforestation averaging 4.3 million ha per year reduce the net loss to 3.3 million ha per year, but old-growth and new forests are not ecologically equivalent.

unprocessed or barely processed logs, for which profit margins are higher than for processed timber products. While a ban on log exports is in place, Table 4.1 shows that timber products with minimal processing can still be exported from Mozambique at low tax rates. Peeling or rough squaring of logs is sufficient to avoid the ban on exports of logs (World Bank 2020a).

The GOM has attempted to encourage primary timber processing through fiscal incentives. Investors who can prove that timber harvested from natural forests has been processed in-country benefit from a 40 percent fee exemption during the annual export permit request (*diploma ministerial* 52/2003). This fee progressively decreases with the increasing level of domestic processing (*Lei n° 14/2016 de 30 de Dezembro de 2016*). Furthermore, forest products from plantation forestry do not pay an export fee.

Yet 90 percent of total domestic wood production in Mozambique goes to domestic wood consumption, at around 414,000 cubic meters in 2012 (World Bank 2018). Wood consumption in urban centers in 2012 was estimated to be around 257,000 cubic meters of logs equivalent, while consumption of native wood species in rural areas was estimated to be at least 150,000 cubic meters. In 2013, Mozambique imported about US\$110 million of wooden furniture, construction materials, boxes, and pallets (Ibid.).

Mozambican market demand for value-added wood products with raw material typically supplied by plantation forestry—such as sawn-logs, construction beams produced in informal sector workshops, and chemically treated utility poles—is modest. However, demand for these products is projected to grow rapidly, especially for construction timber in the case of demand stemming from gas investment projects in Cabo Delgado and indeed from growth throughout the overall Mozambican economy. A recent Standard Bank study presents the potential impact of one of the main gas projects (designated Area 4) on the Mozambican economy (Standard Bank 2019).¹²⁶ Over the next 30 years (construction plus operation), the gas projects are projected to be associated with an increase in annual GDP between US\$15 to 18 billion, a magnitude of the same order as 2020 GDP. Of this increase, 60 percent is expected to come from non-gas related sectors, with the agriculture (14 percent) and trade and accommodation (13 percent) value chains seeing the greatest benefits (Ibid.).

Thus, the potential for indirect and induced job creation may be very large. Creation of indirect and induced jobs linked to extractive industries can be considerably larger than often-limited direct formal jobs. Assuming good progress in implementation, the Area 4 gas project (committed initially to a US\$ 3 billion local content target) may create only a limited number of direct jobs,¹²⁷ but potentially could help generate over 250,000 indirect and induced jobs,¹²⁸ of which about 99 percent would derive from economy-wide effects (64 percent) and supply chain contribution (35 percent) (Standard Bank 2019). Wood products, like many other intermediate goods, could potentially be sourced from Mozambican companies if the domestic industry can achieve required quantity and quality.

Over 80 percent of total wood product use in Mozambique, as in most African countries, consists of consumption of charcoal for cooking (World Bank 2016c, 2018). Even major cities like Maputo used charcoal for more than 80 percent of fuel needs as recently as 2015 (Luz et. al. 2015). Unlike other continents—where palm oil plantations, pulp wood plantations, and timber from natural forest are the presently the main drivers of deforestation—charcoal

¹²⁶ The Standard Bank study is not available to the public online, but has been widely discussed in the Mozambique LNG sector and has been summarized online by the Club of Mozambique, see Standard Bank (2019). “Area 4” is the official designation for a newer discovery off-shore from the far north of Mozambique, including ultra-deep waters. “Area 1” is the designation for the adjacent original find, also off-shore, but closer to land and mostly further to the north. Area 4 investment is forecast to range from US\$ 27 billion investment (low-capex scenario) to US\$ 32 billion investment (high-capex scenario); the Area 1 project has plans for US\$ 30 billion in investment.

¹²⁷ 5,000 local staff will be engaged to fill 3,600 full-time equivalent positions: skilled staff 30%, semi-skilled staff 40%, unskilled staff 30%

¹²⁸ This is in the high-capex scenario. Over 300,000 jobs in the low-capex scenario.

production is still the main cause of African forest degradation in volume terms due to lack of affordable alternative household fuels (GCEC 2014).

The charcoal value chain is very important for local communities in Mozambique. Ninety-five percent of the charcoal business is thought to be informal, and most producers do not have the required license. It is the most important product harvested from Mozambique's unmanaged natural, mostly "Miombo", forests. Miombo woodlands are typical of savannah uplands in southern Africa, one of several wood producing ecologies in the region. The average current price for a 50 kg bag of common charcoal varies between US\$2 per bag close to places where produced, to US\$3.50 in Beira, to US\$17.50 in Maputo. Producer revenue for a ton of charcoal depends on whether taxes and fees are paid and, relatedly, on whether the point of sale is along a forest road or in urban centers.

Charcoal production from general commercial biomass production from planted forests is not likely to be competitive with unregulated charcoal producers using wood from natural forests. However locally-produced charcoal could possibly add significant value to planted forest timber operations that generate significant wood by-products besides logs. The amount of wood residue that could be used for charcoal production after logging is estimated at 40 percent of tree mass (World Bank 2020a and background paper).

B. THE SUPPLY OF WOOD IS PRIMARILY FROM NATURAL FOREST AND IS NOT SUSTAINABLE

Mozambique has 32 million ha of natural forest, covering 40 percent of land area (MITADER, now part of MADER, reported in World Bank 2018a), and 78,000 ha of planted forest (World Bank 2020a). The predominant natural forest ecosystem is composed of Miombo woodlands, covering approximately two-thirds of the total forest area. Other forest ecosystem types include coastal forests in the south, afro-montane forests in central Mozambique, coastal dry forests in the north, and the second-largest mangrove area in Africa (World Bank 2018, World Bank 2020a). Despite extensive natural forest, Mozambique remains an importer of timber products for the domestic market, especially for construction and an expanding electricity transmission grid (World Bank 2018a).¹²⁹

Forests provide significant ecosystem services of both local and global value, but especially for agricultural production. These include, for example, climate and water regulation vital to plant needs, carbon sequestration and storage critical to soil nutrients, watershed protection and reduction of soil erosion (especially vital on hillsides), soil compaction and toxicity avoidance, and habitat provision for pollinators (IPCC 2014; GCEC 2014).

Mozambique's forests are being rapidly depleted. The country lost an average of 267,000 ha of forest every year from 2003 to 2013, representing a historically high deforestation rate of 0.79 percent. This led to release of about 46 million tons of CO₂ every year into the atmosphere, accounting for 69 percent of Mozambique's overall greenhouse gas (GHG) emissions (World Bank 2018). The Government registered a Nationally Determined Contribution to mitigation from all sectors of 23 million tons CO₂e from 2020 to 2030, and 53 million tons CO₂e from 2025 to 2030, as part of the United Nations (UN) Intergovernmental Panel on Climate Change (IPCC) 2015 process (Ibid.). Mozambique pledged to reduce deforestation by 40 percent in the UN Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD+) strategy for 2016-2030 (GOM 2016). Plantation forestry has always been at the center of public strategy both for reducing deforestation and replacing some ecosystem losses due to deforestation.

¹²⁹ The most recent figures available show that net imports amounted to roughly 70,000 mt in 2018. See https://wits.worldbank.org/CountryProfile/en/Country/MOZ/Year/2018/TradeFlow/Export/Partner/all/Product/44-49_Wood

C. HIGH HOPES FOR JOBS AND SUSTAINABILITY FROM LARGE-SCALE PLANTATION FORESTRY HAVE NOT BEEN FULFILLED

Mozambique's 2009 National Reforestation Strategy aimed to increase commercial forest plantation area to 1 million ha in 2030 from about 60,000 ha, primarily through large-scale corporate plantations (Mozambique MASA 2011; World Bank 2016c). Planned establishment of 1 million ha of forest plantation was estimated at the time to be able to create 250,000 permanent jobs, based on optimistic assumptions of 1 job created per 4 ha planted (Serzedelo de Almeida and Delgado 2019). The effort also represented an attempt to slow natural forest deforestation. Yet, as of late 2019, the estimated extent of planted forests in Mozambique is still only 78,000 ha, or about of one-quarter of 1 percent of estimated natural forest area (World Bank 2020a).

The 2009 optimism for job creation through large-scale plantation forestry would have been too high even if forest surface area had expanded as planned (World Bank 2016d). An international middle-income country benchmark of 1 worker per 20 ha planted is more realistic, compared to the 1 job FTE per 4 ha assumed in the 2009 projections; regional estimates where plantation forestry is more developed average 1 worker per 40 ha (ibid.). Attainment of the desired 1 million ha of large-scale commercial forestry in Mozambique would at best create 50,000 jobs at the 1 job to 20 ha rate.

The 2009 plan relied on a large-scale corporate plantation forestry model used in countries with very different land use rights, rural governance, and rural income levels compared to Mozambique. The large-scale commercial sector model of plantation forestry requires extensive, contiguous areas planted with large amounts of homogenous trees in terms of size and species. This demands heavy and expensive industrial and operational structures. Such large-scale models require socially accepted and enforceable land rights, a skilled labor force, low-cost and reliable transportation, a conducive and predictable business environment, and low capital cost. Subsequent sections in this work will show that more feasible models also need to integrate local communities and spread the benefits of plantation forestry to them. Community integration is key to both cutting unit costs and including non-market-mediated benefits, such as benefits to the ecosystem, into value calculations.

In any event, the Mozambique 2016 Ministry of Land, Environment and Rural Development (MITADER) REDD+ Strategy marked a significant change of approach in dealing with reforestation and afforestation. Compared with 2009, the 2016 strategy addressed some lessons learned with regard to large-scale commercial plantation forestry in inhabited landscapes, including addressing the agricultural production needs of local populations through a consultative approach (MITADER, 2016).

4.3 STAKEHOLDERS AND OUTCOMES FOR PLANTATION FORESTRY IN MOZAMBIQUE

Plantation forestry in Mozambique involves a complex network of stakeholders. The Government represents public stakeholders and the broader public interest. Traditionally, plantation forestry has been the domain of large, formal specialized firms, often including foreign investors. People in rural areas where plantation forestry either takes place or Government has designated for commercial plantation forestry are major stakeholders. Civil society organizations (CSOs) often represent affected communities, sometimes with support from external development partners. Increasingly recognizing the need for agreement with local communities, large firms themselves are devoting more resources to improving community relations through corporate social responsibility outreach.

A. PUBLIC STAKEHOLDERS

According to article 109 of the Mozambican Constitution, the State owns all land in the country and regulates concession of land use rights in exchange for a relatively low annual fee, which may appear attractive to forest investors (World Bank 2016d). The Land Law of 1997 establishes the right of use and benefit of land (Direito do Uso e Aproveitamento da Terra, or DUAT). The following 3 groups can obtain DUATs: individuals and communities that occupy land in accordance with their customary practices, Mozambican individuals using land in good faith for at least 10 years, and other groups or individuals. The first 2 groups have permanent rights (DUATs) that can be inherited but not sold. The law also stipulates that the absence of land title or registration does not prevent the use of land by its traditional occupants.

The Forestry and Wildlife Law of 1999 (10/99) and Law Regulations of 2002 (12/02) further define procedures for long-term access concessions and short-term licenses (for Mozambicans only) for exploitation of natural (not planted) forests. After the new administration took office in January 2020, it adopted a Five-Year Government Plan (Plano Quinquenal do Governo, PQG) 2020–2024. The new plan placed strong emphasis on rural development through promotion of productive activities, especially in central and northern provinces, and particularly in agriculture and forestry.

Reforms of the previous Ministries overseeing plantation and natural forestry were enacted and 2 new ministries were created: the Ministry of Agriculture and Rural Development (MADER), and the Ministry of Land and Environment. MADER's mandate includes promotion and coordination of the establishment and operation of forest plantations. MADER is divided into directorates, including the National Directorate of Agriculture and Silviculture (DNAS), responsible for promoting reforestation for commercial and industrial purposes. Under the Ministry of Land and Environment, the National Forest Directorate (DINAF) has the national mandate to manage forests outside protected areas and ensure licensing, management, protection, research, conservation, and monitoring of forest resources. It is also responsible for promoting local communities' participation in sustainable resource management. It also oversees all forest conservation areas in Mozambique.

B. LARGE-SCALE PRIVATE PLANTATION STAKEHOLDERS

Five commercial forestry companies, or umbrella investment operations, have accounted for the majority of large-scale commercial forest plantations in Mozambique since independence.¹³⁰

Industrias Florestais De Manica SARL (IFLOMA)—formerly a state-owned company and now a mixed public-private company with a major South African counterpart—is the oldest forest plantation company in Mozambique. IFLOMA has a contiguous block of about 69,000 ha through a DUAT in Sofala Province, and a 31,000 ha DUAT in Manica Province. About half of this land is suitable for planting, although much less is actually planted. The main products are sawn timber used for construction material, mainly for the Maputo market, treated poles for the local market, and a projected woodchips plant in Beira for paper fiber. IFLOMA has 595 permanent workers, and in Sofala it has 180 employees as seasonal workers, some of whom will be converted to permanent. Some of its technicians come from South Africa. Counting temps as permanent, this is equivalent to 66 ha planted land operated per worker, and 129 ha of DUAT per worker.

Moflor, a Mozambican company that belongs to Grupo Entrepasto, grows both native and exotic trees in Sofala and Manica. Moflor has a planted area of about 10 000 ha. It produces mainly for the domestic market (creosoted poles of various sizes - 6 to 18 m), and the main customers are large companies linked to electricity distribution and telecommunications. It opened an industrial wood processing unit in Dondo, where it produces railway sleepers and

¹³⁰ Company profiles were derived from interviews of company executives conducted by Leonor Serzedelo de Almeida in 2017 and reported in World Bank (2019a).

wood poles with higher quality and longer durability due to treatment with creosote. Processed exports to South Africa consist mainly of decking. Moflor has progressively abandoned its industrial forest plantations to focus more on processing native wood. The company has considerably shrunk its industrial output; in the past it produced 1.2 million railway sleepers per year as rail lines were built, compared to a current 20-30,000 for maintenance. Virtually all low-skilled workers are recruited in villages where the plantations and concessions are located. Several seasonal workers are recruited during the harvest season, depending on activities to be carried out. Moflor currently employs about FTE 200 workers, 85 percent of whom originate from local communities.

Three other big entities in plantation forestry began operations after the end of the civil war. In 2012, Niassa Investments had up to 60,000 ha of planted forests located in an area of 760,000 ha of concessional DUAT land. The planted forests and concession areas were divided among 13 identified plantation forestry operators (World Bank 2016c, 2016d). At the time, approximately 50 percent of the planted forests were in Niassa province. Plantation forestry operators in the Niassa region have gone through a phase of consolidation. In 2012, there were 7 operators but only 3 remain: Florestas de Niassa (recently purchased by Construa Build It); Green Resources (purchased Chikweti, Companhia Florestal Massangulo and Florestas de Planalto); and South African-managed Servir, which took over operations from New Forests.

Portucel Moçambique had plans as of 2017 to invest US\$3 billion in an integrated forestry, pulp, agribusiness, and green energy operation in Manica and Zambézia Provinces. Portucel Moçambique received DUAT land use rights totaling 356,000 ha; it intends to plant eucalyptus trees on approximately 220,000 ha to produce wood pulp for export. It developed a “mosaic” model that foresaw planting only two-thirds of the total area, reserving the remaining one-third for community use. However, the project experienced continued delays, and the company had to write off EUR 14.5 million from the anticipated value of its timber plantations in Mozambique. By 2017, Portucel Moçambique had planted 13,000 hectares, representing only 4 percent of its DUAT.

The Mozambique Tree Farming Group (MTF) and its plantation forestry operating subsidiary Investimento Florestal de Mozambique Lda. (IFM) were born out of South African interest to expand eucalyptus plantation farming operations in Mozambique. For economic viability, the company has specified the following pre-conditions: (a) a suitable dedicated site within an export harbor to facilitate stockpiling, processing, and dispatch of plantation timber (export would be in ship-loads of 25,000 tons plus, and the site had to be inside the harbor to reduce transport, handling, and security risks that could prevent loading on time); (b) access to sufficient timber land with production potential of 20 tons per hectare per annum or better; and (c) plantation areas not further away than 250 km from the harbor to reduce land transportation costs. MTF/IFM had planted 2,100 hectares spread over Sofala and Manica Provinces by the end of 2017. MTF/IFM employed 350 permanent personnel and 170 temporary workers in 2017.

Interviews of executives of these firms, conducted in 2017, help illustrate the challenges large-scale, commercial plantation forestry operations in Mozambique face (Serzedelo de Almeida and Delgado 2019). Problems cited included:

- Safe access to land assigned to companies by Government, given instances of attacks on company staff in those areas.
- Difficulties with local communities that felt insufficiently involved with the land use decision-making by Government underlying companies’ claims.
- Lack of skilled rural labor for forestry tasks.
- Low productivity and motivation of the rural work force.
- Lack of sufficient infrastructure for transporting products at reasonable cost.

All stakeholders identified complications in the relationship between large-scale commercial plantation forestry operators and local communities as a major obstacle to development of a sustainable forestry sector in Mozambique. Respondents felt that local community issues should be explicitly discussed by all stakeholders in the very early stages of a project at the time of seeking land rights through DUATs. Customary land tenure regimes in Mozambique vary by region, shaped by factors such as population density, kinship organization, livelihood strategy, local ecology, land quality, and historical experience (Norfolk and Tanner, 2007). Both customary and official systems define land rights with the same objectives of social, environmental, and economic sustainable development at the local and national level. Nevertheless, community involvement in land acquisition is weak, and conflicts between customary and official land rights are common, leading to disputes between communities and forestry operators (Centro Terra Viva, 2014; Monteiro et al., 2016). Better community integration into forestry plantation projects is clearly crucial to improve livelihoods, but also for the success and sustainability of forestry projects, especially large-scale or foreign-funded operations.

C. COMMUNITY-LEVEL PLANTATION FORESTRY STAKEHOLDERS

Agriculture employs most Mozambicans (70 percent in 2019), with the vast majority being small-scale operations with low productivity (World Bank 2019c). Soil fertility and biomass degradation of the productive landscape has been a growing problem due to soil mining, whereby farmers continue to use up soil nutrients on the same fields over years without replacing them through natural or synthetic fertilizers or nitrogen-fixing plants (Ibid.; World Bank 2018c). Efforts have been made to involve communities in land management, critical for the future of plantation forestry. The Iniciativa Terras Comunitárias (ICT), established in 2006, provides a good example of an effort to empower rural communities to lead development processes in relation to land. Funded by a group of donors, this initiative has shown that the registration and formal recording of land-use rights renders smallholder farmers and communities less vulnerable to losing their land. Fixing field boundaries (delimitation), combined with basic community land-use planning, helps to protect local rights and prepares communities to engage more effectively with external interests, such as potential forestry operators. On the other hand, clear and public land titles allow private investors to identify their counterparts without the risk of having multiple claims over the land following the start of operations.

The Government launched its “Terra Segura” program in 2015, which gives rural communities an opportunity to secure land rights through formal delimitation, with or without boundary markers. “Terra Segura” focuses on 3 main objectives: consolidate land administration and management systems, protect local community rights while promoting citizenship and sustainable development, and deliver information about community land rights and the rights of citizens with respect to land in general (MITADER, 2015). This program guarantees land rights by making them public—that is, recognized by the state—and protects land rights holders against third-party claims.

Initiatives such as the Malonda Foundation, created in 2005, resulted from a cooperation agreement between the Mozambican and Swedish Governments. The main role of the Foundation was to attract further foreign investment to Niassa to increase scale of operations. Five major forestry companies joined, which consolidated to 3 over time, creating 3,000 jobs, all earning more than the statutory minimum wage.

Civil society in Mozambique, as elsewhere, tends to be very sensitive to issues affecting poor persons’ access to land, and to date has taken a keen interest in the public and private sector initiatives. Three civil society organizations in particular stand out: UNAC (União Nacional de Camponeses), ORAM (Organização Rural de Ajuda Mutua), and Justiça Ambiental. They are actively engaged—often alongside development partners—in supporting community rights when dealing with large-scale corporate plantation forestry (see Matavel et. al. 2011; ORAM 2018).

The Centro Terra Viva (CTV) in Maputo aims to contribute to better public decisions with respect to environmental policies, strategies, and legislation through bringing to bear science and technology. It has an active knowledge

outreach program in environmental areas, including community forestry (CTV 2014). The mission of the Fundação Iniciativa para Terras Comunitárias' (ITC-F) is to strengthen organizational and management capacities of rural communities, delimit community land, sustainably use natural resources, and secure the full benefit for different social groups in partnership with other actors (ITCF no date).¹³¹

D. LARGE-SCALE PRIVATE SECTOR, COMMUNITY-LEVEL INITIATIVES RELEVANT TO PLANTATION FORESTRY

Recognizing the need to better involve communities, the large-scale private sector has launched a number of community initiatives relating to plantation forestry. The American Mozambique Leaf Tobacco Afforestation Program, an example of an investor-community partnership, is based on 3 pillars: (a) involving local communities and small-scale farmers in the planting of "live barns" to cure tobacco leaves (made of standing trees specifically planted and pruned for this purpose), (b) maintaining communal commercial forestry plots of firewood with a minimum 7-year harvest cycle following specific community forestry management training, and (c) managing regeneration forest (Miombo woodlands). It seeks to engage closely with communities and those involved in charcoal production or field clearing by fire to identify firewood areas used by farmers and to train them in indigenous woodlands management to ensure long-term sustainability.

Rift Valley Corporation is establishing another initiative through subsidiary Florestas de Niassa (now Construa Build It), and with financial support from the UK's Department for International Development's (DFID) Partnerships for Forests Fund. This Luatize Área de Gestão de Recursos Integrada (LAGRI) initiative in Lichinga, Niassa intends to create a managed, multiple land-use conservation area as a buffer between forest plantations and protected conservation forest areas. It also aims to integrate local communities into the project through:

- Preservation of large tracts of managed Miombo woodlands that maintain biodiversity and provide income to communities.
- Introduction of improved and sustainable agricultural methods to communities that will increase yields, reduce poverty, and improve food security.
- Implementation of a strategic plan to manage natural woodland, providing a sustainable source of fuel wood, building material, charcoal, and opportunities for small businesses through forest harvest and beekeeping.
- Generation of sustainable revenues for communities through sale of carbon units.
- Provision of employment and a range of wider economic prospects to resident communities through development of the plantation forestry industry.

These community-endorsed business interventions, as well as introduction of improved management models through land use zoning, aim to contribute to a vibrant and long-term economy in the Lichinga region. Ultimately, the initiative intends to help grow a sustainable regional economy and optimize benefits to communities within Niassa. If successful, this initiative could scale to other Mozambique regions.

In addition to the partnerships above, a number of more traditional, large-scale corporate social responsibility partnership initiatives between forest companies and communities exist. Examples in Mozambique are New Forest

¹³¹ ITCF has recently achieved considerable outreach through Mozambique media accounts related to community conflicts with large-scale commercial plantation forestry operators (Serzedelo de Almeida and Delgado 2019).

Company, Green Resources, and Portucel programs that support community health, housing, and schools, among other things (World Bank 2016e).

4.4 PRESENT AND POTENTIAL IMPACT OF PLANTATION FORESTRY ON JOBS

Assessing the number of jobs attributable to plantation forestry requires bringing together estimates from different parts of forest product value chains rarely considered together. Total jobs include both formal and informal employment, production-related employment, distinct timber and non-timber forest products jobs, and jobs further along value chains related to processing and marketing. It also requires converting a large amount of seasonal or part-time employment into full-time equivalents (FTE).

A. FORMAL SECTOR PRODUCTION-RELATED JOBS

Employment estimates for large-scale commercial plantation forestry can be derived from the estimate that the present planted area of large-scale commercial forest amounts to 78,000 ha (World Bank 2020a). Combined with a generous estimate of one FTE job per 20 ha based on our analysis, this translates to a maximum of 4,000 current FTE jobs in large-scale commercial plantation forestry in Mozambique. These waged jobs include planting, maintenance, harvest, and processing into boards and poles, which the large-scale commercial forestry stakeholders do in-house. This figure is not out of line with the FTE employment estimated by the 5 firms we have profiled.

Yet the realities of competition across countries would likely lower average labor/output ratios over time to closer to current regional norms for commercial plantation forestry of about 40 ha per FTE job.¹³² The typical worker in a forestry company in Mozambique is a local unskilled farmer with no previous work experience in forestry, causing high absenteeism and low productivity (Serzedelo de Almeida and Delgado 2019). Therefore, an increase of planted forestry areas would likely require a larger number of workers per ha than in countries with a stronger tradition of commercial plantation forestry, at least in the early stages. All in all, projecting 1,000,000 ha¹³³ of planted forest by 2030 from 78,000 ha presently implies the need for a 33 percent CAGR in planted area. This will not happen, and the 4,000 FTE jobs presently in the commercial plantation forest sector will also not expand at anything remotely close to this rate.

B. POST-HARVEST FORMAL AND INFORMAL JOBS BEYOND THE LARGE-SCALE COMMERCIAL SECTOR

Available hard data is not up to date, but there is reason to think that the informal sector is quite important in the Mozambican forestry sector. Approximately 6,850 formal and 189,000 informal small and medium enterprises traded in non-timber forest products (NTFP) in Mozambique in 2009, primarily products such as charcoal, firewood, honey, and handicrafts.¹³⁴ NTFP trade occurs primarily informally through family- or community-based initiatives, but is an important activity in terms of sustainable production of forest goods and income generation (World Bank 2018a). These jobs along the value chain pertain to all of forestry, not just plantation forestry. Growing plantations could support some of these downstream jobs. However, only waste products from plantation forestry, such as trimmed

¹³² A figure roughly supported by Negedea et al. (2015) in a study of employment in Ethiopia's 419,000 ha of planted forest when all casual labor is included. A survey of applicable ratios in other countries found 50 ha per job in large-scale commercial plantation forestry (World Bank 2016f). Similar norms in Asia and Latin America with larger plantations and more capital equipment might approach 60-80 ha per FTE.

¹³³ As noted above, the official (MITADER) estimate of the impact of 1,000,000 ha of planted forests by 2030 was that this would create 250,000 jobs.

¹³⁴ Nhancale, B. et al. (2009) cited in World Bank (2018a).

branches, could be used to make relatively low-value products, such as charcoal, where the highest share of current employment is in small-scale NTFP enterprises.

C. COMMUNITY-LEVEL PLANTATION FORESTRY INTEGRATED WITH AGRICULTURE

Smallholder agriculture is the main source of land use in Mozambique, and still represents the main livelihood for 70 percent of Mozambique's population (World Bank 2019c), both directly and indirectly. Mosaic forestry, reforested hilltops in agricultural areas, and reforested headwaters of watercourses provide agriculture with key ecosystem benefits such as water control, soil retention, wind breaks, pollination, and many other vital "services" that are diminishing in deforested agricultural areas. Thus, the true social benefits of community-based forestry are higher than the market-mediated benefits. However, the latter are still high enough to support the activity (GCEC 2014).

It seems likely that the best prospects for creating forestry jobs at scale in Mozambique—especially for the poor—lies in community forestry initiatives underpinned by corporate commercial forestry ventures. These community initiatives would need to integrate planted forests as a mosaic with agriculture. Like commercial smallholder agriculture in Mozambique, they would benefit from contractual arrangements with companies that expand commercial opportunities available to communities by reducing input costs and growing the market for plantation forestry products. Such schemes might be more beneficial to both community producers and commercial companies if integrated with larger commercial reforestation schemes in adjoining areas, especially in relation to topography (slope) and watercourse headlands (World Bank 2016f).

The symbiosis of the right kind of plantation forestry with agriculture, and consequently its delivery of real benefits to farming communities, is the likely driver of success at scale. Mozambique is currently behind more densely populated countries, such as Ethiopia and Malawi, in this area, but has the potential to scale up widely and quickly. Unlike agriculture, most community forestry costs are up front, and potentially require 7 to 8 years before realizing significant direct profits from harvested wood. Since many of the ecosystem benefits of growing trees and crops/livestock in close proximity are not market-mediated, this gives rise to market externalities where those who bear the cost of planting community forest are not necessarily the same people who reap the ecosystem benefits for proximate agriculture.

This implies the need for community-level institutions to govern productive landscapes and platforms that can coordinate the interests of different stakeholders, including the private sector (GCEC 2014, Delgado et al. 2015). The US\$47 million Mozambique Forest Investment Project (MozFIP) promotes integrated landscape management at the community level and strengthens the enabling conditions for sustainable forest management in Zambézia and Cabo Delgado Provinces. Eventual evaluation of this endeavor will provide both lessons and a proof of concept for scalability of the initiative.

4.5 NEEDS FOR IMPROVING THE GROWTH AND RESILIENCE OF JOBS IN PLANTATION FORESTRY VALUE CHAINS

A number of initiatives can lead to the creation of more and better jobs in plantation forestry and improve the overall sustainability of land use in Mozambique. Cutting the unit costs of production for timber compared to non-Mozambican competitors is essential for creating formal sector jobs in the large-scale commercial sector. Improving the governance of productive landscapes for greater resilience will be essential to poverty alleviation and resilience of rural livelihoods to climate change. Community-level plantation forestry operations carried out in coordination with village agriculture are key to advance these objectives. Scaling skills and mobilizing capital will require active private sector participation in both planning and collaborative implementation of community plantation forestry. Creation of a representative stakeholder platform for implementing a national strategy would further these goals. There is also

a need for stronger emphasis on developing the formal skills needed to create better jobs in plantation and other forms of forestry.

A. CUTTING COSTS FOR COMPETITIVENESS

Creating more and better jobs at scale in plantation forestry value chains involves improving the competitiveness of Mozambican plantation forestry compared to harvests from natural forest and imports. Both issues require cost cutting by plantation forest operators. However, it is especially difficult to compete against harvest of products grown without cost to the producer, as is often the case with illegal logging in natural forests. This relates to how the exploitation of natural forests is governed. Exploitation of hardwood species from natural forests in Mozambique exceeds the annual allowable cut, driven by illegal logging and other unsustainable practices. Illegal timber harvest and trade negatively affect the competitiveness of operators who comply with regulations.

The Government is providing incentives to conduct primary timber processing in country, by reducing the fees investors pay based on level of processing (Lei nº 14/2016 de 30 de Dezembro de 2016). Products derived from forests planted in Mozambique do not pay an export fee. While important to the future of plantation forestry in Mozambique—indeed to overall sustainability—full coverage of issues related to natural forest go beyond the scope of this work. We look, however, at how to improve the efficiency of Mozambican plantation forestry, including monetizing the value of non-market mediated [ecosystem] benefits from mosaic plantation forestry conducted in conjunction with village agriculture.

Comparative financial competitiveness of plantation forestry across zones and countries is determined by measurable relative biophysical growth conditions for trees (attainable yield per ha, per annum) and measurable financial costs, such as land costs per ha, per year; plantation establishment costs; administrative costs (including annual government, security, and Corporate Social Responsibility [CSR]); harvest costs, which involve multiple factors besides labor and machinery; and transport costs, typically to a free-on-board (f.o.b.) export point or domestic wholesale market (World Bank 2016d). Table 4.2 summarizes key comparative cost elements for Mozambique and comparator countries.

TABLE 4.2

Illustrative production costs for 1 m³ timber in Mozambique and comparator countries (circa 2014)

Cost item	Unit	Brazil	South Africa	Uganda	Mozambique
Labor (chain saw operator)	US\$/mo.	350	375	100	100
Land	US\$/ha/yr	120	100	40	30
Plantation establishment & maintenance	US\$/ha	1,650	1,600	2,100	2,000
Administrative	US\$/ha/yr	95	160	150	130
Harvesting cost	US\$/m ³	8	9.5	10.5	15
Harvest volume	m ³ /ha/yr	336	240	260	184
Accumulated cost 8-year rotation	US\$/ha	3,370	3,680	3,620	3,280
Unit Production Cost	US\$/m ³	10.03	15.33	13.92	17.83

Note: These unit costs are meant as illustrations for cross-country comparisons of eight-year Eucalyptus plantations; there is no time discounting and differences in transport costs to final market are not fully included. Harvest volume is mostly a result of biophysical factors (“mean annual increments” in forestry terms), but also the efficiency of the production system beyond these biophysical factors.

Source: World Bank (2016d); original data are from multiple sources, including UNIQUE databases and Castren et al. (2014)

As Table 4.2 indicates, comparatively inexpensive land and very inexpensive labor in Mozambique would seem to be positive factors for Mozambican competitiveness. The accumulated cost of producing a 1 ha rotation of eucalyptus in Mozambique might seem to compare favorably even to Brazil, if the notable omission of the difference in capital costs is ignored. However, much lower harvest volume per hectare on Mozambican plantations renders unit production expensive even compared to high-cost South Africa. Climate and soil factors primarily explain this lower harvest volume, but this could also be negatively affected by the quality of maintenance and low labor productivity of the operation. The main point here is that scaling and creating more and better-paying jobs in the Mozambican plantation forestry sector requires boosting labor productivity and getting buy-in from local communities.

B. STRENGTHENING RESILIENCE THROUGH LANDSCAPE-LEVEL LAND GOVERNANCE

Like agriculture, plantation forestry is negatively affected by drought and flooding, both of which occur regularly in Mozambique. Cyclone Idai in 2019 ravaged Sofala, Manica, and Zambézia Provinces in particular, the main areas for plantation forestry in Mozambique, and also important agricultural areas (Mozambique, United Nations, European Union, and World Bank. 2019). Over 1.5 million people were affected, nearly one-half million ha of fields were severely disrupted, water and electricity were badly interrupted, and damage to roads and bridges was severe, with quantifiable losses of US\$1.39 billion (Ibid.).

This cyclone and the smaller cyclone Kenneth in the same year are associated with the El Niño Southern Oscillation (ENSO), a naturally occurring weather pattern resulting when ocean temperatures in the Pacific Ocean near the equator vary from normal temperatures.¹³⁵ An ENSO event in 2015-16 was also associated with both drought and disastrous flooding in east and southern Africa. Changing weather patterns triggered by ENSO (El Niño, warming; la Niña, cooling) phases damage agriculture, forestry, and fisheries, causing floods and landslides, harming other climate and weather-sensitive sectors, and exacerbating food insecurity. The El Niño phenomenon typically occurs every 2 to 7 years.

Village-level plantation forestry can be a key component of boosting resilience of productive landscapes faced with these weather risks. Reforestation of slopes above agricultural fields and planting nitrogen-fixing varieties around and in crop fields and livestock pastures are critical to restoring the productivity of degraded agricultural landscapes (GCEC 2014; Lipper et al. 2018). Neighboring Malawi, for example, has had considerable recent success in this regard, including with an ambitious Youth Forest Restoration Program.¹³⁶

Since MITADER (the Mozambique Ministry now largely merged into MADER) efforts in 2014, GOM has promoted significant forest sector reforms. Although these mainly aim to fight degradation of natural forest, they are also important for plantation forestry development (World Bank 2018a). They include an effort to clarify land rights at the individual parcel and community levels. Public sector actions also target agroforestry growth and more sustainable charcoal production.

Ultimately, the objective of expanding plantation forestry at scale has to be part of the larger ongoing effort to prepare a National Land Use Plan, including a National Forest Policy, Strategy, and Law. Having a strong national Land Use Plan and credible national governance for both natural and planted forests will ease mobilization of concessionary support from development partners, facilitate CSR investments from forestry firms, and ease fiscal support from non-land parts of Government. Mozambique appears to be embarking in this direction. Finally, the process of defining scientifically accepted minimum criteria for the sustainable management of forest for legislative purposes and the

¹³⁵ Water temperature greater than 0.5 degrees Celsius above normal is an anomaly and this repeated for three months leads to the designation of an El Niño event. See: <http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/enso.shtml>

¹³⁶ Which was on track to reforest 50,000 ha in 2019; see <https://www.wri.org/blog/2018/12/malawi-putting-its-money-where-its-forests-are>

establishment of Forest Stewardship Council (FSC) directives is under way in Mozambique. This will allow for greater transparency in creating and applying forest management rules and will elevate quality standards for corporate forest operations and products.

C. IMPROVING ACCESS TO LAND FOR ALL THROUGH BETTER COMMUNITY INVOLVEMENT WITH THE PRIVATE SECTOR

Lack of clarity and transparency regarding land negotiations and land use has resulted in community conflicts and increased costs to plantation forestry operators, discouraging potential investors. The uneasy relationship between communities, plantation forestry operators, and government remains a major issue. More attention and resources need to be allocated to engage with communities from the very early stages of a plantation forestry project. This is essential to reducing the high likelihood of conflict. There is also a need to better address land access security and to improve the enabling business environment for forestry plantation operators.

Interventions to formalize legal land tenure for local communities are essential to better manage productive landscapes. This involves development of community land-based plans with local stakeholders, delimitation of different kinds of land and related rights, and strengthening community-based organizations that deal with land. It will eventually entail issuance of DUATs to community stakeholders and strengthening land registries to keep track of records and land administration more generally. These efforts will likely require improved geo-spatial and information handling technologies and tools.

Finding ways both to deliver and fund ecosystem “services” in integrated landscapes requires landscape-level institutions. In some parts of even the developing Americas, a single farm can include hill crests, riverine areas, headwaters, and downstream fields. In such cases, land use planning occurs within the farm. In Mozambique, community-level institutions (or larger) will be necessary to solve landscape-level problems.

D. BUILDING A STAKEHOLDER PLATFORM TO IMPROVE COHERENCE AND COMMUNICATION

Most corporate stakeholders interviewed in 2017 noted the absence of a representative association or body of forestry plantation operators in Mozambique (Serzedelo de Almeida and Delgado 2019). As in most countries with a plantation forestry sector, a body made up of forestry plantation operators could provide collective input to policy discussions, and help organize, advocate for, and represent the sector both nationally and internationally. It could also become a think tank on best practices, including community engagement and infrastructure development.

An independent, third-party organization could be endorsed by relevant stakeholders and be funded by companies to intermediate communications between forestry operators, communities, and government. Differences in the perception of facts and relative importance can hinder mutual understanding between communities and foreign plantation forestry operators. Both sides, plantation forestry operators and the community/employee/out-growers, will have to adapt and be flexible to create constructive dialogue related to integration of community members along the value chain.

Communications would include distribution of information to enhance awareness within communities of their rights and land values. Topics should include current and new activities and areas for communities, including activities and areas that might be more usefully ceded to investors and what the communities could realistically expect to gain. Other topics could include informational materials outlining the negative impact of practices such as slash-and-burn

agriculture on asset values—both market-mediated and eco-system-related—have on the community. Government development of spatial territorial plans with adequate community and private participation is an essential tool for sustainable management of the country's natural resources.

E. HARD PUSH ON IMPROVING THE SKILLS BASE THROUGH PARTNERSHIP AND COLLECTIVE ACTION

The immediate markets for community-based forest products in Mozambique mainly are hardwood timber for furniture, construction timber, transmission poles for utilities, and a large market for sustainable feedstock for charcoal. The private sector largely needs to provide the technical forestry, business, and other skills and inputs for commercial plantation forestry that do not exist in large quantity in Mozambican communities.

Mobile, company supported agroforestry schools in concession areas fall in the category of “doing well by doing good”. Mobility between remote areas and urban centers constrains job training, and displacing people from communities to training centers for long periods of time is costly and challenging for individuals. Mobile agroforestry schools mitigate lack of access to training in remote areas, while avoiding the heavy costs of placing training institutions throughout a vast country such as Mozambique. Sending instructors into communities also familiarizes trainers with community needs and concerns, providing important inputs into future programs.

A training needs analysis for large-scale forestry plantations was conducted in 2017 through interviews with several plantation forestry operators in Mozambique (Serzedelo de Almeida and Delgado 2019). The purpose was to better understand: (a) the process of integration of local community workers into commercial forestry plantation in Mozambique, (b) the amount of training plantation forestry operators need to integrate community members into their labor force, and c) the number of workers per hectare needed for each commercial forestry activity under Mozambican conditions.

The first step was to identify the most relevant plantation forestry activities in a standard commercial plantation. This was done through a data survey based on Best Forestry Practices (Direção de Serviços de Valorização Florestal, 2003) and Tree Planting Guidelines for Uganda (Jacovelli, 2018). Forty-nine distinct skill areas were identified as being needed in commercial plantation forestry production (Serzedelo de Almeida and Delgado 2019). A team of relevant academic and business stakeholders were interviewed to better understand issues related to filling different kinds of plantation forestry jobs in remote areas without a large-scale plantation forestry tradition (Ibid.). The interviews revealed 2 common practices: (a) preliminary selection done by community leaders, and (b) divide workers in different categories.

Based on the interviews with operators, most of the activities needed in a forestry plantation can be performed by community members without a technical or university degree, and literacy is not a decisive factor for employment for several activities (Ibid.). However, lack of skilled plantation workers raises plantation forestry operational costs. Given the difficulty remote communities face in accessing urban centers to attend formal training, most training needs should be provided on site, further boosting costs to operators (Ibid.). Interviews with commercial managers suggested that the number of forestry tasks that a subsistence farmer can perform increase to 22 after attending minimal formal training (Ibid.).

Other relevant survey findings include that commercial forestry plantations normally select workers within local communities. Community relations can be complex, and to avoid community conflict, community leaders make the preliminary selections. Hiring priorities of local male community leaders may run counter to the priorities of outsiders. Outsiders must be aware of, and sensitive to, local governance and community gender roles, including those related to how communities may view the appropriateness of male company representatives directly recruiting women in the community. It is good practice for companies to hire female extension staff to recruit female workers.

Respondents from large-scale companies stressed that training should be primarily driven by demand and focused on specific skills rather than the kind of general educational curriculum best covered in public schools. Most operators agree that even people with technical degrees require specialized forestry-related training beyond their regular degree work.

Finally, formal sector employers identified work ethic in terms of financial ambition and arriving for work reliably and on time as a particular problem in rural Mozambique compared to other countries in the region. Firm respondents identified very high levels of worker absenteeism of between 25 and 50 percent, in addition to lack of workforce skills (Ibid.). Therefore, plantation forestry operators tend to engage more workers than required to guarantee delivery of tasks. Training in soft skills could be explored as a way to address these problems.

Three typologies of workers are currently found in a forestry plantation: full-time, occasional, and subcontractor workers. The number of workers fluctuates a great deal, depending on the type of intervention and the rotation period. For small and medium plantations (<7,000 ha), the number of workers varies between 16 and 30 full time and up to 300 part-time. For bigger plantations (>7,000 ha), the number of workers is roughly 100 full-time and 2,500 part-time (Ibid.).

F. ADDRESSING FINANCING NEEDS

Forestry is by definition a user of multi-annual credit, which is difficult to access for rural Mozambicans. Facilitating private out-grower schemes through a public-sector grant scheme is a priority to build the sector and support self-reliance. Beyond infant-industry arguments, the positive externality benefits of replanting forests support the case for using public financing. Community-level grant schemes, however justified by underlying economics, require substantial investment in local self-governance institutions. Emergence of such institutions will be easier if they can also offer a degree of social income protection and agricultural benefits, in addition to dealing with forest issues. This suggests a large public-sector role, but also the need for financing from private sector partners. Matching concessional public sector grant resources can leverage private investment in community woodlots, other community-led plantation forestry, and commercial plantation forestry efforts with community out-growers.

Out-grower schemes provide an opportunity to form sustainable and inclusive partnerships between plantation forestry operators and communities. Initiatives such as the Mozambique Forestry Investment Program (MozFIP) involve rural cooperatives, local service providers, and entrepreneurs to support sustainable plantations for multiple purposes. Private out-grower schemes developed in the agriculture sector for commodities such as cotton, poultry, sugar, and others, offer lessons for plantation forestry.

Finally, Mozambique's REDD+ commitments to GHG mitigation through tree planting, and the monitorable nature of public-private partnerships (PPP) for community forestry, open the possibility of using carbon finance to augment returns from community-level plantation forestry (GCEC 2014). Such activities are off to a strong start in Latin America with the "20 X 20 Initiative". A country-led program devoted to mixed forest and agricultural land restoration, it uses the forest component as the driving technical tool for sequestering carbon to bring climate finance and ecosystem benefits to agriculture. Seventeen Latin American and Caribbean countries and 3 regional programs have committed to begin restoring more than 50 million hectares (or about 124 million acres, an area roughly the size of France) of degraded land by 2020. More than 40 technical organizations, and a coalition of impact investors and private funders investing US\$2.4 billion, are supporting the initiative.¹³⁷

¹³⁷ See <https://initiative20x20.org/> for information and a comprehensive list of projects underway. The African Forest Landscape Restoration Initiative (AFR100) is a country-led effort endorsed by the Africa Union Commission and patterned after the 20 X 20 Initiative to bring 100 million hectares of cleared land in Africa into full or partial forest restoration by 2030. However, it is not as well integrated with impact investing and is not as far along in implementation.

4.6 CONCLUSIONS

Five main conclusions emerge from the analysis presented in this chapter:

1. Rapid growth in forest product demand in Mozambique of about 3.8 percent per annum will continue for decades. Demand for timber products produced by commercial plantation forestry companies will likely increase with the massive foreign investments Mozambique will experience in the next 5 years, especially in the gas sector, and demand will likely continue to outstrip sustainable supply from domestic sources. Imports of timber products are likely to continue to grow from their current level of US\$110 million annually. Informal logging of natural forest for charcoal will continue to be the biggest domestic user of wood for the foreseeable future.
2. Hopes for job creation by commercial-scale plantation forestry to date have been misplaced, largely because the needs and desires of those already on the land have not been sufficiently engaged. Plantation forestry has traditionally been viewed mainly as a matter of replacing informal products from natural forests with more formal products made from large-scale commercial planted forests, increasing efficiency and sustainability while creating a large number of formal jobs. At present, commercial timber production and marketing are unlikely to account for much more than 4,000 FTE formal production jobs, and at most twice again that much in post-harvest processing (of wood as an input, not including construction or furniture-making) and marketing. The largest number of jobs, about 200,000, are in informal, non-timber forest product sectors, including charcoal, which are not based on planted wood, and often are not legal.
3. Despite low labor and land costs, formal sector Mozambican plantation forestry is not competitive with other regional suppliers for bulk products such as eucalyptus, and thus will require investment to overcome weaknesses.¹³⁸ Poor relationships with local communities, Mozambique's main barrier to formal plantation forestry sector growth, can be addressed through better involving communities in planning and by creating more skilled jobs. Economies of scale are achievable for companies who join together to address skills gaps, and the public sector plays a critical role in assigning property rights to smallholders.
4. The best hope for major improvements in number of jobs, livelihoods, and resilience comes from better integration of plantation forestry with smallholder agriculture, which accounts for the large majority of both the population and land use in Mozambique. "Climate smart" agriculture under Mozambican smallholder conditions first and foremost requires use of "mosaic" forestry in association with cropping, livestock, land use planning, effective governance, and community participation and buy-in. Paradoxically, the fate of smallholder agriculture in Mozambique depends significantly on what happens with community-level plantation forestry.¹³⁹

Low agricultural productivity growth for crops is in part due to the serious degradation of the productive landscape in which both crop farmers and plantation foresters in Mozambique work. Plantation forestry is one of the few tools for restoring degraded agricultural landscapes. Yet, the advantages of community forestry are almost never considered when accounting for investment returns, in part because they stem from hard-to-observe or attribute ecosystem services such as soil and water management, soil fertility, wind breaks, and pollination services. This agricultural added value from community foresters creates incentives to fairly compensate community foresters for their work beyond just the price for which they can sell their direct products. Success will require institutional solutions at the productive landscape level, since the ecosystem

¹³⁸ This abstracts from the export of high value items such as rosewood to Asian markets.

¹³⁹ In a former era, extension advice to farmers in developing countries was to remove all trees from fields to facilitate plowing, emulating the experience of the temperate world with mechanization. Thus, clearing land for agriculture, especially for raising cattle, was seen as incompatible with sustainable forestry. Yet, in the heat and rainfall of the tropics, open fields quickly lose soil fertility and structure in the absence of expensive fallowing and use of green manure, leading to degradation of the land. Presently, many developing countries advise their

benefits for farmers created by community foresters are largely non-monetized and are not fully capturable by those creating them. Institutional solutions will likely require local government action and funding from outside the local area.

5. The GOM recognized after 2009 that using forest planting in REDD+ strategies can open a means for public assistance to fund private plantation forestry efforts in productive smallholder-dominated landscapes. Such funding implicitly recognizes the non-monetized ecosystem benefits forests confer, and that they are vital to the continued viability of agriculture. Public policy favorable to community-level plantation forestry will also be necessary to overcome negative externalities generated by unregulated depletion of common forest assets from illegal logging. The latter harms both sustainable forestry and agricultural production. Policies to promote community forestry could involve subsidies to PPPs through matching grants, for example. There are also an increasing number of successful examples of using carbon finance mechanisms to help restore degraded agricultural landscapes; Mozambique should pay close attention to these opportunities.



5. MORE AND BETTER JOBS FROM CROPS AND TREES

The evidence and analysis developed in the 3 case studies suggest common themes for more and better jobs from crops and trees. They also generate a set of specific recommendations for policymakers that apply broadly to using the potential of agriculture and plantation forestry for growth more effectively.

5.1 IMPORTANCE OF THE CURRENT NUMBER OF JOBS IN AGRICULTURE LOOKING FORWARD

Many sources seem to assume that agriculture,¹⁴⁰ despite representing the main employment of 70 percent of Mozambicans, has little potential to contribute to further growth in national waged work and better jobs. However, more in-depth study of the cassava and cashew value chains shows this conclusion to be misleading. Cassava cultivation is arguably the main agricultural work activity in Mozambique—and one of the main sources of waged employment nationally—and cashew is also important. Chapter 2 estimated that there are presently approximately 300,000 FTE waged jobs in cassava production. A further 1.5 million persons are likely to be self-employed at least part time growing cassava. Further, cashew production is also a major employer, accounting for about 150,000 permanent waged jobs and 1.8 million seasonal waged jobs (Chapter 3). In addition, nearly 1 million self-employed can be added to cashew employment. Cashew processing and internal transport in 2017 provided roughly 17,500 waged industrial jobs and up to 140,000 other post-harvest jobs, mostly informal and seasonal.

Plantation forestry has been less important for employment. It has traditionally been viewed mainly as a matter of replacing informal products from natural forests with products harvested from large-scale, commercial planted forests, purportedly mitigating escalating deforestation. Despite the fact that plantation forestry is inevitably a land and capital-intensive industry, it was viewed as recently as a dozen years ago to have potential in Mozambique to be an important creator of formal sector private jobs. Chapter 4 shows that these hopes have been misplaced, both because of unrealistic assumptions about the labor intensity of large-scale commercial plantation forestry and because the needs and desires of those already on the land have not been sufficiently engaged. Chapter 4 estimated that timber production and marketing from planted trees are unlikely to account presently for much more than 4,000 FTE formal production jobs, and at most twice again that much in post-harvest processing (of wood as an input, not including construction or furniture-making) and marketing. The largest number of forestry-related jobs, about 200,000 of them, are in informal natural forest product sectors, including charcoal made from wood from natural forests. These jobs are often not legal.¹⁴¹

¹⁴⁰ Although plantation forestry is usually not considered to be part of agriculture, at least in forestry circles, the rest of this chapter will take “agriculture” as including plantation forestry, for brevity.

¹⁴¹ Noting that these figures do not include employment from large commercial logging of natural forests for timber.

Looking forward, there is no time to waste in the promotion of more and better jobs in agriculture, including the value chains we have studied. Chapter 1 showed that it was unrealistic to think that even one-third of new labor force entrants for the foreseeable future will be absorbed in sectors outside agriculture and food. The battle for better economic inclusion of new entrants to the rural labor force—and thus of the main part of the national labor force—is being lost. Solutions at sufficient scale must involve agriculture, both on and off farm. Agriculture is not a sufficient solution to promotion of more and better jobs, but in Mozambique it will be a necessary component for the foreseeable future. Farmers, traders, and processors ultimately share a common interest in being part of growing competitive value chains in an open economy. The commodity chapters argued that better competitiveness would require changes from business-as-usual under the best of circumstances. They showed however that growth is made much more difficult by several contextual factors: (a) climate change, (b) the likelihood that the macroeconomic effects of foreseen major developments in the oil and gas sector will depress relative incentives for agricultural production, and (c) by increasing competition and rising quality standards in markets for traditional Mozambican agricultural exports.

Despite the magnitude of the challenges, the 3 value chains studied offer significant pathways to creating more and better jobs. Besides its premier role in Mozambican food supply, cassava has realistic potential for major new value addition in processing for industrial uses based on demand trends. Realizing this potential will require public investment in boosting farm productivity and private investment in partnering with farmers, developing processing infrastructure, and developing export markets. The cashew sector is presently in a state of decline due to a variety of factors. Viable solutions all involve better coordination and cooperation across the whole value chain. Clear pathways exist for improving farm incentives for cashew that would improve the reliability and quality of raw material for Mozambican processors, necessary for them to operate in more diverse, rapidly growing, and more remunerative export markets. Plantation forestry was seen to face major hurdles in its industrial capital-intensive form and is unlikely in any event to provide direct job creation on par with the other 2 cases. However, when integrated into agricultural community management of productive landscapes, it can be a premier builder of resilience to climate change for agriculture, and thus livelihoods much more broadly, than those from plantation forestry alone.

The 3 key entry points for success in delivering the promise of more and better jobs across the 3 value chains studied are:

- (a) Boost agricultural productivity to reduce unit costs of production and make production systems more resilient to climate change.
- (b) Level the domestic market playing field through greater transparency and engage proactively with international trade problems through public-private concertation.
- (c) Build institutions to improve stakeholder concertation and information dissemination along whole value chains.

5.2 BOOSTING AGRICULTURAL PRODUCTIVITY AND RESILIENCE OF AGRICULTURAL LIVELIHOODS

The 3 commodity chapters all built a case that increases in average labor productivity are necessary to maintain growth in a sector where contextual factors such as climate change, world market distortions, and Dutch Disease will inevitably increase the ratio of agricultural unit costs compared to agricultural output prices. Unfortunately, we did not find evidence of strong agricultural labor productivity increases over recent years in any of the 3 value chains examined. Productivity growth for the selected value chains in Mozambique depends greatly on policies towards public goods—such as research, extension, and infrastructure—key to facilitating private supply response.

Relative land abundance in Mozambique might seem to offer potential for increasing labor productivity through land-extensive mechanization. However, as seen in the previous chapters, obtaining clear access to large tracts of contiguous land in Mozambique's communal and smallholder land systems has been problematic for private sector actors. In these smallholder systems, growth in average labor productivity requires yield growth per ha. Failing productivity growth from sustainable intensification, agricultural profits per worker at the farm level remain largely a matter of relative prices, both between outputs and inputs and among alternative crops. Long term, agricultural prices per unit will decline compared to unit costs.

Labor productivity in cassava and cashew in Mozambique is low compared to other countries in the region, and commercialization of these sub-sectors is largely still a work in progress. Input use is very low even compared to neighboring countries in the region. Publicly funded agriculture research and extension is modest in Mozambique at 0.25 percent of agricultural GDP (World Bank 2019e), about half the average in SSA as a whole and one-tenth the norm for OECD countries. Boosting productivity requires providing key public goods such as research and extension essential to the common good in a manner accessible to all, but here funding requires public action as no single private entity can capture the benefits. Examples include the need for investment in agricultural research, training for activity-specific skills, and transportation infrastructure. Systems are also needed to promote private goods, such as agricultural inputs and credit, whose benefits go directly to those that use them. Paradoxically, the chapters suggest that while public funding of public goods has been modest, public funding of private goods such as inputs has been more substantial.

Not surprisingly, Mozambique's average cassava yields are low relative to West Africa and are one-half to one-third of yields in Latin American or Asia. The spread of pests is a major factor for insufficient supply of raw cassava to processors, especially sweet varieties, and requires intensification of pest control measures. It is crucial to develop improved seed-root stem production and distribution systems for pest-resistant cassava varieties. To improve quality and yield, large cassava farms supplying processors need to control pests and diseases on their own farms, but can only succeed if pests and diseases are also controlled on the farms of their numerous smallholder neighbors. A network of field service providers near major smallholder farm growing zones is needed to deliver technical hub services, including technical assistance and capacity-building. Besides bolstering the cassava research capacity of IIAM, the GOM should work to encourage development of a private or public-private partnership (PPP) germplasm distribution system to facilitate distribution of new cassava varieties to farmers. Some work to improve planting material is under way, but much more is needed.

For cashew, also a smallholder activity, the key primary production challenge is to raise yields from the current low average of 3 kg/tree (only 60 percent of the norm for Mozambique conditions), which requires replacing aging trees with improved root stock, trimming trees regularly, and stepping up anti-fungal and anti-pest spraying. Germplasm research is also needed to boost productivity, but as seen in Chapter 3, efforts by INCAJU to introduce Brazilian dwarf varieties were not successful. Only private industries can provide inputs and nurseries for seedlings on a sustained basis. INCAJU has experimented at times with doing both functions directly, and more recently has directly contracted with private entities to do this work on their behalf with all input costs (not services) paid by the GOM, ostensibly financed by the proceeds from the export tax on RCN.

Furthermore, increasing agricultural productivity growth of any kind in Mozambique is becoming more difficult over time due to climate change. Climate change reduces the resilience of household incomes derived from natural resources such as land, water, and biomass. This resilience is already under threat from degrading agricultural land and water resources in the absence of farmer investment in soil and water management. This trend was aggravated when Mozambique suffered severe weather shocks associated with El Nino events in 2015/2016 and again in 2019/2020. Chapter 3 argued that the cashew crop, which is primarily grown in coastal areas, is especially vulnerable to weather events associated with climate change due to poor trimming of trees linked to poor producer incentives. Chapter 1 argued that cassava plays a special role in the resilience of household food supplies to weather events. Cassava's

tolerance to high temperatures and intra-seasonal drought leads to less volatile production over time in Mozambique compared with other starchy staples and provides flexibility in when it can be harvested.

Plantation forestry at the village level is one of the most important initiatives for addressing degradation of the natural resource base in smallholder areas and the declining resilience of Mozambique's agricultural systems to climate change. Commercial plantation forestry had long been at the center of public strategy for mitigating climate change through carbon sequestration, replacing some of the ecosystem benefits lost through deforestation. Yet, large industrial plantation forestry has not greatly expanded planting area in the last decade, and those areas that were planted were spatially separate from the main cropping areas, and thus the ecosystem benefits generated for cropping and livestock were minimal.

However, Chapter 4 built a case for scaling up existing efforts to promote small-scale community forestry in agricultural areas with significant community involvement in both production and benefits. This case depends largely on the importance of community forestry for the resilience of productive landscapes involving smallholder agriculture. Increased community forestry involving trees grown in "mosaic" methods with crops and pasture stabilize soil and water degradation for smallholder agriculture. Improving governance of productive landscapes will be essential to improving the resilience of rural Mozambicans to climate change risks. A rotation of seedlings in a community woodlot takes 8 years to start producing income from sales of wood, which raises difficult financing issues. We made the case that carrying out community-level plantation forestry in coordination with village agriculture is a key tool to advancing sustainability in a financially viable and scalable manner.

5.3 SUPPORTING COMPETITIVE MARKETS WHILE ENGAGING WITH THE TRADE ENVIRONMENT

This analysis shows that it is not possible to make agricultural policy in Mozambique without reference to developments in both regional and international markets. This was most obvious in the case of a traditional export crop such as cashew. Chapter 3 discussed the problems that have affected the Mozambican cashew sector in recent years. These most notably include the fact that Mozambique is a "price-taker" in all international agricultural markets, including markets for cashew. Under these conditions, enforcing an RCN export tax to boost processor profitability will reduce what intermediaries and farmers can earn from RCN by almost the same amount, to the point that incentives for investing in (or even maintaining) cashew production are unattractive. Yet on-farm investment in spraying and trimming is necessary to produce more and better RCN over the long term. Other ways to improve farm margins include improving processor efficiency for lower unit cost of processed kernel, increasing competition to reduce the comparatively high (vis-à-vis other countries in the region) margins of RCN middlemen between farms and processors, or reducing the export tax on RCN.

A different, but equally difficult, trade issue arises for domestic cashew processors: the industry is still over-reliant on a small number of large Asian outlets, especially India, and to a lesser extent Vietnam. These countries are cashew "price-makers" in the markets where Mozambique sells. Similar to the case of raw pigeon pea exports from Mozambique to India in 2017 alluded to in Chapter 1, prohibitive Indian barriers for the import of processed cashew kernel from Mozambique appeared suddenly in 2020. This was motivated by several factors: abundant Indian processing capacity seeking protection against imports of processed nuts, a bumper Indian domestic harvest of RCN, and many alternatives to Mozambique for Indian RCN imports.

While bilateral trade discussions with India mitigated this problem marginally for Mozambican processors in the short-term, it is not a viable solution to a structural problem. This was most recently illustrated by the impact of the Covid-19 pandemic on 2020 spot markets for cashew and many other ingredients of consumer discretionary items outside long-term contracts. The only longer-term solution for cashew is diversification to higher-priced and more

reliable—but quality and food-safety sensitive—OECD and other wealthy country markets on a long-term contractual basis. This will require substantially more on-farm investments and institutional support on necessary practices such as phyto-sanitary, organic, and fair trade certifications. Since processors in those higher-value markets tend to prefer contractual and vertically integrated procurement procedures with long-term suppliers, this also likely will require significant new public and private Mozambican institutional initiatives, including partnerships with foreign firms. Fortunately, global markets are growing rapidly on trend for high-quality and reliable supplies of raw cashew nuts and semi-processed kernels.

Similarly, the success of community forestry in Mozambique is not independent of the cost of imported wood products in the main urban Mozambican markets, and these imports are rising (Chapter 4). Most strikingly, even future development of cassava is affected by trade. Raw cassava is as close to a non-tradable good as there is in African agriculture, being low-value, bulky, and highly perishable once harvested. This view is supported by the low level of raw cassava trade from northern Mozambique to population centers in southern Mozambique, despite the persistence of much higher consumer prices in the south (Chapter 2). Yet, we argued that cassava has a bright future as a processed industrial starch and high-quality cassava flour, for which significant and rapidly growing regional and international export markets exist. Here, as in the other 2 chains studied, cooperation to improve the quality and reliability of raw material involving all actors along the chain is key to taking advantage of new market opportunities.

The arguments above suggest that business-as-usual likely will not work at scale for more and better jobs from value addition in the 3 chains studied. Thus, the Government needs to act to encourage private efforts given a lack of adequate alternatives on the jobs front. For all 3 value chains, private sector processors have sought protection through tariffs, local content mandates, or outright subsidies to specific activities or firms, purportedly to expand to a scale where self-sufficiency without subsidy is possible. Yet infant-industry arguments for protection or subsidy need to establish transparently that protection or subsidies encourage investment that boosts productivity and achieves economies of scale or scope, and that these industries will be self-supporting within a defined period. Credible monitoring of progress should be open to the public, and there must be Government recourse to remove protection or subsidies if they are not serving the purpose intended. Fiscal incentives need to have clear exit strategies that prevent implicit subsidies from being used for distributive purposes alone, without further efforts to increase efficiency. It must be clear that the forgone fiscal resources implicit in the incentive scheme are not taking fiscal resources away from the fundamental need to increase productivity and quality.

5.4 INSTITUTIONAL SUPPORT TO STAKEHOLDER CONCERTATION AND INFORMATION DISSEMINATION

Across commodities, the case studies show that the main issues facing the chains can only be solved by closer concertation across stakeholders along entire chains. Where the public role is likely to be high and stakeholder interests are diverse, such concertation might well be implemented through stakeholder “platforms”. These platforms could be involved in the elaboration, implementation, and monitoring of an evidence-based commodity “Master Plan” that envisages how public and private funding can be brought together to develop the chain for mutual benefit. In the cassava case from Nigeria discussed in Chapter 2, a plan of this type promoted measures such as support to contract farming systems and blending of HQCF in wheat flour. Regardless of the commodity focus, stakeholder platforms in Mozambique should include the main stakeholders for the commodity and its derivatives, and create a shared vision of goals and means to achieve them. It would require effective governance input from those asked to fund the Platform, primarily the private sector and Government.

Stakeholder commodity platforms could also serve as mechanisms to provide feedback on regulatory issues, such as food safety, legislation, standards, certification, and regulatory issues. They can serve as advocacy voices for specific production support measures and for production and distribution of improved germplasm, including to smallholders. They could facilitate information flows with other countries on research findings and analysis, preserve institutional

memory for matters affecting the Industry, and monitor developments affecting stakeholders in terms of international and regional prices and opportunities. It would also represent a contact point for interested investors and support the Mozambican industry through direct trade promotion and better trade information flow. Finally, platforms could provide a forum to discuss trade-offs between the interests of different stakeholders to minimize conflicts while maximizing synergies.

For cashew, for example, INCAJU has until recently served as the main Government intervention institution in the sector. INCAJU's role for the period 2017/2020 was to implement the activities previewed in the GOM-approved Cashew Master Plan. This included specific interventions to develop the value chain, such as contracting external agents to provide spraying services to farmers with inputs paid for by INCAJU and supplying limited amounts of improved germplasm. INCAJU's main task as a regulatory body has been to create a friendly environment to attract investments in the cashew sector, particularly in processing. Going forward, under a stakeholder platform model, INCAJU might serve primarily in a regulatory and policy-oriented role in a Cashew Platform that provides a focal point for producer and processor associations, public research and extension institutions, and private suppliers of cashew inputs, extension, and marketing services, including in international markets. INCAJU might also take over the role of institutional memory and knowledge repository and disseminator for the Platform, a role it already plays to some extent. This type of transition will require a shift of funding sources for INCAJU to originate from the entire cashew sector, not just from those farmers most affected by the RCN export tax, as was the case until recently.

For plantation forestry, a community-focused "Plantation Forestry Platform" could tap into the broad expertise of GOM agricultural, forestry and environmental agencies, the private forestry sector, CSOs, and the agricultural community to identify ways to scale-up sustainable community plantation forestry in agricultural areas and represent its interests to the rest of Government and funding sources. It could also provide a focal point for GOM and providers of carbon finance (such as REDD+) to dialog with private interests in community forestry and producer associations.

More broadly, this book has argued that multi-stakeholder approaches for the commodities investigated—and likely many others—involving small and large farms, communities, CSOs, the private sector and government can be transformative. This requires that participants within the value chains bring their distinct institutional capacities together to focus on improving agricultural productivity, quality, access to resources and markets, and resilience of agricultural livelihoods to climate. But time is running out; imminent events in the macroeconomy associated with oil and gas development likely will drive the national economy rapidly away from agriculture, while climate change worsens, and competitor countries are not standing still. Business as usual will not work, and failure to act implies that most of the population, which still lives in rural areas, will face uncertain, and at best, static livelihoods. Beyond the hardships involved, many will try to improve their prospects by migrating to urban jobs, of which there will be nowhere near enough to accommodate them, with many of the problems that rapid rural-to-urban migration implies.

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