

Scoping study on fruits and vegetables

Results from Burkina Faso

Caitlyn Carrico, Ernestine Okoko, Dieuwke C. Klaver



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Wereldwijd lijdt een op de drie mensen aan een of meer vormen van ondervoeding. De teams van de Bill & Melinda Gates Foundation die zich bezighouden met landbouw en voeding, in samenwerking met het Britse Department for International Development (FCDO), willen het potentieel van groente- en fruitketens onderzoeken om het aanbod van voedzame voedingsmiddelen te vergroten en te versterken, en om de lokale marktkansen voor meer inkomsten te vergroten, speciaal voor vrouwen. Dit rapport belicht de conclusies van een onderzoek in Burkina Faso en identificeert verschillende oorzaken en mogelijke interventies om de fruit- en groentesectoren te verbeteren en daarmee de consumptie te verhogen.

Currently, one in three of the world's population suffer from one or more forms of malnutrition. The Agricultural Development and Nutrition teams at the Bill & Melinda Gates Foundation, in collaboration with the UK's Department for International Development (FCDO), seek to investigate the potential of vegetable and fruit supply chains to increase the supply of and strengthen demand for nutritious foods, as well as increase local market opportunities for increased income, especially for women. This report highlights the conclusions from a study in Burkina Faso, and identifies several root causes, as well as opportunities for interventions to further develop the fruit and vegetable sectors, and with that enhance consumption.

Key words: fruit, vegetables, food system, nutrition, supply chains

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Preface

The world's population is expected to increase by 2 billion persons in the next 30 years, from 7.7 billion currently to 9.7 billion in 2050. In spite of progress made in the past decades, the number of people being undernourished is on the increase again. Globally, 462 million are underweight, while 1.9 billion adults are overweight or obese. This contrast highlights well one of the most prominent global challenges imposed on our food systems, which is: how to make available, accessible and affordable healthy food to all.

To meet the growing demand for food and improved nutrition, food production and its nutritional value need to be enhanced. Compounding this issue is the pressure that existing agricultural systems place on the environment. Although there is scope to bring new land under cultivation, for example in Africa and Latin America, this has the knock-on effect of damaging the climate, biodiversity, natural habitats and more generally the integrity of the Earth's environmental system. The challenge of achieving global food and nutrition security is underscored by Sustainable Development Goal (SDG) 2: 'End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.'

Fruits and vegetables play a key role in achieving the above-mentioned goals. This was acknowledged by the Bill and Melinda Gates Foundation (BMGF) and the Foreign, Commonwealth & Development Office (FCDO) which realized that more knowledge on the current state of fruit and vegetable consumption, trade, processing and production worldwide, and notably in low- and middle-income countries, is needed. For that purpose, Wageningen University & Research was contracted to conduct a global scoping study including deep dives into selected countries. After more than a year and a half of research, we are happy to present a number of research outputs that address comprehensively the state of art and main challenges associated with fruits and vegetables. The reports take us through all aspects of food systems in which fruits and vegetables play a role, from consumption to production, but also around the world, from Nigeria to Nepal. The study provides BMGF and FCDO with a clear set of recommendations as to priorities for philanthropical investments that have the goal of enhancing consumption of and economic benefits from fruits and vegetables.

Fruits and vegetables play a key role in meeting current and future food system challenges. With this research we know better where we are and what is needed to address these challenges. I hope our work contributes to setting in motion food system changes urgently needed.



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Summary

S.1 Background

The Agricultural Development and Nutrition teams at the Bill and Melinda Gates Foundation (BMGF), in collaboration with the UK Foreign, Commonwealth & Development Office (FCDO), seek to investigate the potential of vegetable and fruit supply chains to increase the supply of and strengthen demand for nutritious foods, as well as improve market opportunities for increased income, especially for women.

A global scoping study of the horticultural sector in West Africa, East Africa and South Asia was conducted. The Phase I study was based on available literature and secondary data and resulted in the identification of so-called leverage points for interventions in the food system to promote the production, trade and consumption of fruits and vegetables. To test the validity and feasibility of the identified leverage points in specific contexts, seven deep-dive country studies have been performed in seven countries: Bangladesh, Burkina Faso, Ethiopia, India, Nepal, Nigeria and Tanzania.

This country study provides a better understanding of current trends in the fruit and vegetable sector of Burkina Faso. As a result of this study, BMGF and FCDO intend to identify potential investment options for enhancing the sustainable and inclusive development of the fruit and vegetable sector. The goal of this country study is to understand what kind of investments can be made to accelerate systemic changes in the food system for healthier diets and provide more economic opportunities for women.

S.2 Method

We investigated key questions on fruits and vegetables identified during Phase I. To add scope and focus to the study we selected various fruit and vegetables (mango, papaya, amaranth, baobab and néré, cabbage). The crop selection is justified based on opportunities for 1) an uptake of consumption among poor and middle-class urban and rural consumers; 2) economic importance and income generation for farmers; 3) importance for nutrition; and, 4) empowerment opportunities for women. We used a mix of five focus group discussions (FGDs), various key informant interviews (KIIs) and literature to provide an answer to the key questions identified, allowing for in-depth information gathering as well as cross referencing and triangulation.

S.3 Key findings

We found that while there are several producer- and consumer-oriented programs in place by the government, these are not sufficiently effective. On the producer side, this often has to do with the cultural barriers and burdens women face, and which are especially prominent in rural areas, such as limited access to land and water. Producers also often lack equipment or make use of rudimentary equipment, increasing the difficulty of work and decreasing production efficiency. Even with equipment, effective technical methods are not always known or implemented, and there is limited access to advice and support. In addition, lack of access to quality inputs to production remains an important barrier to expansion. Inputs include a fresh and sufficient variety of seeds as well as fertilizer.

On the consumer side, consumer awareness campaigns are likewise not sufficiently effective, likely due to lower-income women's limited access to communication technologies and low levels of education and literacy. Consumer pricing campaigns are currently focused on cereals due to a concern for sufficient calories, but would benefit from including fruits and vegetables to redirect the focus to nutrition security and making fruits and vegetables accessible to the lowest income households.

Meanwhile, private investments, including certification programs, tend to be focused heavily on the export-oriented value chains, and therefore do not benefit fruit and vegetable production for local consumption. While certain informal agreements exist, such as wholesalers providing necessary capital to producers up-front, the lack of finance and access to a secure market for these products along with price fluctuations dissuade producers from entering. In addition, inadequate input utilization, especially pesticides, has also resulted in unsafe chemical residues on produce.

While trust plays a central role in many of the informal contracts and negotiations in the market, there is often a growing lack of trust on the consumer side. For example, there is a new segment of conscious consumers who are concerned not only with nutrition but also with accessing safe food products.

Despite the barriers that women face, there are women who are earning a good living from producing fruits and vegetables. This may happen for individual women as female entrepreneurs, though this requires the support of the husband and family. More typically, women are successful in collectives, through associations or cooperatives, allowing them to pool resources and jointly apply in order to access financing. Most women who earn an income avail of the autonomy to decide how to use it, hence increasing their bargaining power at the household level. Indications exist that women's agricultural and non-agricultural incomes have a stronger positive statistic association with household food diversity scores than household incomes obtained from cash crops. Women's prominent roles in the fruit and vegetable value chains includes their dominant presence in the transformation and processing of these products, as well as their dominant presence as retailers of these products.

1 Introduction

1.1 Background

The world population is projected to rise from 7.6 billion in 2017 to 9.8 billion by 2050, and to 11.2 billion by 2100 (UN, 2019). To meet the growing demand for food and improved nutrition, food production and its nutritional value need to be enhanced. Currently, a third of the world's population suffer from one or more forms of malnutrition. Diets play a key role in the malnutrition pandemic, meanwhile the dietary transformation observed in many countries, and specifically, low and middle-income countries, is moving in the wrong direction, with the intake of fat, sugar, salt and animal sourced food increasing (HLPE, 2017). The benefits of fruits and vegetables in preventing diet-related diseases are well established (GBD 2017 Diet Collaborators, 2019). Fruits and vegetables can therefore help to tackle the global malnutrition challenge. So far, most research and development efforts have been more focused on staple foods like cereals, than non-staple foods like fruits and vegetables. A scoping study on fruits and vegetables will help provide a better understanding of trends in the fruit and vegetable sector, and contribute to addressing the challenge of achieving global food security while procuring more economic opportunities for increased employment and income, particularly for women.

1.2 Objectives

This study investigates the current trends, bottlenecks and opportunities in the horticulture sector of Burkina Faso. It aims to contribute to improve efficiency in the horticultural sector and support healthy and sustainable food, while ensuring equitable inclusion of women through better access to market opportunities and empowerment. The Bill and Melinda Gates Foundation (BMGF) and UK's FCDO plan to utilize the findings of this study to identify potential investment areas that can enhance the sustainable and inclusive development of the horticulture sector in Burkina Faso. We also expect that policymakers in the country can use the findings to transform their respective food systems to provide healthier diets and more economic opportunities for women.

1.3 Approach

In Phase I, a general analysis of global and regional trends in the horticultural sector (fruits and vegetables) indicates that the current system of fruit and vegetable production in the seven intervention countries (Nigeria, Burkina Faso, Tanzania, Ethiopia, India, Bangladesh and Nepal) does not meet the needs of healthy diets. From extensive analysis of existing literature and official documents, a series of questions was developed to investigate during focus group discussions and individual interviews to be held in each country.

In this second phase of the scoping study we examine through exchanges organized around selected products, key issues emerging from Phase I in order to deepen knowledge of local horticultural value chains and to identify innovative business models, food and nutrient flows, and the essential investments needed to boost the development of the horticultural sector on a large scale.

In Burkina Faso, these exchanges were formed on products chosen based on different criteria including micronutrient content, the ability to generate and strengthen economic jobs for women, and the potential for food and entrepreneurial innovation. The selected products were mango, papaya, néré fruit (yellow pulp), baobab fruit (monkey bread), cabbage, amaranth (borombourou) and baobab leaves. The reasoning for this choice is described in Chapter 3, and these sectors are described in detail in Chapter 4.

We organized five focus group discussions according to the following themes:

- Non-Timber Forest Products Sector (baobab and néré)
- Fruit Trees Sector (mango and papaya)
- Vegetables Sector (cabbage and amaranth)
- Gender
- Policy

Each focus group included about 15 stakeholders, bringing together representatives from each link in the relevant value chain as well as from relevant NGOs and government ministries. For each of the three sector workshops, invited actors included those operating in the field of inputs, financing, chain promoters, producers, transporters, wholesalers, retailers and consumers. In the gender and policy workshops invited actors included those with expertise in the field of gender, a good knowledge of the fruit and vegetable sector, and a good understanding of the policies and regulations that govern the sector. Best efforts were made to ensure the optimum gender balance among the participants. Appendix 2. provides a list of all workshop participants.

To present the results of the study, we began with a general analysis of the fruit and vegetable sector. Next, we summarized our findings from our data collection, including statistical analysis, literature review, focus group discussions (FGDs), and one-on-one interviews with key informants (KIIs), in response to identified questions on the emerging issues of Phase I.

2 State of play

2.1 Country profile Burkina Faso

Burkina Faso is a French-speaking Sahelian country located in the heart of West Africa, covering an area of 274,200 km². With a Human Development Index (HDI) of 0.452 in 2019, it is classified as a 'weak human development' country.

The population increased from 11.9 million in 2000 to 20.5 million in 2019 according to the last population census. The average rate of population growth over the period was 3%. The population density in 2020 was 78.44 inhabitants per km². Burkina Faso has a relatively young population: 77.9% of the population is under the age of 35.

Figure 2.1 shows the average rainfall of Burkina Faso across regions. Overall, Burkina Faso has three broad climatic zones: the Sahelian zone, the Sudano-Sahelian zone and the Sudano-Guinean zone. The Sahelian zone is in the northern region of the country where rainfall is less than 600 mm per year. The Sudano-Sahelian zone is in the center of the country with between 600 and 900 mm of rain per year. The Sudano-Guinean zone occurs in the southern region of the country where rainfall is greater than 900 mm per year (FEWS NET, 2017).

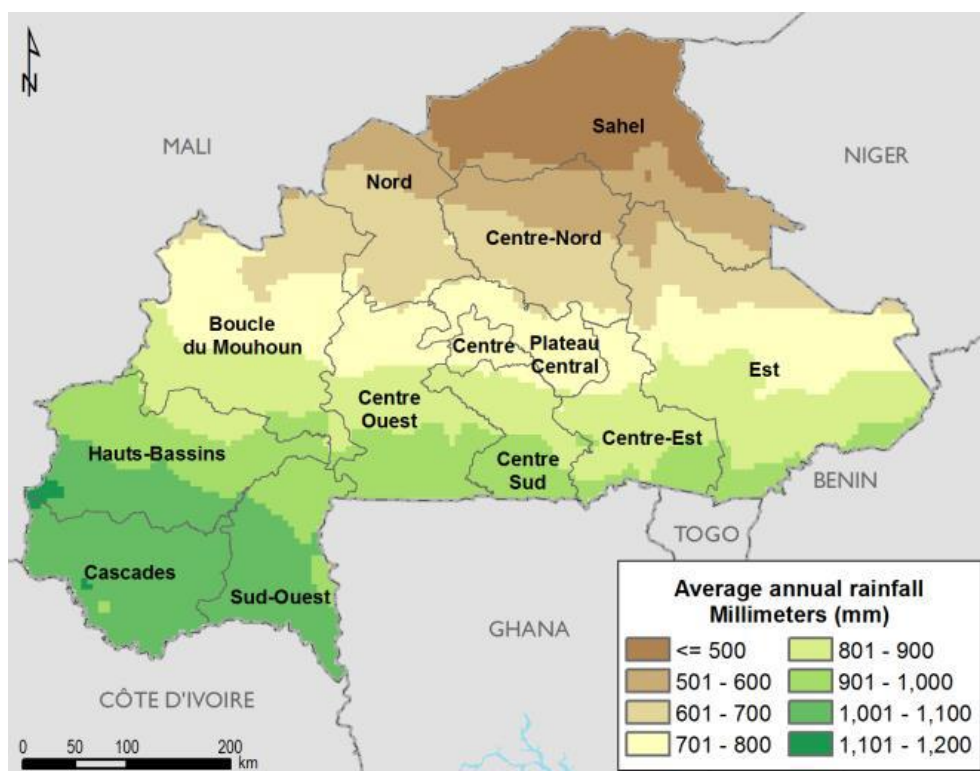


Figure 2.1 Average annual rainfall in Burkina Faso
Source: FEWS NET (2017).

Agriculture accounts for about 80% of the labor force and contributes 16-30% of gross domestic product (GDP). While it provides more than 60% of the cash income of agricultural households, the agriculture sector contributes significantly to national food security. As a result, its development is a priority for development policies and strategies.

To solve the problem of food insecurity in Burkina Faso, emphasis has been placed on the production and consumption of high-calorie foods such as carbohydrates at the expense of food diversity. However, the consumption of sufficient amounts of calories does not equate to the supply of nutrients necessary for the proper functioning of the body. In addition to acquiring sufficient calories, food diversity is necessary to obtain sufficient nutrients for a healthy and balanced diet (Remans et al., 2014). Food diversity, which is a measure of nutrient adequacy must therefore be integrated into analyses and taken into account in agricultural systems planning (Remans et al., 2014).

Adequate fruit and vegetable production can contribute strategically to food diversity and therefore the supply of nutrients essential to a healthy and nutritious diet at the population level. Undiversified diets can lead to malnutrition (Houndji et al., 2013; Lourme-Ruiz, 2016). Aware of the negative effects of malnutrition on the country’s socio-economic development, the Government of Burkina Faso reaffirmed its commitment to ensuring better nutritional security for the population through the adoption in 2020 of a new national multi-sectoral nutrition policy. The overall objective of the national multisectoral nutrition policy (PNMN) is to improve the nutritional status of the population, in particular women, children and vulnerable groups, through the implementation of multisectoral nutrition interventions. The interventions selected are those involving the following themes: (i) food security; (ii) health; (iii) water, hygiene and sanitation; (iv) education; (v) social protection, and all sectors that support nutrition (PNMN, 2020).

2.2 Overview and trends analysis for horticultural produce in Burkina Faso

2.2.1 The farming system

In this section, we review the agricultural farming system in Burkina Faso. We organize our discussion around the most basic representation of a horticultural value chain, as per Figure 2.2. Here, the value chain begins with the factors of production as inputs into production. Produce is either directly marketed or processed before marketing. Products are either sold to domestic consumers, exported to the regional market (the rest of West Africa), or exported to the rest of the world (with Europe being a major destination).

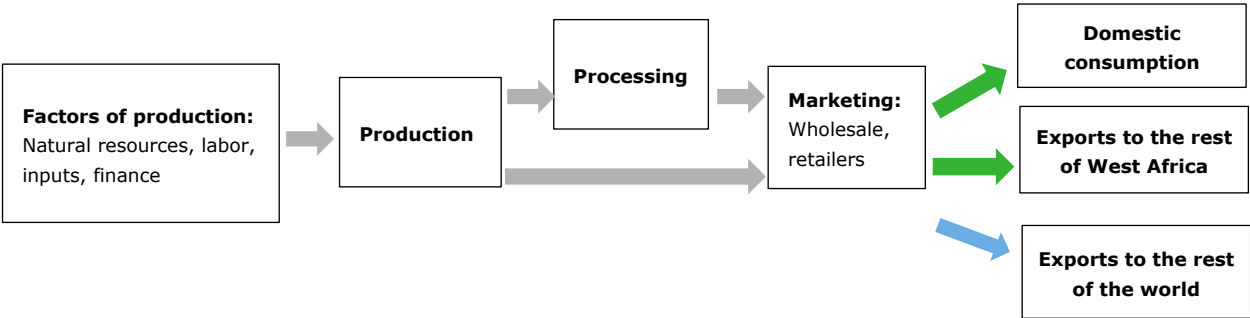


Figure 2.2 A simplified fruit and vegetable value chain
 Source: Authors’ compilation.

2.2.1.1 Natural resources: land and water

The most basic inputs into the production of fruits and vegetables are natural resources, namely land and water. Burkina Faso has a large potential of irrigable land reaching 233,500 ha, of which about 12-14% is currently exploited (AFC, 2015). There are 54,678 hectares of irrigated vegetable plots (DGESS, 2018), and 8% of the 142,500 hectares of fruit trees are irrigated (MAHR, 2011).

Irrigated vegetables include onions, tomatoes, cabbage and lettuce, which covered 75% of the 27,000 - 30,000 hectares in 2008 (WFP, 2017). Fruits and vegetables are also cultivated in 500 ha of lowlands where water collects into wells and reservoirs during the rainy season. Overall, the

production period of vegetables is largely dependent upon the availability of rain, which varies from 3-10 months between September and July (Gross, 2018; Ouédraogo et al., 2019).

Vegetable farming in Burkina Faso is practiced in its entirety over small plot areas. Nationwide, vegetable farming production areas comprise between 4,000 and 6,000 hectares, depending on the season. There are three types of vegetable farms:

- *Urban farms*, which are located within cities, either adjacent to rivers (such as vegetable plots located on both banks of the Houet in Bobo-Dioulasso) or downstream and around dams built inside cities (such as the vegetable farms located downstream of the Boulmiougou and Tanghin dams in Ouagadougou).
- *Peri-urban farms*, which are located in city suburbs around wells, boreholes, and dams, within a 30 km radius of cities. Near Ouagadougou, peri-urban farms exist in Saaba, Koubri, Loumbila and Boulbi. Barna is an important area for peri-urban farming near Bobo-Dioulasso as is the Goïnré region for the city of Ouahigouya.
- *Rural farms*, which are located in rural areas, often in proximity to dams and reservoirs. Rural farming areas include Guiédougou, Kongounsi, and Lake Dem.

For the most part, vegetable farmers' access to land is via property ownership (44.2%), temporary loan/transfer (48.9%), leasing (4.2%) and purchasing (2.7%) (MAHRH, 2007). Most peri-urban operators lease the plots. These figures represent the land rights as settled according to customary law, and not according to formal land policies and laws: In 2013, 5,753 land titles were officially registered and issued under the formal regulations, of which 74% were in Ouagadougou and 21% were in Bobo-Dioulasso.

Access to water is determined by the source used, the volume of water used, and the purpose for which it is used by producers. It also depends on the availability and sustainability of water resources.

Wells, boreholes, dams, rivers, and streams remain the main sources of water for vegetable production in Burkina Faso. However, the remoteness of plots from rivers, and the drying up of streams during periods of drought — which are becoming more and more prolonged due to the phenomenon of climate change — explain why access to water is so difficult. The technical levels of equipment used to extract water and to irrigate are relatively low. Only a few producers, particularly those organized in groups, can afford equipment such as motor pumps or pipeline infrastructure.

2.2.1.2 Agricultural labor

The majority of agricultural activities are organized and implemented by smallholder family farms which rely mainly on family labor rather than salaried labor (Toulmin et al., 2003). Therefore, family farming is the most important form of production in the rural economy (Zoundi et al., 2005).

While labor is relatively abundant in some areas, few people are trained in the latest cultivation techniques. This situation is exasperated by a mass exodus of young people to cities or mining sites which significantly reduces the labor force in other areas. Most permanent labor force used for vegetable production are household members in particular women and children. This is the case with 88% of vegetable producers interviewed in Region Centre and Centre Ouest (Gross, 2018). In gender terms this implies that women spend a lot of time on household vegetable garden, whereas they are in the same time trying to find revenues to pay vegetables and herbs for the daily meal. Together with household chores women spend 8-9 hours on these activities, leaving hardly any time to produce or market vegetable. The OECD (2018) concludes that women work on average 2.5 hours per day as unpaid labor force on the family plots (staples, cash crops, vegetables), delivering 80% of all labor in the production season. In the horticulture sector, external workers are sometimes contracted in peak production periods when household labor force is not sufficient (Gross, 2018).

The horticulture sector consists of approximately 400,000 mainly smallholders, of which 100,000 are female. The average age of these producers varies considerably from relatively young producers of 15 years to producers older than 40 (AFC, 2015; Kagambeca, 2016).

A number of well-known associations, cooperatives and federations of cooperatives exist for horticultural production (MAAH, 2019). There are sector-specific organizations for onions, mangoes and bananas. However, 68% of horticultural producers in Burkina Faso do not adhere to a member or producer organization. A similar pattern exists for processing. The majority (80%) of vegetable and fruit growers process their harvests by themselves, and only 20% of producers are members of an association or cooperative that has a drying unit (AFC, 2015).

As shown in Table 2.1 below, in 2018, there were an estimated 698,682 vegetable producers in Burkina Faso, of which 65% are estimated to be male (445,091 men) and 35% are estimated to be female (244,592 women) (MAAH/DGESS, 2018). The Centre Ouest region is home to the largest amount of vegetable producers.

Table 2.1 Breakdown of vegetable producers by region (2018)

Regions	Producers	%
Boucle du Mouhoun	97,815	14%
Hauts Bassins	55,895	8%
Centre Nord	97,815	14%
Nord	69,868	10%
Centre Sud	27,947	4%
Centre Ouest	132,750	19%
Plateau Central	20,960	3%
Centre Est	69,868	10%
Centre	34,934	5%
Cascades	34,934	5%
Est	20,960	3%
Sahel	20,960	3%
Sud Ouest	13,974	2%
Total	698,682	100%

Source: MAAH /DGESS (2019).

In the non-timber forest products (NTFP) sector, there is a strong presence of women (96.7%) in collection and transformation. As shown in Table 2.2, the majority of collectors and transformers (1,119,816) work in an association rather than work individually (71,230).

Table 2.2 NTFP Producers by region, gender and producer type

Region	Individual producer		Group or association		National	
	Total	Female	Total	Female	Total	Female
Centre	2,247	1,868	6,698	6,698	8,944	8,565
Centre Sud	3,919	5,500	12,261	12,154	16,180	17,654
Sahel	5,356	684	513	506	5,869	1,190
Boucle du Mouhoun	10,650	8,891	34,654	32,508	45,304	41,399
Est	1,941	6,535	68,499	59,982	70,441	66,517
Centre Est	9,370	6,491	2,969	2,930	12,339	9,421
Hauts Bassins	1,896	1,715	18,758	18,308	20,654	20,023
Cascades	10,915	4,493	1,965	1,679	12,879	6,172
Plateau Central	9,991	6,851	59,204	50,011	69,195	56,862
Centre Ouest	14,946	14,936	914,295	909,015	929,241	923,951
Total	71,230	57,963	1,119,816	1,093,790	1,191,046	1,151,753

Source: MEEVCC/DGEVCC 2018.

2.2.1.3 Inputs: fertilizers and pesticides

The majority of producers combine organic and mineral fertilization. The Direction Générale de la Prévision et des Statistiques Agricoles (Directorate-General of Projection Statistics, DGPSA) conducted surveys across all 13 regions of Burkina Faso on fertilizer usage. According to these survey results, in 2007, the volume of fertilizer used was estimated to be 6,411 tons, of which 65% was nitrogen, phosphorous, and potassium (NPK), 30.3% was urea and 4.8% was phosphate. Average fertilizer doses were reported to be 635 and 296 kg/ha for NPK and urea, respectively (ILLY et al., 2007). However, for organic manure, vegetable farmers were reported to apply doses of 2.7 t/ha — well below the recommended dose, which is a minimum of 10-20 t/ha (ILLY et al., 2007). However, the majority of fertilizers on the market are available to cotton producers, not fruit and vegetable producers. This includes products, credit, and extension services (AGRA, 2018).

Pesticides are widely available to fruit and vegetable producers but are grossly misused. A survey among 316 tomato growers on phytosanitary practices in 2015 and 2016 in the North and West zones of Burkina Faso showed that 90% of pesticides used are purchased in local markets without guarantee of conformity or quality. Many tomato growers use cotton pesticides and apply doses that are higher than those recommended. More than 70% of vegetable farmers do not observe any measure of adequate protection during pesticide use, from the preparation of the mixture until the end of the treatments. Rather than following recommended treatment plans, pesticide application is determined subjectively by aesthetic crop health. Empty containers of pesticides are left in fields by 53% of farmers. The misuse of pesticides evidently indicates risks for both human health and the environment (Son et al., 2017). Complicating the matter is that 67% vegetable farmers are non-literate and so written information on pesticide application is not accessible (MAAH/DGESS, 2019).

2.2.1.4 Production

As shown in Figure 2.3, the total horticultural production in Burkina Faso was reported to be 434 kt in 2019, of which 318 kt were reported for vegetables and 115 kt were reported for fruits. Fruit production grew by 26% over this period, and vegetable production increased by 21%.

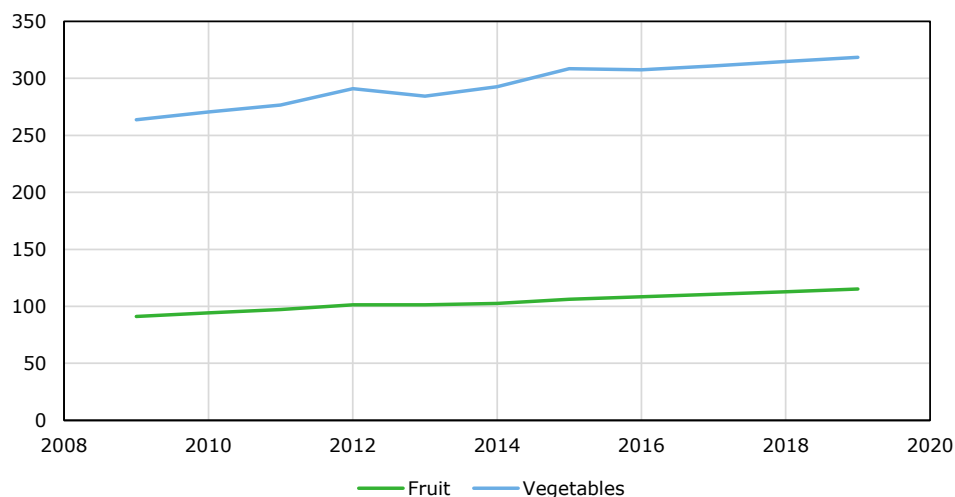


Figure 2.3 Fruit and Vegetable Production in Burkina Faso, kt
Source: FAOSTAT (accessed 2021).

Figure 2.4 shows the horticultural yields in Burkina Faso between 2009 and 2019. Horticultural yields increased by 8.6% for fruits and by 11% for vegetables during this period. In 2019, fruit yields were reported as 62,937 hg/ha and vegetable yields were reported as 97,792 hg/ha.

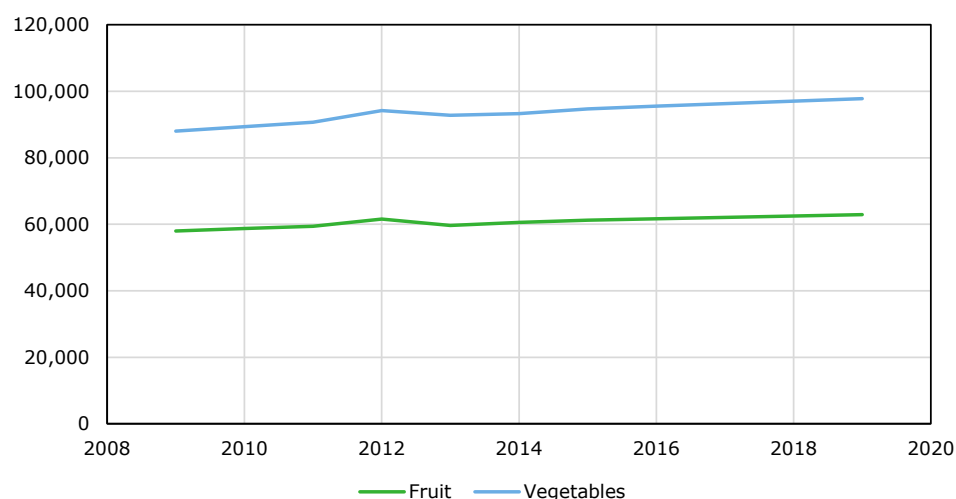


Figure 2.4 Fruit and Vegetable Yield in Burkina Faso, hg/ha
Source: FAOSTAT (accessed 2021).

2.2.1.5 Production areas

In this section we present the fruit and vegetable production areas for Burkina Faso. We begin with the historical fruit and vegetable trends, and then we consider specifically the geographic distribution of production areas for: (1) Fruit tree products, (2) non-timber forest products (NTFPs), and finally (3) vegetable products (vegetables).

Figure 2.5 shows the production area for aggregate categories of fruits and vegetables between 2009 and 2019. Overall, the production area of vegetables is greater than that for fruits. Both fruit and vegetable production area expanded moderately during this time, by 16.5% for fruit and 8.8% for vegetables.

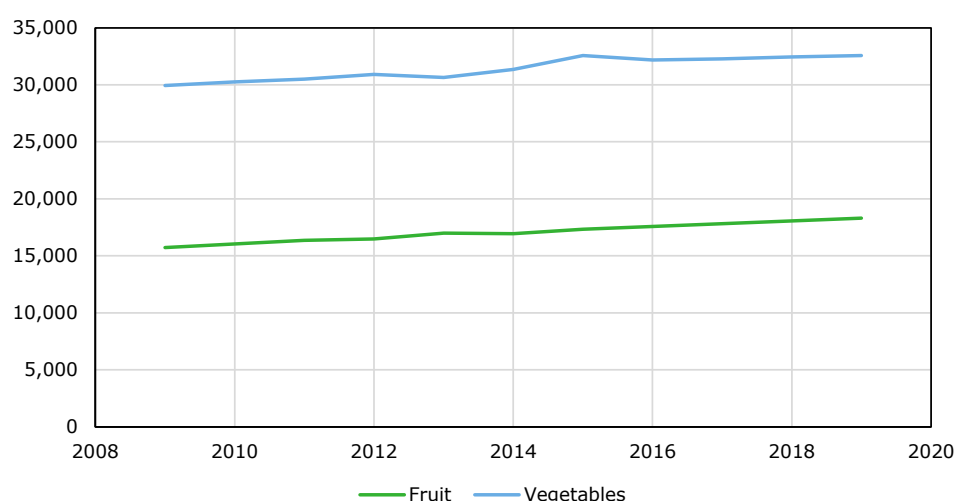


Figure 2.5 Fruit and Vegetable Production Area in Burkina Faso, ha
Source: FAOSTAT (accessed 2021).

2.2.1.6 Fruit tree products

In Burkina Faso, the production area for fruit is estimated to be about 142,500 ha nationally, as per Table 2.3 below. Cashew and mango species occupy 70.2% and 24.7% of this area respectively. While cashews are grown predominantly for their nut, the fruit (cashew apple) is also consumed. Other fruit species (citrus, banana, guava and papaya) occupy only 5.1% of the area (MAH/DGPER/DPSAA, 2011).

Table 2.3 Area division of fruit tree production

	Area (ha)	Percentage of total area
Citrus	5,651	4.0
Cashew	100,002	70.2
Banana	895	0.6
Guava	564	0.4
Mango	35,221	24.7
Papaya	167	0.1
TOTAL	142,500	100.0

Source: MAH/DGPER/DPSAA (2011).

Table 2.4 shows the ranking of regions by area of fruit production. The Hauts Bassins and Cascades are the most important regions in terms of area, accounting for 77.8% of the area of fruit planted in the country. The Sud Ouest region occupies 15.2% of the area, and all other regions account for 6.95% of the total area. Although the data has been collected over a decade ago, it still represents the major fruit production areas.

Table 2.4 Areas of fruit crops by region (2009)

Regions	Area (ha)	%	Rank	Summed proportion
Hauts Bassins	64,075	44.97	1st	77.82
Cascades	46,813	32.85	2nd	
Sud Ouest	21,712	15.24	3rd	15.24
Centre Ouest	4,882	3.43	4th	6.95
Boucle du Mouhoun	2,438	1.71	5th	
Centre Est	1,450	1.02	6th	
Centre Sud	1,128	0.79	7th	
Centre	Zones of Burkina Faso without fruit tree production			
Centre Nord				
Est				
Nord				
Plateau Central				
Sahel				
Total	142,498	100		100

Source: MAH/DGPER/DPSAA (2011).

Figure 2.6 shows Burkina Faso's geographical coverage of fruit tree products including production density. As this map shows, the most important production areas are located in the southwest regions of the country. At the province level, Kénédougou alone accounts for 31.6% of the fruit production area, and Comoé accounts for 22.8%. The Houet, Poni and Leraba provinces also account for a significant area of national fruit tree production at 13.3%, 11.2% and 10.1%, respectively.

Fruit production area - Burkina Faso

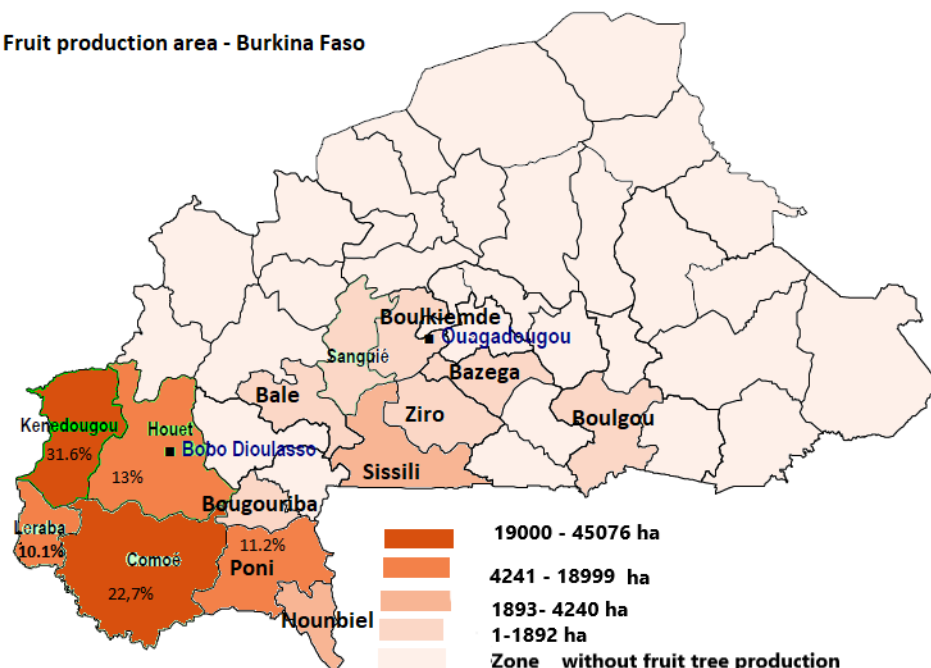


Figure 2.6 Fruit production areas of Burkina Faso (2009)

Source: MAH/DGPER/DPSAA (2011).

2.2.1.7 Non-timber forest products

In Burkina Faso, as in several countries in the sub-region of Africa, NTFPs make an important contribution to the food and nutrition security of the population. Approximately 70% of Burkina Faso's national territory, equating to 19,048,352 hectares, contains a wide variety of NTFPs (about 50 varieties). A 2016 study by the Ministry of the Environment collected information on various NTFP species selected for their socio-economic importance in people's lives. These species are summarized in Table 2.5 below.

Table 2.5 NTFP scientific and common names

#	Scientific name	Common name
1	Adansonia digitata	Baobab
2	Parkia biglobosa	Néré
3	Tamarindus indica	Tamarind
4	Acacia macrostachya	Zamneg
5	Balanites	Desert dates
6	Bombax costatumPelleg	Kapokier
7	Saba senegalensis	Lianes goine
8	Vitellaria paradoxa	Shea
9	Ziziphus mauritiana Lam	Jujuba

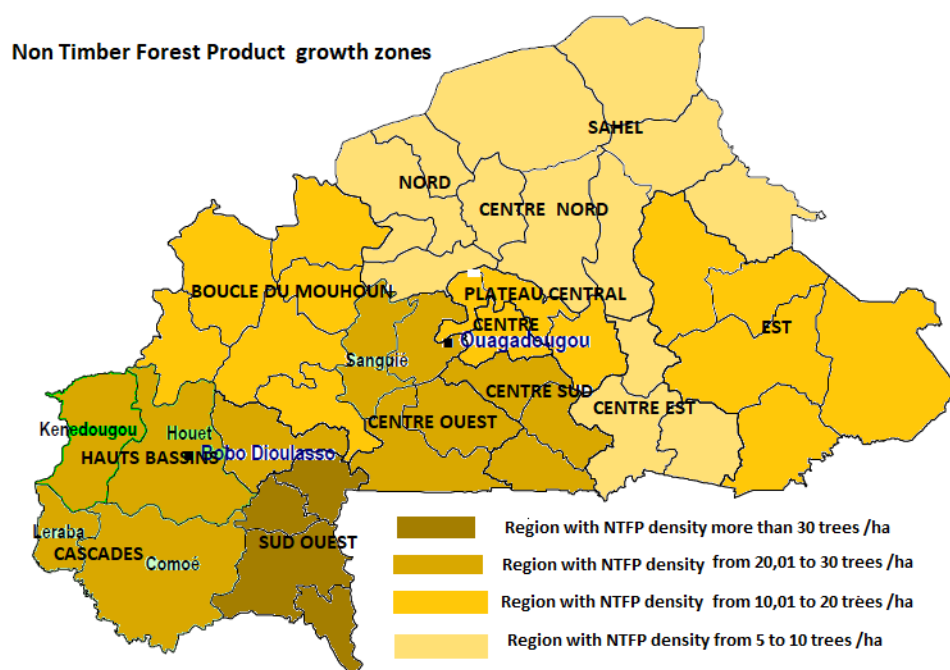
Table 2.6 presents the density of the different species of non-timber forest products according to region. In certain areas some NTFPs are more prominent, and in other areas many NTFPs do not grow. For example, shea is most prominent in the Centre Ouest region, with a density of 19.72 trees per ha but it does not grow at all in the Sahel region. In contrast, desert dates are the most prominent species in the Sahel region, growing at a density of 5.88 plants per ha, whereas in the Hauts Bassins and Cascades regions, the density is only 0.08 and 0.05 tree per ha, respectively.

Table 2.6 Regional NTFP species distribution (density: number of trees per ha)

Common name	Boucle du Mouhoun	Cascades	Centre	Centre Est	Centre Nord	Centre Ouest	Centre Sud	Est	Hauts Bassins	Nord	Plat Central	Sahel	Sud Ouest
Zamnegu	3.32	0.12	0.08	0.25	1.04	2.10	0.78	1.36	2.67	1.59	1.20	0.22	0.17
Baobab	0.05	0.04	0.00	0.11	0.15	0.03	0.15	0.15	0.07	0.16	0.05	0.06	0.04
Desert dates	2.15	0.05	1.41	2.65	3.18	0.89	3.23	3.07	0.08	2.29	4.01	5.88	0.59
Kapokier	0.57	0.67	0.55	0.20	0.06	0.47	0.47	0.42	0.65	0.16	0.35	0.00	0.62
Néré	0.52	2.20	0.31	0.30	0.03	1.19	0.76	0.05	2.09	0.07	0.11	0.00	3.84
Lianes goine	0.13	0.39	0.00	0.00	0.01	0.06	0.04	0.00	0.14	0.08	0.00	0.00	0.08
Tamarind	0.52	0.63	0.31	0.52	0.14	0.86	0.44	0.83	0.77	0.22	0.44	0.03	0.33
Shea	8.43	23.73	8.86	5.72	1.00	19.72	16.89	7.43	17.78	2.59	4.63	0.00	26.14
Jujuba	0.63	0.01	0.16	0.25	0.32	0.24	0.17	0.3	0.10	0.23	0.30	0.42	0.01
	16.32	27.84	11.68	10.00	5.93	25.56	22.93	13.31	24.35	7.39	11.09	6.61	31.82

Source: MAH/DGPER/DPSAA (2011).

From Table 2.7, we can also compare the relative total NTFP density between regions. Overall, the Sud Ouest region has the highest NTFP density of 31.82 plants per ha, of which shea is the majority species at 26.14 trees per ha. The Centre Nord region has the lowest NTFP density of 5.93 trees per ha, of which desert dates are the majority species at 3.18 trees per ha. The NTFP density is geographically presented in Figure 2.7. From this map, it can be generalized that geographically the southwest regions have higher densities than the northeast.

**Figure 2.7** NTFP growing areas of Burkina Faso

Source: MAH/DGPER/DPSAA (2011).

2.2.1.8 Vegetable products

Table 2.7 shows the vegetable production area by region. Vegetable production occurs in all 13 regions of Burkina Faso and has an estimated total area of 54,500 ha nationwide. The major production regions in terms of area are the Boucle du Mouhoun region (9,720 ha), the Hauts-Bassins region (7,763 ha), and the Centre Nord region (7,536 ha). Vegetable farming is least common in the

Sahel (563 ha) and the Sud-Ouest (475 ha) regions. The main national crops in terms of area occupied are bulb onion, tomato and cabbage.

Table 2.7 Ranking table of production regions by cultivated area (2018)

Regions	Area (ha)	Rank
Boucle du Mouhoun	9,720	1
Hauts Bassins	7,763	2
Centre Nord	7,536	3
Nord	5,904	4
Centre Sud	5,840	5
Centre Ouest	4,075	6
Plateau Cent	2,829	7
Centre Est	2,793	8
Centre	2,782	9
Cascades	2,600	10
Est	1,621	11
Sahel	563	12
Sud-Ouest	475	13
Total	54,501	

Source: MAAH/DGESS (2019).

Figure 2.8 shows the geographical distribution of vegetable production across the country. Generally, vegetable farming is more predominant in the west of the country than in the east.

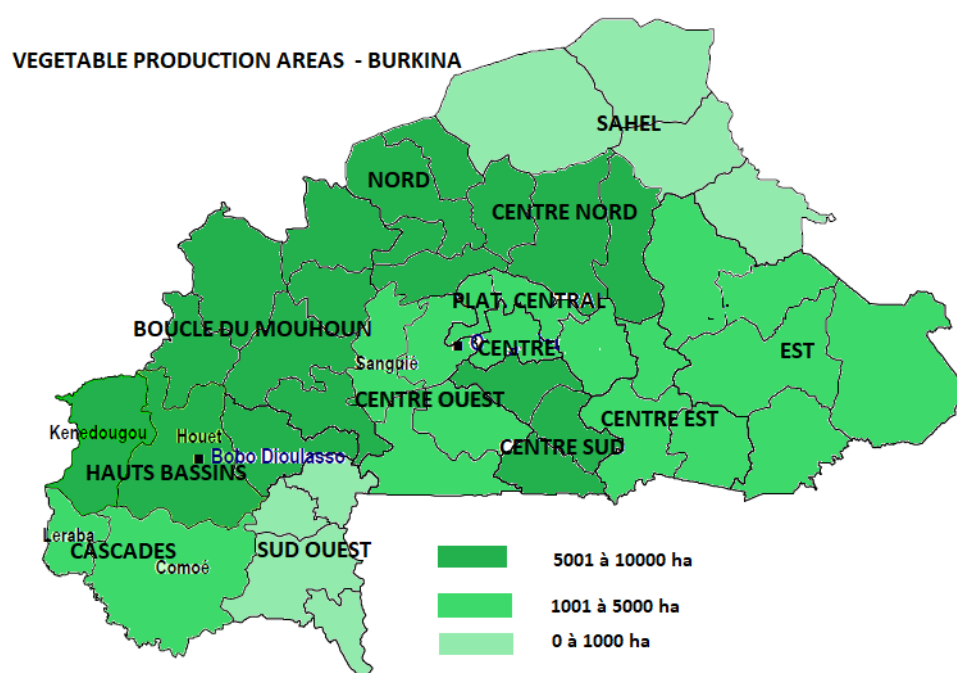


Figure 2.8 Burkina Faso's vegetable production areas (2018)

Source: MAAH/DGESS (2019).

2.2.2 The seed system

Burkina Faso is a leading country within West Africa in terms of seed system development. It has a seed policy and regulations in place as well as a functional seed committee, certification agency, updated national catalogue and active private sector association. Burkina Faso's public institute for agricultural research, the Institut de l'Environnement et de Recherches Agricoles (INERA), is tasked

with, among other things, increasing the general uptake of quality seeds throughout the country. In 2016, INERA designed a framework agreement on future public-private partnerships for producing initial classes of seeds.

The private seed sector faces multiple technical, infrastructural and financial challenges. There are 17 seed companies operating in Burkina Faso, of which two, Nafaso and NANKOSEM, are headquartered in the country. Partners NANKOSEM and Technisem are involved in breeding, testing and production through smallholders, and they also provide extension services for vegetable crops. Several national seed companies and cooperatives produce seeds from publicly-developed improved varieties, most of which from the region or popular local varieties. Only a few global vegetable seed companies are present.

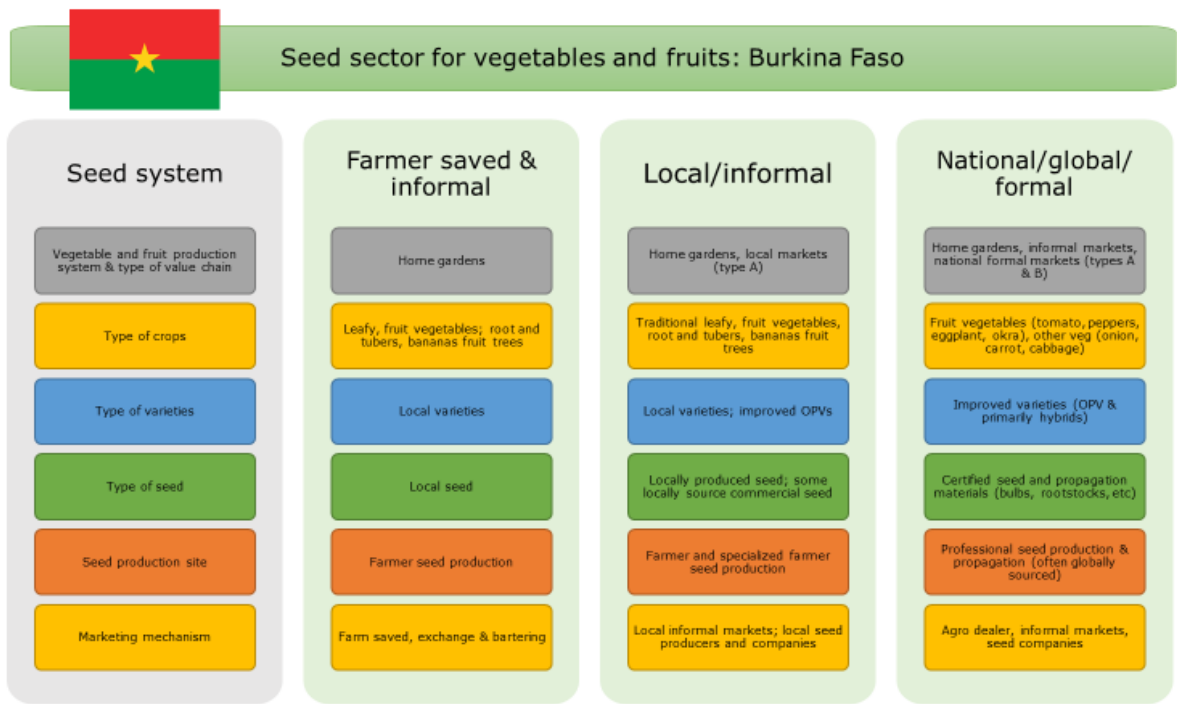


Figure 2.9 The Seed Sector for vegetables and fruits in Burkina Faso
Source: based on Louwaars et al. (2013).

The Burkinabé seed companies Nafaso and NANKOSEM have built a business around trading and distributing seed, but they have not invested in research and development (R&D) to develop their own locally-adapted varieties. Very little maize, rice or vegetable crops are bred for domestic markets. Much of the vegetable seed sold by local companies and traders is still imported from outside the country and continent.

Companies have demonstrated tailored approaches to smallholder customers by offering several hybrid and primarily open-pollinated varieties (OPVs) for vegetables. Adoption of hybrid seed still has a long way to go. A variety of promotion efforts have been made to illustrate the potential of hybrid varieties to farmers however smallholders continue to prefer OPV as they lend themselves to on-farm seed saving.

For commercially less attractive vegetable crops and basically all fruit trees, public agricultural research institutes are critical for varietal development and the seed supply chain. Moreover, public investment in the development of fruit and vegetable varieties is basically absent or only just beginning. For those vegetables and for all fruits, farmers continue to use local varieties and local and informal seed sources. A diversity of varieties, in cases adapted to specific locations and farmers’ and customer demands, remain dominant. In this manner, the formal commercial seed sector provides vegetable producers with quality seed of improved varieties for a small portion of the total

commercially vegetable market (tomato, onion, okra etc.), and the informal sector remains important for other vegetables, particularly African leafy vegetables, and fruits.

Farmers with home gardens or who are engaged in the informal marketing of fruits and vegetable use multiple seed sources. They may use farmer saved seed or planting material (fruit trees) from neighbors or informal markets or nurseries. For some vegetables, they may purchase small packs of seed from national companies. In such cases home garden farmers would opt for quality seed that may be OPV sourced from local cooperatives or agro-dealers. With a wide array of seed systems from farmer saved to national and initial global commercial seed systems, Burkina Faso's seed sector, particularly for vegetables, is in an emerging development phase for commercially more attractive vegetables. The seed sector depends predominantly on imported varieties for the major vegetables for which commercial seed systems are in their nascent development. The public sector is fragile and the role of informal seed systems remains important.

2.2.3 Exports

Horticultural exports in Burkina Faso rose between 2009 and 2019, particularly for fruit exports which grew 600% over this period to reach an export value of US\$23 million by 2019, as shown in Figure 2.10. Between 2009 and 2019, vegetable exports decreased by 55% to US\$743,672 in 2019; however, these are the recorded statistics and do not account for unrecorded trade. The jump in vegetable exports recorded in 2018 is linked to a jump in tomato exports to Ghana. The reasons for this increase are not documented.

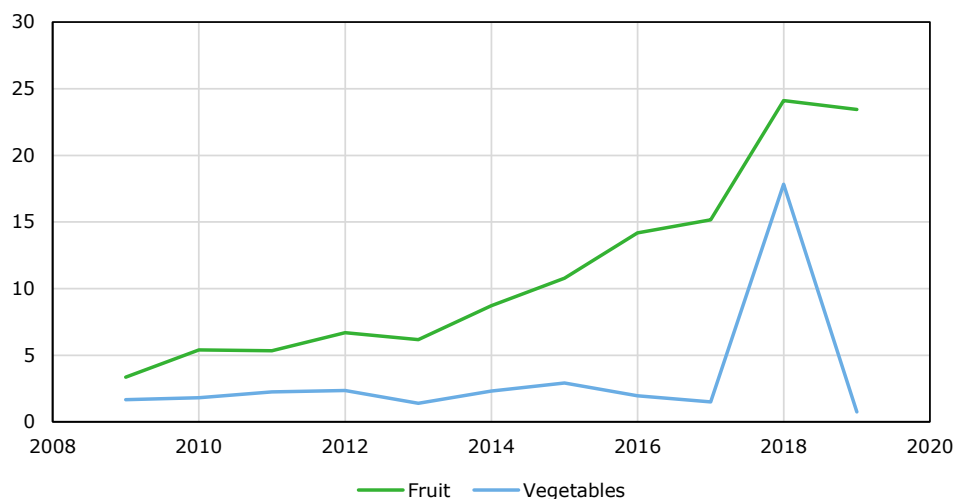


Figure 2.10 Fruit and vegetable exports from Burkina Faso, million US\$

Note: selected relevant HS4 categories in Chapters 7 (vegetables) and 8 (fruits): 0702, 0703, 0704, 0705, 0706, 0707, 0709, 0803, 0804, 0805, 0806, 0807, 0808, 0809, 0810.

Source: COMTRADE (accessed 2021).

The regional West African market provides a strong consumption base for vegetables, and Burkina Faso is the second biggest exporter of onion in West Africa after Niger. Burkina Faso's largest regional export partners are Côte d'Ivoire (58%), Niger (16%), Ghana (13%), and Togo (11%) (AFC, 2015). In terms of extra-regional trade, Burkina Faso is a major mango exporter to Europe.

Figures 2.11 and 2.12 show vegetable and fruit exports between 2015 and 2019, respectively, in terms of t exported by product. Figure 2.11 shows that the largest exported vegetable by quantity is onions (25,500 t), followed by tomatoes (4,400 t). Figure 2.12 shows that mangoes are the largest exported fruit by quantity (10,200 t) in 2019.

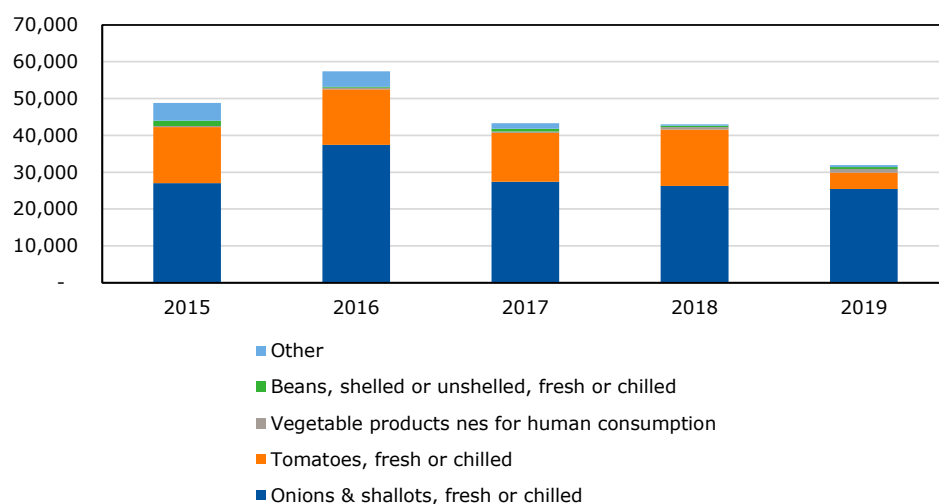


Figure 2.11 Vegetable exports in t
Source: FAOSTAT (accessed 2021).

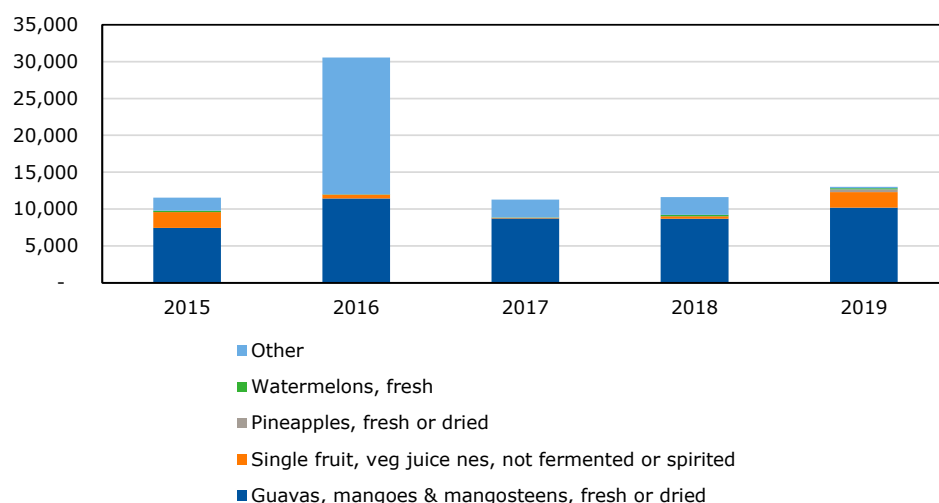


Figure 2.12 Fruit exports in t
Source: FAOSTAT (accessed 2021).

2.2.4 Gender issues

Understanding gender relations and cultural backgrounds at the household level and in the fruit and vegetable value chains helps to understand part of the financial and economic functioning of these value chains and consumption patterns.

Roles and responsibilities in rural households and agricultural production

Women, girls and in particular daughters-in-law in three generation households are responsible for household chores and taking care of children and other family members. These chores also include procuring and producing the vegetables, herbs and fruits necessary to prepare the sauce, soup or stew. Most women obtain a small home garden from their husband to grow vegetables and harvest NTFPs (except for bushmeat and honey), part of which they sell at local markets to pay for other ingredients needed. The sauce, soup or stew accompanies the staple foods brought in by their husbands. Male heads of households, apart from producing staple foods, earn incomes from cash crops such as cotton, rice (where appropriate) and fruits and vegetables (Gross, 2018; WFP, 2017).

Women who have daughters-in-law to take care of household chores and family care have more room to maneuver to undertake income generating activities.

The following table presents gender disparity statistics in Burkina Faso. Gender disparities differ considerably between the different regions, cultural backgrounds, education levels and between rural and urban areas.

Table 2.8 Gender disparity statistics

	Women/girls	Men/boys
Hours spent on household chores and taking care of family members in rural areas	6.5 hours a day for women 4 hours a day for girls	1 hour per day 4 hours a week
Time spent as labor force on the household fields managed by male heads of households or household enterprise	2.5 hours a day (in the production season), delivering 80% of labor force needed	
Paid labor for agricultural activities	38% of women	82% of men
Financial autonomy	90% of women decide upon their own income* 61% of women may decide about their own income ** In 14% of households, the husband decides on expenditure made with women's income.	In 50% of households, decisions about daily expenditure are taken by men alone
Investment of revenue back into the family and community ***	90% of revenue	30-40% of revenue
Access and control over land (figures represent access and control according to customary law and not according to judicial law)	40% of women say they are landowners, but only 14% can sell land.	32% of men can sell land
Size of parcel given by husbands to women	Generally speaking, some 0.1 ha, however women want to have 0.5 ha	
Access to lowlands (bas-fonds) and irrigable land***	8% of those surfaces ready for production	92% of surface
Access to formal finance	20% can use land title as collateral to obtain a loan	40% can use land title as collateral to obtain a loan
Having a bank account	10%	20%

Sources: OECD, 2018; * Thiombiano (2014); ** Da (2017); *** Souratie et al. (2019).

Behind the figures

Burkina Faso avails of a land tenure policy, rules and regulations that provide equal opportunities to men and women to own land and to inherit it. However, until now, the country has faced considerable institutional difficulties to enforce these policies and regulations, implying that land governance of rural land is instead regulated according to customary laws and traditional chiefdoms. Under these laws, women cannot possess land, nor plant trees — inhibiting fruit trees — to claim land ownership. Traditionally women depend upon their husband for the allocation of a small vegetable garden. Organized in an association, they can obtain collective land access to develop economic activities and occasionally manage to reach a certain level of economies of scale to find promising markets.

Men exert quite some influence on how women use the rest of the time they have each day. Some examples of this are the following:

A development project supported women from poor to very poor households to produce cabbage and onion. Instead of cultivating these in two turns, which was possible through water retention, the women could only complete one production cycle, because their husbands wanted them to work on the household plot: « *l'homme ne te laissera jamais aller faire autre chose tant qu'il y'a des travaux au champ* » productrice de Sourou (Da, 2017)

Women who have the opportunity to earn a daily income higher than the wages paid to agricultural workers on the household field, have started to pay for these workers and continued their own

activities in a mango drying enterprise for export to the EU. They earned 1,000 West African CFA Franc (CFA) per day (US\$1.82) — about the formal minimum wage — and paid the agricultural worker CFA500 (US\$0.91) (Parrot, 2017).

Based on the above figures, the OECD (2018) concludes that due to the unequal access and control of female agricultural production and related revenues, Burkina Faso misses an opportunity to increase agricultural production in its Gross Domestic Product (GDP) from 15 to 20%.

Women's role in fruits and vegetable value chain

Women play a central role in the transformation of fruits, vegetables and NTFPs and are involved in fruit and vegetable value chains as retailers (nearly 100% in the domestic mango sector) and occasionally as wholesalers (30% in the export mango sector).

By tradition and as a result of the constraining factors mentioned above, women harvest NTFPs to meet the requirements for their daily meals and for the market: selling NTFPs represents the highest share of women's incomes (WFP, 2017). A strong example of women's involvement in the transformation and marketing of NTFPs is that of the shea butter sector, which provides shea-oil and fait for the daily meals in rural areas, and which is being exported as an essential ingredient for cosmetic products. The network of shea butter producers in the Haut-Bassins and Cascade region is a collective effort by 10,500 members, 97% of which are women, organized in 225 groups and associations to protect forest parks and exploit these. In 2016 shea butter exports were valued at CFA25.5 billion (US\$46.5 million), the shea butter sector being the fourth most important export sector of Burkina Faso (PNDES, 2018). Women play similar dominant roles in the transformation and marketing of other NTFPs.

Although women face difficulties in growing trees, they are involved in the transformation of nuts (cashews), fruits (mangoes) and flowers (hibiscus) produced by these trees for both domestic and export markets.

ACT (2015) estimates that 72% of all vegetable producers are male on average, but in the Sahel, Centre Est and Nord, and the Northern region, women's share in production is reaching 71%, 46%, 42% and 42% of the vegetable producers,¹ respectively.

The roles of women and men on markets are differentiated: whereas wholesalers and semi-wholesalers are predominantly men, women are more present as retailers in local markets close to their residences (Gross, 2018; WFP, 2017; Catalystas, 2019). The main reasons for this are: the limitations women face to increase their businesses, the cost of transport to more distant markets, difficulties in adequately storing their vegetables and fruits as well as obtaining the authorization of their husband to travel (Gross, 2018; WFP, 2017; OECD, 2018).

Female entrepreneurship

Whereas 90% of women have their individual and informal businesses in processing NTFPs, fruits and vegetables, and marketing these products as street vendors or on local markets as retailers, some examples exist of women having been able to start their own processing units and marketing activities in the formal sector. Based upon a survey of the Chamber of Commerce and Industries, some 16% of formally registered female enterprises may relate to the fruit and vegetable sector because they transform agricultural produce, market food products and drinks, or have a hotel or restaurant. Of all women interviewed in this survey, 24% were under 30 years old and 75% had a master or PhD degree or finished secondary school. This is in contrast with 80% of the population of 25 and older not having any instruction level at all (Parrot et al., 2017). Most of these female entrepreneurs deliver products or services at the local or national market (88%) and have between one to ten employees (62%) (CCI-BF, 2018).

¹ This could possibly relate to the migration of men.

2.2.5 Consumption of fruits and vegetables

Consumption patterns

In urban as well as in rural areas, households prefer to eat daily meals with the following three ingredients:

- Tô of millet, sorghum or maize, rice or fofou de manioc
- Vegetables, green leafy vegetables, oil and other 'condiments'

Meat or fish?

A national survey conducted in 2013 by the Ministry of Health found that consumption of fruits and vegetables is largely insufficient with most respondents eating less than the five portions of fruits and/or vegetables required for sufficient consumption. In particular, the study shows that 56% of respondents did not eat fruits or vegetables on a daily basis, 30% ate one or two portions per day, 9% ate three to four portions and only 5% ate more than five portions of fruits and/or vegetables per day.

As shown in table 2.9, at the national level, only 5.1% of households eat sufficient fruits and/or vegetables, with 29.5% of households in the Northern region, 17.2% in the Centre Ouest region and 9.8% in Cascades eating five or more portions per day. Consumption in urban centers (3.8% of households) was found to be slightly lagging behind rural centers (4.7%)^{2,3} (Ministère de la Santé, 2014). In the capital Ouagadougou and three production areas Loumbila, Koubri and Kingoussi, the four most widely consumed and available vegetables throughout the year are sorrel, jute mallow (consumed fresh when available and dried), amaranth and okra (consumed fresh when available and dried). Half of all 400 households interviewed consume one of these vegetables once a week in areas of low vegetable farming activities in Ouagadougou, Loumbila and Koubri. In Kongoussi, more than 45% of households consumed okra, jute mallow leaves, sorrel leaves and bean leaves more than once a week.

Hama-Ba (2017) further reported that 94% of households interviewed in Ouagadougou, 63% in Loumbila, 78% in Koubri purchase these four vegetables at the market, whereas in Kongoussi 82% of households consume their home garden vegetables. One explanatory factor is that this last village has access to water for a longer production period (Hama-Ba et al., 2017).

Table 2.9 Daily vegetable consumption by region

Regions	>=5 portions of fruit and vegetables per day
Boucle du Mouhoun	2.5
Cascades	9.8
Centre	3.3
Centre Est	2
Centre Nord	2.8
Centre Ouest	17.2
Centre Sud	4.1
Est	1.5
Hauts Bassins	2.1
Nord	29.5
Plateau Cent	-
Sahel	1.7
Sud-Ouest	1.7
Total	5.1
Urban	3.8
Rural	4.7

Source: Ministère de la Santé (2014).

² Observation, if rural consumption is 4.7% of the population and urban consumption is 3.8% of population, then an average of 5.1% of the total population consuming five or more is not realistic.

³ No information available that shows if NTFPs like baobab leaves and monkey bread, néré fruits and seeds have been included in these findings.

How do households obtain fruits and vegetables?

According to a 2012 national food security survey conducted in the months of September to October, 62% of rural households purchased their own food (including vegetables and fruits) at the market and 34% used their own produce from agriculture, fisheries and hunting activities or NTFP harvests. Three percent of households obtained their food through gifts, support from others, loans, or labor force in return for payment in kind or barter. Meanwhile, 92% of urban households purchased their food at the market and 5% also produced, caught or harvested it by themselves, with 2% depending upon gifts, support, loans etc. (WFP, 2014).

Fruit and vegetable consumption fluctuates in relation to their harvesting period and to some extent to market prices. Ouedraogo (2020) distinguishes three periods in the year according to household food consumption in rural areas. The July to September period covers the production period for staple foods (millet, sorghum, maize, black-eyed-peas) and cash crops (e.g. cotton), but is also a hunger gap period at the household level with household staple stocks being emptied during this time, and low availability of other income sources. The October to January period is a recovery period. During this time staple crops are harvested, as well as cotton in the cotton production areas, which allows food ingredients to be purchased, school fees to be paid and health services to be visited. In this period horticultural activities start. From February to June, the mitigation period, access to food is ensured through the diversification of livelihood strategies.

A survey conducted by Lourme-Ruiz (2017) in the Hauts Bassins region, known as the region 'where everything grows' showed changes in consumption patterns throughout the seasons, including that of fruits and vegetables. For example, green leaves were consumed in all three seasons by 62-66% of all farm households interviewed. However, the consumption of fruits and vegetables rich in vitamin A varied considerably from 65% of the households in the mitigation period, when mangoes are harvested and vegetables are cultivated in areas with sufficient access to water, down to 7% in the hunger-gap period and 6% in the recovery period. Only 10% of households consumed other types of vegetables in the mitigation period, however this increased to 41% in the hunger-gap period and 66% in the mitigation period.

The market prices of vegetables in Ouagadougou demonstrate considerable variation over the year. Heron (2016) found that vegetable prices fluctuate more than the prices of staple foods and in particular during off-seasons. Onion prices appear relatively more volatile than other vegetable prices.

Factors influencing the consumption of fruits and vegetables

Only a few studies have investigated the factors that influence fruits and vegetable consumption. Kabore et al. (2020) conducted a survey among 442 health professionals in the Centre region — a region with a high urbanization rate — between June to August 2016. They concluded that the price of fruit is not the determining factor for irregular fruit consumption. Rather, other factors such as gender, occupation, distance from fruit supply and the average monthly financial income of health professionals surveyed, as well as their cultural background are what influence their food practices.

Table 2.10 shows the ranked factors influencing the consumption of leafy vegetables in Ouagadougou, Loumbila, Koubri and Kongoussi, according to Hama-Ba (2017). The most important factor is ranked as 1, and the least important factor is ranked as 8. Seasonality ranks as the most important factor in three of the four surveyed regions, and visual quality ranked as the least important factor in three areas.

Table 2.10 Prioritization of factors that influence the consumption of vegetables

	Ouagadougou (consumption area)	Loumbila (production area for vegetables)	Koubri (production area for vegetables)	Kongoussi (extended production area for vegetables)
Seasonality	1	3	1	1
Food habits	2	2	3	4
Socio-cultural background	3	1	2	3
Availability	4	4	5	6
Knowledge of nutritious value	5	5	6	5
Easiness to prepare	6	7	4	2
Price	7	6	7	8
Visual quality of product	8	8	8	7

Source: Hama-Ba (2017).

Prices

The cost of food intakes that respond to the energetic needs of an average household are estimated at CFA673 per day (US\$1.22). The cost of foods that ensure sufficient energetic intake as well as the 13 micronutrients needed for a healthy diet are estimated at CFA1,430 (US\$2.59) a day. For Burkina Faso this implies that 13% of households are not able to meet their energetic demands and 45% of households cannot access nutritious foods (WFP, 2020).

In 2017, 56% of all food produced consisted of cereals, with fruits and vegetables accounting for 1% and 4% respectively of all food produced. Household's food consumption consisted of 61% of cereals in 2019 and 7% of vegetables, with no fruits consumed. The cheapest nutritious diet consists of 45% cereals, 35% vegetables and 3% fruits (WFP, 2020).⁴

Table 2.11 below shows an overview of the average costs in US\$ per person per day for a healthy diet defined based on food-based dietary guidelines. In Burkina Faso, a healthy diet will cost on average US\$3.66 out of which 30% (US\$1.08) is spent on fruits and vegetables, which is slightly lower than the global percentage of 39% spent on fruits and vegetables.

Table 2.11 Cost of fruits and vegetables and cost of a healthy diet in 2017

	Cost of healthy diet in US\$	Cost of least costly fruits and vegetables in US\$	Share of fruit and vegetable costs in a healthy diet
Burkina Faso	3.66	1.08	30%
Global	3.77	1.46	39%

Source: Anna Herforth and Aishwarya Venkat, personal communication. Based on the analysis in Herforth et al. (2020).

Gender

Based on a survey among 579 farm households in the Hauts Bassins Region, Lourme-Ruiz (2017) concluded that income generated by women and/or mothers has a stronger association with household food diversity scores than revenue obtained through agricultural production. In this region cotton and staple food production is generating considerable income which is managed by male heads of households and not necessarily used to buy food. Women's off-farm activities have a stronger association with food diversity scores.

However, the World Food Program (2017) also observed that women spending too much time on income generating activities in the same region and that of the 'Boucle du Mouhoun' and the Cascades were not capable of taking sufficient care of their children, which explains the significant malnutrition figures among children in these regions.

⁴ Based upon household composition of six household members, one child being breastfed, one child going to primary school, one adolescent girl, one adult male, a breastfeeding woman and an elderly woman.

3 Identified research questions

3.1 Introduction

In this chapter, we provide the basis for our product selection. Burkina Faso produces a wide variety of fruits and vegetables, including international and local varieties, and, in addition to classic cultivation or farming, collection of forest products makes an important contribution to national nutrition. We selected six plants which contribute to, or have the potential to contribute to, nutrition security and furthermore have the potential to increase female participation, increasing employment and salaries and thereby increasing women's domestic power. We selected cabbage, amaranth leaves (known in Burkina Faso as *Boroumborou*), baobab leaves and fruit, *néré*, mango, and papaya. Cabbage and amaranth are green vegetables grown for daily consumption; baobab and *néré* are non-timber forest products; and mango and papaya are cultivated fruit trees. Table 3.1 below provides an overview of our selection criteria which we describe in the following section. We finish this chapter with a brief overview of the research questions.

Table 3.1 Product selection criteria for products in Burkina Faso

Product	Production area	Production volume	Consumption	Potential for Women	Health benefits	Innovation potential
Néré	Highest densities in Cascades, Hauts Bassins, Sud Ouest regions where trees grow at 2+ plants per hectare.	12,775 t fruit powder (2012)	Yellow powder used as sugar substitute. Seeds are transformed into <i>soumbala</i> , a daily food important for the population.	Women are responsible for much of the supply chain - collecting from forests, processing and selling.	Contribute to iron, vitamin C, vitamin A intake	Better organization of the value chain with an emphasis on harvesting the fruit at maturity, on quality control for processed products as currently problems of contamination exist in the powder.
Mango	1,538 hectares in Kenedougou, Houet, Comoe, Leraba (2019).	16,375 t (2019)	Mango eaten fresh nationwide or consumed as juice in urban areas.	Women are engaged in processing and selling.	Contribute to vitamin C, vitamin A and folate intake. Reduces dietary risk for coronary heart disease (CHD).	Certain varieties grown for local markets; second-grade mangos from export-oriented cultivation also end up on local market.
Papaya	Grown in Houet and Bazega.			Women are engaged in processing and selling.	Contribute to vitamin C, vitamin A and folate intake. Reduces dietary risk for CHD.	An upcoming fruit, consumed more and more.
Baobab	Highest densities in Est, Centre Sud, Centre Nord, and Nord regions where trees grow at 0.15+ plants per hectare.	8,675 t fresh leaves and 2,600 t leaf powder; 250 t fruit powder (2012)	Very important food in main dishes and eaten weekly. <i>Pain de singe</i> : an important source of calcium for women — made into biscuits; the powder also has an important use for young children.	Women are responsible for much of the supply chain - collecting from forests, processing and selling.	Contribute to iron, vit C, vit A and folate intake. Positive association with CHD, stroke, all-cause mortality, but negative with cardiovascular disease (CVD). High calcium content	Leaves: Concerns over quality control, especially of powder; opportunity to commercialize and better organize value chain. Fruit: quality control improvements, also potential opportunities to scale up and improve commercialization.

Product	Production area	Production volume	Consumption	Potential for Women	Health benefits	Innovation potential
Cabbage	732 hectares in Houet (20% of national production); Sanmatenga, Bam, Yatenga, Sanguie, Boulkiemde (6,158 t) (2004); peri-urban and urban plots.	20,734 t (2004)	Ubiquitous staple food.	Sales, retail, and preparation.	Reduces dietary risk for total cancer and all-cause mortality but increases dietary risk for CVD.	Opportunity to improve growing conditions and distribution.
Amaranth	Grown via peri-urban and urban farming.		Very important food in main dishes, eaten weekly.		Contributes to iron, vitamin C, vitamin A and folate intake. Reduces dietary risk for CHD, stroke, all-cause mortality, but negative with (CVD).	Opportunity to improve growing conditions and distribution.

Source: Authors' compilation, based on various sources including Afshin et al. (2019); Alemu et al. (2019); Yip et al. (2019); Aune et al. (2017); MAAH /DGESS (2019); MAH/DGPER/DPSAA (2011); Ministère de la Santé (2005) and FAOSTAT (accessed 2021).

3.2 Selection of fruit and vegetable supply systems

Vegetables

Cabbage is a ubiquitous staple food in Burkina Faso, being the third largest produced vegetable after onions and tomatoes. However, unlike onions and tomatoes, cabbage is a cruciferous vegetable and has a higher nutritional value of calcium and vitamins A and C. In terms of female participation, while production is split between men and women, women dominate the commercialization of cabbage.

Amaranth leaves (Borombourou) are another staple green, consumed in daily meals — in rotation with other traditional meals throughout the week — either fresh or dried, which provide high levels of calcium and vitamin A. While production statistics are not available for amaranth leaves, this product is grown throughout the country, and in urban and peri-urban farming areas surrounding major cities. Similar to cabbage production, men and women cultivate amaranth while women take charge of the commercialization.

Non-timber forest products

The Baobab tree is a forest product which offers two products: leaves and fruit, otherwise known as pain de singe. Baobab leaves are pervasive in Burkina Faso and are an important part of the daily traditional meals. Baobab fruit is especially high in calcium and is preserved as a powder used for children and women in calcium-rich biscuits. The Baobab tree is therefore a unique plant which provides both a daily leafy green staple as well as an important plant-based source of calcium, critical for the development in children and prevention of osteoporosis in adult women. Baobab trees are part of the forests which cover 70% of Burkina Faso's terrain. The entire value chain is dominated by women and children but is generally not very organized. There is great potential to improve the organization of the value chain, and to invest in cultivating Baobab trees.

Like the Baobab tree, the néré tree is a forest product growing on over 70% of national territory and harvested and commercialized in value chains run exclusively by women. Currently, the fruit is predominantly harvested prematurely for its seeds which are used to produce Soumbala, a daily staple in the national diet. However, there is potential to improve cultivation and harvesting practices. Néré fruit is a highly nutritious yellow fruit and source of vitamin A. It is preserved as a powder which is used as a sweetener for children's food and domestically made into biscuits for children and adults. However, because the fruits are harvested before maturity, the fruit pulp is often poor quality and is therefore used as cattle feed. Enormous amounts of this poor quality powder are produced so it is often hard to find good quality néré fruit powder.

Fruit trees

Mango is a major fruit for Burkina Faso and has a highly developed value chain mostly due to the export intensity of the sector. Nonetheless there are several local varieties of crops produced for the domestic market and second-grade products initially cultivated for export also go to this domestic market. In terms of production, 60-70% is estimated to be domestic-oriented. Mango processing is a growing sector and employs a high proportion of women, and demand for processed products on the domestic market is growing. Processing also helps solve logistical problems as there is not adequate access to refrigerated storage during the peak season.

The papaya market is upcoming in Burkina Faso. Papaya is an equally nutritious fruit with a similar nutrition profile to mango. However, in contrast to the export-oriented importance for the mango sector, the papaya market is dominated by imports, particularly from Ghana. Papaya is increasingly being consumed and cultivated in Burkina Faso, though the quality of domestic papaya is less than imported papaya.

3.3 Research questions

As previously mentioned, based on the findings of Phase I, we identified gaps in research to address in Phase II. We began with 13 hypotheses (Table 3.2), under which a total of 30 research questions are grouped. These research questions were posed to various experts in key informant interviews as well as to the focus group discussants (FGDs). Relevant research questions were selected for each of the five focus group discussions. For example, gender relevant questions were posed to gender-oriented FGDs and policy-relevant questions were posed to the socio-politically-oriented FGDs. In Chapter 4, the responses of interviewees and FGD discussants are presented, accompanied by relevant literature where necessary.

Table 3.2 *List of the research questions*

Section	Questions
4.2	How does seasonal variation in weather influence fruit and vegetable production, yields and market prices (disaggregated by fruit and vegetable category)?
4.2 and 4.4	What are the main causes and their volumes of production losses, and where do they occur?
4.2	What are the main barriers for farmers to increase the production of fruits and vegetables? What keeps farmers from intensification? Do female producers face greater barriers than male producers, and are there examples that have addressed these barriers? Are quality inputs and services accessible, and is the enabling environment supportive to intensification?
4.3	How much are the production costs, and can we compare them across the seven countries? What happens to the farm gate price when costs are reduced? What happens to the income of farmers when farm gate prices are lower?
4.4	Does value chain efficiency result in lower farm gate prices and/or consumer prices? Data on prices: farm gate and consumer prices What are the risks, costs and types of coordination for the key fruit and vegetable categories? How can more efficiency be achieved and are there examples of such enhanced efficiencies? Are there examples that more secured markets (more formal) are beneficial to smallholder farmers? How should farmers benefit from such arrangements? How do traders and processors (male and female) connect to consumers? Are they organized to support each other?
4.5	What examples are there of women succeeding? Are these exceptions or at scale in the different levels of the fruits and vegetables value chains? Are there examples of traders and processors (male and female) that are capable of responding to consumer needs by developing innovative food products? What are conducive conditions for information sharing, and what is the role of trust (as social construction of exclusivity)?
4.6	Has the introduction of new fruit and vegetable varieties contributed to more fruits and vegetables consumed? Trends on fruit and vegetable consumption: are these dependent on season or geographical location (production/ non-production areas), and can these trends be disaggregated by different types of fruits and vegetables?

Section	Questions
4.7	Why are prices to consumers of fruits and vegetables higher as compared to other domestically produced food crops? Are there differences between categories of fruit and vegetables and what explains these differences?
4.8	Are there examples of successful integration of women in profitable production and value chain operations? What explains these successes and is there evidence of them being scaled up? What business models work best for women's inclusion and leadership? If fruit and vegetables become more commercial (or scaled up) will the income be controlled by women?
4.9	Inventory of relevant standards (public/private) How are the standards enforced? Do consumers trust standards? How is it appreciated by other stakeholders in the food system?
4.10	Are there specific policies and strategies formulated and implemented for improving diet quality among different consumer categories, and do they include strategies on fruits and vegetables? Is there evidence of their impact? How have policies enabled women to address systemic constraints that they face, and to successfully access sufficient nutrition? Inventory of innovative examples implemented, who is implementing it? Are consumers' motives taken into account?
4.11	What are consumer motives and barriers to (not) consume (specific) fruits and vegetables, such as indigenous vegetables, for different household members? If everything is as planned (available, affordable, acceptable) will consumers increase fruit and vegetables intake in their diet, according to the recommendations?

4 Research results

4.1 Introduction of the selected fruit and vegetable supply systems

4.1.1 Producers

Table 4.1 provides the official production statistics in terms of production area (ha), production volume (t), and yield (t/ha) for each of our selected crops. While this information is not available for every year for each crop, the latest information from the most recently available report is presented.

Table 4.1 Production statistics Burkina Faso for the selected crops

Product	2008			2011			2013			2018		
	Production area (ha)	Production (t)	Yield (t/ha)	Production area (ha)	Production (t)	Yield (t/ha)	Production area (ha)	Production (t)	Yield (t/ha)	Production area (ha)	Production (t)	Yield (t/ha)
Cabbage	2,434	107,476	44	2,726	57,007	21				6,865	164,760	24
Amaranth										246	1,324	5
Mango	35,221	243,286	7							22,686	243,358	11
Papaya	167	3,652	22									
Nere fruit									180			
Baobab fruit									103			
Baobab leaves									921			

Source: RGA 2008 Maraichage et RGA 2008 Arboriculture; Rapport d'analyse du maraichage - campagne 2011-2012; Rapport d' Etude sur les aspects socioeconomiques de 9 espèces PFNL; Rapport Enquête maraichère 2018 et Rapport recensement vergers mangues 2018.

NTFPs

Baobab leaves and fruits (monkey bread) and néré fruits are harvested from trees that grow in natural environments (without human interventions) in the bush, in fields, fallows or forests. These NTFPs are harvested for either direct consumption, selling or processing. In large producing areas, harvesting is more organized. For baobab trees, for example, a 'baobab leaf campaign' is organized from September to October for men and women to harvest the leaves. More rarely, trees are planted by the farmers themselves.

Baobab trees are found throughout the entire territory of Burkina Faso except in the Centre region, likely due to the high rate of urbanization of the area. Four broad geographic areas can be distinguished by population of baobab:

1. Este, which contains 28.59% of the national population;
2. Centre Nord, Nord, and Sahel with 11.92%, 10.52% and 9.37% of the national population respectively;
3. Hauts-Bassins (7.95%), Boucle du Mouhoun (7.40%), Centre Sud (6.76%) and Centre Est (6.65%);
4. Cascades, Centre Ouest, Plateau Central and the Sud Oeust, which each contain less than 5%.

The importance of baobab in the Sahel zone (Sahel, Nord, Centre Nord regions) can be explained by the extensive territorial coverage of the region. Though less trees are in the Sudan zone (Hauts Bassins, Cascades, Sud Ouest regions), they are significantly more productive than those in the Sahel zone.

The government has developed the *nutritive garden initiative* where baobab trees are cultivated for their leaves via an adapted type of cultivation. The first initiatives have been underway since 2017 and

women's groups are allowed to produce, harvest, consume and sell baobab leaves year-round. This under the condition that the trees are regularly watered. The harvest period is reduced to six to seven months a year if watering does not take place. Transplantation of baobab shrubs in forests — their natural environment — occurs after two years. Periodic evaluation of this initiative assesses the successes and weaknesses of the initiative and allows for the necessary adjustments to ensure its sustainability.

Like the baobab tree, *nééré* trees are also scattered throughout the territory, except for the Sahel region. Nationally, the Sud Ouest region has the highest percentage of *nééré* trees, comprising 28.69% of the national population. Other regions with high levels include Hauts Bassins with 24.26%, Cascades with 18.26%, Centre Ouest with 11.68% and Boucle du Mouhoun with 8.25%. Sud Centre only contains 4.17%, Centre Est 2%, Est 1%, and the other regions contain less than 1% of the national population. Surprisingly, high-productivity regions are not the regions with the highest level of *nééré* density. The Centre, Centre Nord, and Nord regions have the highest productivity of *nééré* whereas the Cascade region, which has the highest levels of *nééré* density, has the lowest tree productivity.

Néré trees are not a public good, in contrast to baobab trees that grow naturally. In agroforestry formations, each tree has an owner. The *nééré* tree is seen as capital and is subject to special protection based upon customary tenure systems. For example, in the Boucle du Mouhoun region, when a landowner rents his land, he retains the right to the *nééré* tree. These special considerations are due to the important economic value of the *nééré* seeds which are used to make *soumbala*, an essential part of Burkinabé cuisine. *Néré* harvesting is predominantly performed by female workers.

Baobab trees are most often public goods under collective customary tenure systems. However, when they grow on family land (customary tenure), people who want to harvest leaves need an authorization.

Fruit trees

In general, fruit production is a male activity with 96.7% of fruit tree producers encompassing men and only 3.3% women. It is also an ageing population with only 17.1% of fruit tree producers under the age of 35. The majority of fruit tree workers are illiterate, including orchard owners (according to customary law) and managers, of whom 74.3% are illiterate.

Mango is the primary fruit tree in terms of production volume, comprising 62.5% of the total domestic fruit production volume in tons. Mango is produced in the 14 fruit tree provinces in the southwest of the country, over an area of approximately 35,221 hectares or 24.7% of the total area covered by fruit trees. The major provinces producing mangoes are Kénédougou, Houet, Comoé and Sissili.

More than half (58%) of fruit tree producers produce mangos. While fruit tree production in general is an unorganized sector with less than 11% of producers belonging to an association or cooperative, mango growers are also the best-organized group of fruit tree producers. They are organized in cooperative societies (*scoop*) grouped in a national company called the National Union of Mango Producers of Burkina (UNPMB). UNPMB is an economic and professional organization aimed at improving the living conditions of its members. Its essential mission is to work for the greater professionalization of mango producers. It has management bodies such as the General Assembly (AG), the Board of Directors (CA), and the Supervisory Board (CS). Appendix 4 presents detailed statistics on mango production in Burkina Faso.

Papaya is grown on 167 hectares, covering only 0.1% of national fruit tree production area. Papaya is produced in ten of the fourteen fruit tree provinces of Burkina Faso. Only 4.2% of fruit tree producers produce papaya. While 61% of them say they have mastered farming techniques, 39% admit that they do not know how to master at least one cultivation technique (RGA, 2008). Papaya producers are mostly men as is the case for fruit tree producers in general. Nonetheless, certain female fruit tree producers such as Mrs. Kassongo — the first female papaya producer in the Hauts Bassins region — are making headway, and there is hope that the field will attract more women in the coming generations.

Box 4.1 Mrs. Kassongo – the first female papaya producer in the Hauts Bassins region

From bananas to papaya

A successful banana producer since 2004, Mrs. Kassongo began planting papayas in 2009, attracted by the high yield potential of the crop (60-80 t/ha over 2-3 years). Initially scattering papaya plants throughout the banana grove, in 2010 Mrs. Kassongo devoted 0.25 ha to papaya, and today operates 2 ha exclusively for papaya production out of a total of 8.5 ha of fruit tree production.



Profitability

With well-irrigated and fertilized papaya plants, this high yield translates into high revenues of approximately CFA10-15 million (approximately US\$18,500-27,800) — a year. Annual production costs are estimated to be CFA3,440,000 (approximately US\$6,400) — a year, including inputs, capital costs and depreciation of irrigation equipment, and labor. There are also costs associated with risk. Because of the high and steady market demand, Mrs. Kassongo has not experienced any sales-related risks. However, she does face other risks including plant diseases and parasitic attacks, or the impacts of climatic change such as losses from strong winds, citing losses of around CFA1,200,000 (approximately US\$2,200) from the loss of 100 trees. Accounting for all costs and potential risk, estimated are profits between CFA5,360,000 and 10,360,000 (approximately US\$9,900-19,200) a year as per Table B1 below.

Table B1 Annual profit estimates for two hectares of papaya in CFA

	Low Yield	High Yield
Revenues	10,000,000	15,000,000
Costs	3,440,000	3,440,000
Risk	1,200,000	1,200,000
Profit	5,360,000	10,360,000

Job creation: Supporting the local economy and the next generation of papaya farmers

The success of Mrs. Kassongo's entrepreneurship allows her to contribute to job creation, employing six permanent staff including three women and three youths for the two hectares of papaya, out of a total of 24 permanent employees working on the 8.5 ha. Permanent staff are responsible for daily tasks including irrigation, weeding, and fertilizer application. For less routine tasks including planting, irrigation system installation and harvesting, Mrs. Kassongo employs an additional 20 contractors per ha.

Mrs. Kassongo also hosts trainees from agricultural training centers, with 30-40 doing an internship with her at a given time. While these students often look forward to acquiring their own land after graduation, land acquisition can be a lengthy process. To help her trainees, Mrs. Kassongo offers them support where possible, such as employing them as supervisors while they are starting off.

Overcoming obstacles to achieve recognition

Mrs. Kassongo was inspired to enter into fruit tree production by her father, a banana producer in Côte d'Ivoire with 300 ha of bananas as well as cocoa fields. While her husband was initially critical of her plans to become a fruit tree producer, Mrs. Kassongo persisted. With her father's endorsement, Mrs. Kassongo convinced her husband to support her in investing in the necessary land.

After years of persistence and hard work, Mrs. Kassongo has received numerous accolades in the industry, including awards on the 2012 Farmer's Day, the 2020 Balo d'Or, and 2021 International Women's Day. She plans to leverage these awards to secure loans to finance agricultural projects for women in her community.

Vegetables

Cabbage is produced in all regions of Burkina Faso on an estimated total area of 6865 ha. The Hauts Bassin, Nord, Boucle du Mouhoun, and Centre Nord regions account for more than 69% of the total area covered by cabbage. With 2,745 ha of cultivated land, the Hauts-Bassins region is the largest producer of cabbage in the country. According to 2018-2019 national statistics, amaranth occupied only 246 ha, with 77% of the area cultivated in the Centre region home to the capital Ouagadougou (MAAH/DGESS, 2019).

About 25% of all vegetable producers in the country cultivate cabbage, giving an estimate of 174,670 cabbage producers. Although amaranth is widely cultivated and grown on a total area of 246 ha, there hasn't been a survey to indicate the number of amaranth producers. While cabbage producers are generally men, women are the predominant producers of amaranth.

Among Burkina Faso's 2018 vegetable farmers surveyed, only 23% were literate with 15% only literate at a primary level. The majority of respondents, 77%, live in rural areas, and producers operate mostly as individual farmers (about 88% of farms). There are, however, some that are organized into groups, and cooperatives. Over half of vegetable farmers (55.52%) in Burkina Faso are over the age of 35. Considering the importance of water for vegetable farming, 30% of vegetable farmers tend to plant around water points such as dams, 26% plant around traditional wells, 18% vegetable wells, 17% rivers, 5% boreholes, and 1% boulis (artificial ponds) (MAAH/DGESS, 2019).

4.1.2 Coxeurs and pisteurs

Fruit trees

The collection activity described here concerns only mangoes. The activity of collecting mangoes is carried out by actors commonly known as coxeurs for the domestic market and for the dried mango value chains for the export markets. Coxeurs are making less efforts in selecting mangoes based upon their quality and more interested in quantities. Coxeurs deliver them to other links in the chain, including wholesalers on the domestic markets and processors.

In the export market of fresh mangoes to the EU, pisteurs are in charge of identifying the right orchards, harvesting and selecting the high quality mangoes (appearance and avoiding fruit fly infestations) in the orchards. These pisteurs call themselves harvest technicians or suppliers to wholesalers specialized in the export of fresh mangoes to the EU by plane or by boat. Pisteurs are organised into associations and work as a team (Parrot et al., 2017). Both men and women work as pisteurs, though this varies depending on region. For example, in the Cascades region women and youth work as pisteurs whereas in the Hauts Bassins region, the activity is male dominated.

4.1.3 Processors

NTFPs

NTFP processing is predominantly comprised of women organized either in groups or in processing associations. Some women have private processing units. Processing can be artisanal, semi-industrial or industrial. For baobab leaves, freshly harvested leaves are dried and powdered by women either for the direct preparation of food or for selling. The transformation of baobab and néré fruits is done in two stages: 1) the primary stage which comprises the extraction of the fruit pulp from the hull and the pulverization of the pulp into a fine powder using drumstick mortars, and 2) the secondary stage which involves the production of juice, ice cream, cakes cookies.

Fruit trees

In mango processing, there are two main types of processors: (1) mango dryers, which comprise 95% of mango processors, and (2) juice, puree, syrup, jam and vinegar producers, which comprise 5%. The actors of the link are organized in a professional association called 'Professionnel de la transformation de la mangue du Burkina Faso' (*Burkina Faso Mango Processing Professionals*, PTRAMAB). Papaya currently has very few initiatives for papaya processing based in Bobo-Dioulasso producing sauce, jam, juice, and dried papaya.

Vegetables

Vegetable processing is becoming more common in large urban markets. In Ougadougou prepared dishes and meal kits have become increasingly popular. As staples of Burkinabé cuisine, cabbage and amaranth are key ingredients in various recipes in these dishes and kits.

4.1.4 Transportation

Fruit trees

Depending upon the distances to be covered, fruits are transported in trucks of 7 tons from orchards to wholesaler markets, where they will be further transported with tricycles to nearby local markets or by bus to wholesale markets in other urban areas. Tricycles and trucks are usually driven by men.

Vegetables

In the vegetable sector, the transportation service is highly informal and varies greatly. Service providers may own large trucks or simple tricycles. The supply system of market vegetables to Ouagadougou is used as an illustrative example, as shown in Figure 4.1.

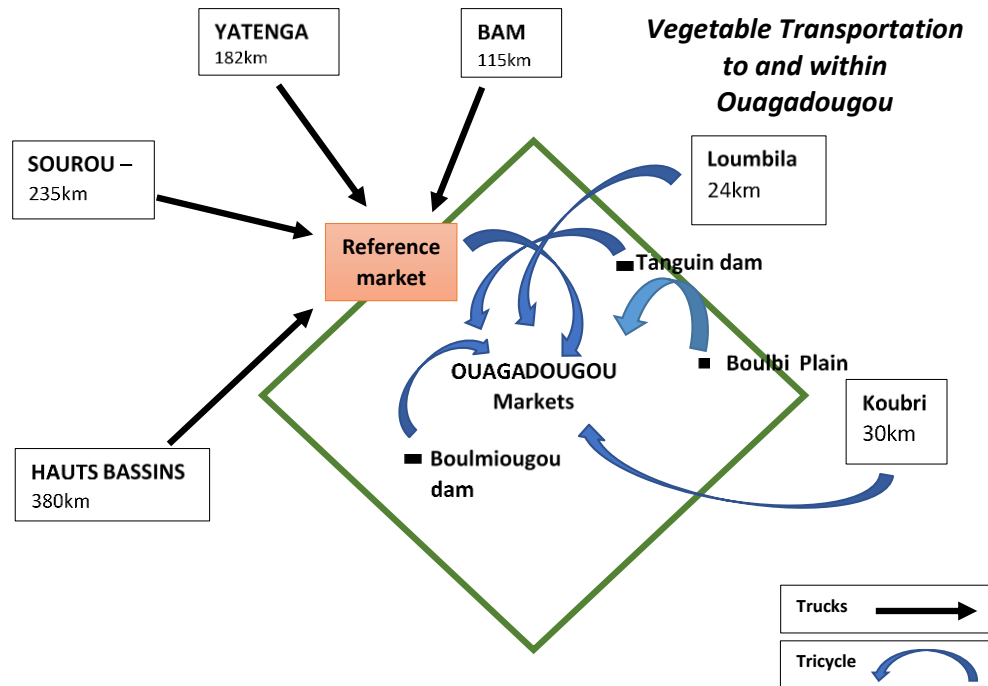


Figure 4.1 Illustration of vegetable transportation to and within Ouagadougou

Source: Authors' compilation.

Vegetables in Ouagadougou are sourced from three main geographic regions:

1. Urban sites in the plains or bordering dams: the Boulmiougou dam, the Tanguin dam and the Boulbi plain.
2. Peri-urban sites: Koubri, which is 30 km from Ouagadougou, and Loumbila, which is 24km from Ouagadougou.
3. Rural production areas: Hauts Basins, Bazega, Bam, Yatenga and Sourou.

There are around 60 markets in Ouagadougou which are supplied by urban and suburban producers. In these cases, produce is transported by independent service providers on tricycles or by the merchants themselves on their motorcycles.

Produce from the rural production areas is transported by owned or rented trucks with a capacity 5-10 t. All produce from these rural areas is first transported to a reference (wholesale) market in Ouagadougou and is subsequently dispatched to the various markets of the city by tricycle. For example, for cabbage transported from the Hauts Bassins region, Larlé is an important reference market.

Transportation between the reference market and the various consumer markets throughout the city occurs early in the morning, between 3am and 5am. Truck drivers such as tricycle drivers are usually male. While some female traders own tricycles and transport goods themselves, these cases are exceptional.

4.1.5 Trade and retail

NTFPs

Rural producers/gatherers and intermediaries are spread throughout the country, wherever products or demand exist. Overall, the sector is very informal. Mostly, rural families harvest NTFPs for self-consumption and surplus produce is routed through intermediaries to different markets. On the market, the product is sold either to retailers, other wholesalers or directly to consumers. Certain NTFP products, including baobab and *néré*, are exported to Niger and southern countries including Côte d'Ivoire. These export transactions are predominantly informal.

Fruit trees

Burkina mangoes are sold on the domestic market, in the sub-region including Ghana, Niger and Côte d'Ivoire, and internationally to Europe, the US and the Middle East). Trade may be organized by individuals or corporate entities. Many exports are organized in the Association Professionnelle des Exportateurs et Commerçants de la mangue au Burkina (Professional Association of Mango Exporters and Traders in Burkina Faso, APEMAB) created in 2012. APEMAB members include traders, exporters and packing centers. For the domestic market, there are wholesalers and retailers which operate in a highly informal environment. Wholesale sales is a male-dominated activity while retail is a female-dominated activity. Some 30% of the semi-wholesalers on the fruit market of Bobo is female.

Overall, papaya trade is much less organized than in the mango sector. Burkina Faso papaya is produced for the domestic market. The majority of those involved in the distribution of papaya are women.

Garden market vegetables

The commercialization of vegetables is largely female-dominated. Wholesalers and retailers often engage transportation services such as trucks and tricycles to ensure the transport of vegetables from place of production to the wholesale markets where they operate.

4.1.6 Non-governmental organizations (NGOs)

Table 4.2 presents select relevant NGOs in the sector. There are NGOs that are relevant to vegetables, fruit trees, and NTFPs. Currently, fruit tree NGOs do not work with papaya producers. We also include the Hellen Keller Foundation, relevant to nutrition.

Table 4.2 *NGOs active in vegetables, fruits, NTFPs, and nutrition*

Theme	NGO	Location	Objective
Vegetable production	Association Burkinabè d'Action Communautaire - Burkina (ABAC)	Bazega (Centre Sud); Namentenga (centre Nord)	Support services for sustainable development initiatives for small producers.
	UFC (Burkina)	Oudalan	
	Agence Adventiste du développement et de l'aide humanitaire (ADRA)	Bazega	
	Béo Neéré	Ouaga (Centre), Kaya (Centre Nord), Ouahigouya (Nord), Koupèla	Promotion and training of agroecological techniques.
	Action pour la promotion des Initiatives Locales (APIL) founded in 1998	Centre nord Plateau central	Accompanying the rural population in its quest for well-being. Sustainable food systems.
	Conseil National pour l'Agriculture Bio (CNABIO)	Nation-wide	Training, support services, advocacy and local certification.
	BIOPROTECT		Innovative organic solutions to production problems. Crop research/protection and organic soil fertilization. Production of organic inputs. Training in organic and ecological agriculture. Marketing of organic agricultural products.

Theme	NGO	Location	Objective
	Namanzanga	Centre, Plateau Central	Agriculture and vegetable farming. Environment and climate change. Alphabetization training Health Democracy participation
	Autre Terre	Active in Burkina Faso, Sénégal, Mali	Belgian development NGO and member of the Terre group. Agroecology and Recycling.
	Terre Verte		Agroecological research land restoration formation.
Fruit Trees	Organisation Néerlandaise de Développement (SNV)	Hauts Bassins Cascades	Support for the promotion of women's entrepreneurship in the processing link of mangoes and cashew nuts.
	Comité International de Bio Ethique (CIB)		Reflection on the ethical and legal issues of research in the life sciences and their applications. The exchange of ideas and information and awareness-raising actions.
	CEAS		Combating poverty in ways that combine economy and ecology, research and technology for agricultural equipment and agro-processing.
	COLEACP		An interprofessional network for the promotion of sustainable horticultural trade bringing together ACP producers/exporters and EU importers.
	Programme Equité		Fair Trade and biodiversity
NTFPs	Tree Aid	Nord, Centre Nord, Est, Centre Est, Centre Sud, Centre Ouest, Sud ouest	Reforestation Restoring the environment. Support for the planting of trees that generate income- generating activities, e.g., Baobab Nutritious Gardens
	SLCD (Belgique)	Sanmatenga (centre Nord)	Support for the promotion of NTFP.
Nutrition	Foundation Helen Keller International		Community management of acute malnutrition. Promotion of orange-fleshed sweet potato Improved food production at household level. Food fortification. Vitamin A supplementation. Zinc supplementation

Source: Authors' compilation.

4.1.7 The seed system

NTFPs

There are a variety of scientific research initiatives in Burkina Faso which work towards sustainable production of NTFPs, including universities, research institutes, and NGOs. For example, the Centre National de la Recherche Scientifique et Technologique (Center for Scientific and Technological Research, CNRST) has a department of forest production. There is also the Centre National de Semences Forestières (National Center for Forest Seeds, CNSF), the Unité de Formation et de Recherche en Sciences de la Vie et de la Terre (Training and Research Unit in Life and Earth Sciences, UFR SVT), the Institut National de l'Environnement et de Recherches Agricoles (National Institute of Environment and Agricultural Research, INERA), and l'Association Centre Ecologique Albert Schweitzer (Association of Ecological Center Albert Schweitzer, CEAS).

The CNSF is in charge of the forest seed system in Burkina Faso. It is also a seed bank that preserves the genetic diversity of Burkina Faso's forests. The CNSF produces and distributes quality forest seeds for more than 160 species found in Burkina Faso. Breeders use research results to produce nursery plants of NTFPs. The CNSF has five nurseries which produce more than 200,000 plants per year. Private nurseries also support the CNSF in this production as a profitable business operation.

Apart from the public research institutions mentioned previously, the market for private breeders is developing in Ouagadougou and Bobo-Dioulasso.

Traditional agriculture (fruit trees and vegetables)

In the agricultural sector in general, there are two types of seed systems that co-exist: 1) the traditional system where producers specialize in the production of traditional variety seeds that they use for their own fields with the supplement being sold to other demanding producers; 2) the formal system based on varietal creation through research, followed by multiplication and distribution by the private sector including individual producers, companies, seed producers' organizations and NGOs. Regulations are made to govern the operation of the formal system such as quality control, certification, etc., while ensuring the protection and promotion of the traditional system. However, effective enforcement often faces difficulties. In the fruit trees sector, the application of the formal system with varietal creations has contributed greatly to the development of sectors such as mango.

The Institut National de l'Environnement et de Recherches Agricoles (National Institute of Environment and Agricultural Research, INERA) is the main institute for the research and production of seeds for the development of fruits and vegetables in Burkina Faso. Hosted by the regional directorate of INERA in Bobo-Dioulasso, the National Centre for Fruit and Vegetables in Farakoba was established (2010-2011) with funding from the World Bank as a regional (West Africa) center for fruit and vegetable research. Despite these government and international initiatives, international seed companies, such as Technisev, remain dominant in seed production, and supply nurseries and producers.

Mango nurseries are mostly found in Bobo-Dioulasso and Orodora. They reproduce mango plants and sell them to producers. Nursery workers are mostly poorly educated with a low level of professionalism. About 65% of mango producers buy their plants from nurseries, while 30% produce their own plants.

The Burkinabe market has long been flooded with small, sweet and visually appealing solo papayas from Ghana or Côte d'Ivoire. This imported variety is preferred to the traditional domestic papaya which although sweet is voluminous at 1-2 kg, difficult to handle, and deemed aesthetically unappealing. Research undertaken in recent years at the INERA level has led to the creation in 2007 and then in 2020 of new seed varieties that allow producers to cultivate papayas whose organoleptic quality is similar to that of the papayas from Ghana and the Côte d'Ivoire. Five varieties of papaya were developed between 2007 and 2020 (see Table A3.1 in Appendix 3) and are currently available in orchards and markets.

The production and marketing of papaya seeds is carried out by large foreign seed companies such as Technisem/Nankosem, which regularly supply nursery seeders with seed. Papaya nurseries breed plants and sell them to growers. As with mango, papaya nursery workers are mostly poorly educated with a low level of professionalism. In the majority of papaya production regions, fruit tree producers produce their own papaya plants, with the exception of the Cascade region where nearly 64% of growers use nurseries to source plants (MAAH/DGPER/DPSAA, 2011).

To produce cabbage and amaranth, vegetable producers either produce their own seed or source from seed companies which are typically local affiliates of large international seed companies. Companies include Nankosem, Boutapa, SAPHYTO, PROFINA, KING AGRO, TOPAGRONAFASO; EPCSAC, EPAM, FAGRI, LAVODEC, KENEDOUGOU NAFA, SOCIETE TIGTAABA SARL, FASO NEEMA, EAKF, SEMAFORT, AGRO PRODUCTION, and SAALA MONDE. These companies receive government approval to sell certified seeds for 2-3 years. There are around 4,000 producers involved in seed production. The association of wholesalers who distribute agricultural inputs AGRODIA is specialized in horticultural seeds and fruit tree seeds. It counts 54 distributors, and 1,000 members dispatched in the 45 provinces of the country. Most of their inputs are imported, okra, onion, pepper, lettuce, eggplant, spinach amaranths and corète are produced in-country.

4.2 The main type of value chain

Across the selected crops, there are two main types of value chains: formal or organized value chains, exclusively represented here by mango, and informal or unorganized value chains which include papaya, baobab, néré, cabbage, and amaranth.

Of our selected crops, only the mango value chain is partially formally organized. On the production side, there are about 15,000 farmers, with less than 10,000 operating based on formal organization. The level of formality depends on the production links with formal processing and trade. Organization in associations strengthens the vertical integration of the sector and has helped increase its productivity. There are four main organizations: the National Union of Mango Producers of Burkina Faso (UNPM-BF), the Burkina Faso Mango Processing Professional Organization (PTRAMAB), the Professional Association of Exporters and Traders of the Mango of Burkina (APEMAB), and the Interprofessional Mango Actors of Burkina (APROMA-B).

From 2017 to 2020, exports of fresh mangoes rose from 5,657-15,832 t and those of dried mango rose from 1,715-2,387 t. National mango production is estimated to have grown from 243,358 t in 2019, to 271,503 t in 2020, despite the difficult environment marked by the Covid-19 health crisis in addition to the existing fruit flies issue. While these statistics demonstrate the dynamism of the mango value chain, the dominance of exports is also apparent. Although the export volume does not exceed 40% of domestic production —with 60-70% retained on the national market — the export market affects the domestic market, with international prices putting downward pressure on the field-edge prices. This has an important influence on fruit tree producers as 91% of growers sell their produce at the edge of orchards. Nonetheless, farmers have also benefitted from the export market which has influenced the formalization of the market.

While also part of the fruit tree sector, the papaya value chain differs from the mango value chain and is largely informal. The informality of the papaya sector is in part due to the fact that it is currently a small sector focused on the domestic sector. Nonetheless, there is strong growth potential due to the high yield — 60-80 t/ha for a well-irrigated orchard — associated profitability of the crop for producers, and the demand for the product which is largely met by imports from Ghana.

Non-timber forest products are harvested and marketed in a highly informal chain, much of which is operated by women. Little investment has been attracted so far due to the informality and female dominance of the chain. However, new initiatives such as the nutritive garden initiative are indicative of the transformative impact which investments in the chain can have by introducing more formality to the chain.

Though consumed daily and demanded throughout the country, the value chains for cabbage and amaranth remain highly informal. There are a variety of reasons for this. Producers, particularly in the urban and peri-urban regions cultivate small plots, transportation occurs very informally, typically during the night and before dawn, and products are largely sold on the unregulated city markets.

4.2.1 Enabling environment and relevant policies identified

The enabling environment for value chain development depends on political, commercial and cultural factors.

The government supports the horticultural sector through research and extension activities. For NTFPs, for example, the Ministry of the Environment has spearheaded the nutritive garden program, as mentioned previously, developing a cultivation technique for baobab through research and extension. The Ministry of the Environment also leads programs on forestry management, reforestation and grafting, all of which are important contributors to increasing the sustainability of NTFP production.

The Ministry of Agriculture provides extension services to producers. There are a number of research activities on traditional horticultural crops, such as INERA research into the development and promotion of Burkinabé papaya. INERA along with CNRST are also working to improve the quality of vegetable species.

The government further contributes research into harvesting, post-harvest processing and preservation techniques. National research structures such as IRSAT and CEAS work on the development of post-harvest processing equipment including the hammer grinder, mechanized roaster, mill, dryer, shea press, néré grain shellers and atomizer, as well as processing.

The government also develops and regulates production standards. The government agency ABNORM sets standards for farm production as well as food processing, and the Ministry of Agriculture sets phytosanitary measures. The Ministry of Health carries out sanitary controls.

Because enforcement of standards and regulations is irregular, the private sector has its own mechanisms of regulation. For the export market, there is an extensive list of international certification schemes which are applied to products exported to the US and Europe. For the domestic market, there is a farm certification system, to certify organic farms, developed by the Conseil National pour l'Agriculture Bio (*National Counsel for Organic Agriculture*, CNABIO).

Cultural factors affect the acceptability of, and demand for certain horticultural products. For example, traditional meals require ingredients such as baobab and amaranth leaves, supporting the market for these highly valued products.

Consumer demand can also be influenced by, for example, governmental campaigns promoting healthy diet and the consumption of certain foods. For example, the government has sought to emphasize the nutrition dimension in its latest food security strategy, the May 2017 Multisectoral Strategic Plan of Nutrition. Other government initiatives promote the consumption of local foods.

4.3 Increasing production leads to lower fruit and vegetable consumer prices

4.3.1 Seasonal variation

Seasonal variation influences production, yields and market prices across all products. There are two main seasons in Burkina Faso, a dry season, from mid-October to mid-May, and a rainy season, from mid-May to mid-October. The average annual rainfall is 1,300 mm in the south and less than 400 mm in the north. However, with climate change there is also increasing variability in these patterns.

Prices are lower when crops are in season and abundant, and higher when crops are out of season and scarce. Table 4.3 provides an overview of the availability of different products by month.

Cabbage is produced from June through February with high yields and low prices, with peak season occurring between October and February. March through May cabbage production is more difficult with low yields and high prices. Amaranth season lasts from March to September, when yields are high and prices low. From October to February, amaranth production is more difficult, and as a result, yields are lower and prices higher.

In general, Burkina Faso's hot and humid tropical climate is suitable for the development of mangoes. Mangoes are available in the markets from February to August, with different varieties featuring in the markets at different times. Due to the diversity of soils, mangoes from the Cascade region (Banfora) appear first from February to March. Those of the Hauts-Bassins region (Kenedougou/ Orodara) and the center west (Koudougou), appear later in April. April, May and June are the peak months for mangoes in Burkina Faso.

Papaya is also a plant that thrives in hot and humid tropical climates. However, unlike the mango tree which is a long-term investment of about 8-10 years, the papaya plant begins to produce after six months. When it is well-irrigated and well-fed with manure and fertilizer, it can be harvested every two weeks for six months.

Non-timber forest products (NTFPs) likewise face varying seasons of high and low yields, influencing prices. The baobab tree produces leaves and fruits, with fresh baobab leaves abundant from May through October at low prices. From November to October, fresh baobab leaves are only available from well-irrigated nutritive gardens. Baobab fruits are abundant from December to March at low

prices but are otherwise unavailable. Néré fruits are abundant from March to July at low prices but are otherwise unavailable.

Table 4.3 Production season by crop

	Cabbage	Amaranth	Mango	Papaya	Baobab leaves	Baobab fruit	Néré
January	peak	difficult	difficult	favorable	difficult	peak	unavailable
February	peak	difficult	difficult	favorable	difficult	peak	unavailable
March	difficult	peak	favorable	favorable	difficult	peak	peak
April	difficult	peak	favorable	peak	difficult	unavailable	peak
May	difficult	peak	favorable	peak	peak	unavailable	peak
June	favorable	favorable	favorable	peak	peak	unavailable	peak
July	favorable	favorable	favorable	peak	peak	unavailable	peak
August	favorable	favorable	difficult	favorable	peak	unavailable	unavailable
September	favorable	favorable	difficult	favorable	peak	unavailable	unavailable
October	peak	difficult	difficult	favorable	peak	unavailable	unavailable
November	peak	difficult	difficult	favorable	difficult	unavailable	unavailable
December	peak	difficult	difficult	favorable	difficult	peak	unavailable

Source: Authors' compilation.

4.3.2 The main barriers to increased production

Across products, barriers to production increasingly include natural phenomena (environmental) as well as socio-economic constraints.

Environmental constraints

Naturally occurring constraints include environmental aspects such as soil quality and climate conditions like temperature. Dealing with naturally occurring hazards such as plant disease, parasites, and pests also limits production expansion capacity. Barriers to production expansion are expected to increase with climate change due to greater variability in the environment as well as more hazardous risks.

Market constraints

Unreliable or non-existent market opportunities as well as market instability are major constraints to production expansion. In some rural areas, there is no immediate local market opportunity. Without access to transportation, rural producers cannot enter distant markets without experiencing significant losses.

Even when producers do access the market, the reliability and stability of the market remain unpredictable. Sales contracts are often informal and prices can fluctuate widely.

Another issue is a lack of access to funding. It is difficult for producers and processors to access financing, particularly women.

Technical constraints

Technical constraints affect the entire value chain, from producer to consumer. Production often lacks equipment or makes use of rudimentary equipment, increasing the difficulty of work and decreasing production efficiency. Even with equipment, effective technical methods are not always known or implemented, and there is limited access to advice and support. In addition, lack of access to quality inputs to production remains an important barrier to expansion. Inputs include a fresh and sufficient variety of seeds as well as fertilizer. More basic inputs such as water are also important limiting factors, as water deficiency is common and irrigation is not always prevalent.

Post-harvest, access to preservation through refrigerated transportation and storage as well as processing facilities remains limited. This inhibits the expansion of production as there is little guarantee that additional crops can be transported and utilized.

Social constraints

Social constraints often limit access to land and water, and these constraints are especially important for women who bear the weight of socio-cultural burdens. For example, accessing land is a complex process which may depend on the permission of the land owner, the chief, the mayor's office, and (if a woman) the husband.

4.3.3 Production losses

NTFPs

The volume of losses in NTFP value chains is estimated at about 30% of production. These occur at three levels: production, including pre-harvest and harvest, processing and storage.

NTFPs are mostly found in the natural environment and are suspect to various factors including climate change, pests and diseases, and harmful human activities which can cause losses in pre-harvested volumes. Climate change-related risks include increased flooding and drought. Harmful human activities such as the misuse of pesticides, overcutting, bushfires and premature harvesting can also cause production losses. Demographic pressure from urban expansion is also a threat to NTFPs in certain regions. While the Ministry of the Environment organizes a reforestation campaign every year during the rainy season, planting about six million trees of different NTFP species annually, according to interviewed experts 75% of these trees die with improper care. Finally, losses are also recorded at harvest time during the cutting and bagging of baobab leaves.

During NTFP processing, losses occur during hulling, which is done by hand. For example, during baobab and néré fruit pulp processing, if not performed carefully, sand can contaminate the powder, making it unfit for consumption.

Traditionally, most NTFP products are consumed seasonally with only limited short-term storage needs. Therefore, storage methods have remained archaic and unadvanced. Even within a one-year time interval, products are susceptible to deterioration from yeast, acidity, rodents, termites, and other insects.

Fruit trees

Losses in fruit tree value chains such as mango and papaya occur during production, transportation, processing and trade. Mango losses are estimated at 60%, and for papaya, the estimate volume of losses is 40%.

At the pre-harvest production level, fruit trees are vulnerable to climatic risks, including drought, flooding, strong winds, and climate change, as well as pests and diseases. For mangos, fruit flies in particular may attack fruits growing in the rainy season, destroying 50-80% of production. Fruit flies infestations occur in years with early rainfall starting by the end of May – June. During harvest, produce is often lost to poor technical knowledge and practice. For example, fruits may fall and split open during harvesting, or fruits may be harvested prematurely.

Transportation represents another significant risk to fruit tree products which are grown in rural orchards at distance from urban centers where they are traded and sold. Due to poor road conditions, transport vehicles can get stuck, and significant delays can cause the entire cargo load to rot. These delays represent an important risk given that there is insufficient refrigerated transportation available.

During mango processing, losses are mainly recorded in July when mango is affected by fruit flies. According to a mango juice producer interviewed, juice production sometimes stops altogether at the end of June due to the fruit fly problem. In addition, there are insufficient cold storage chambers, and during the hotter months of April and May, fruit can be lost to spoilage. Losses in the processing link can range from 50-60%.

There are also significant losses during trade of the fruit tree products. The majority of domestic suppliers suffer losses related to product spoilage due to a lack of access to conservation units, including refrigeration and cold storage. There have been government initiatives to help traders but to

little effect. For example, according to market interviews, the state built a cold room at the Bobo-Dioulasso fruit market; however it has never been functional. Papaya is a particularly delicate fruit susceptible to damage from falls or numerous manipulations during trade.

Exported mangoes are inspected on arrival to the importing country. If fruit fly larva is found in a batch arriving in Europe, the shipment is intercepted and the goods incinerated. In addition to the lost goods, the exporter must also pay for the destruction at a rate of 0.50 euro/Kg. There have been increasing domestic quality controls in Burkina Faso to minimize export losses. While in 2017, there were 20 cases of mango interception from Burkina, in 2020 there were only five.

Vegetables

The risk of loss in vegetable cultivation occurs mainly during the pre-harvest phase of production. Low yields are linked to the use of poor seed varieties and inadaptation of appropriate production techniques tailored to specific crops, pest attacks, and plant diseases. Climate variations can also affect production. In Burkina Faso, for example, the favorable period for cabbage production runs from October to February, the dry and cold period, while amaranth peak season is from March to May, the dry and hot period. Yield losses can be up to 50% for cabbage, especially at the beginning of season, and up to 100% for amaranth.

Losses during trade often occur from product spoilage. This includes products originally infected at the time of production, for example, through a pre-harvest parasitic attack, as well as spoilage due to lack of cold storage. Unsold products often wilt by the end of the day and are effectively lost due to lack of conservation.

4.3.4 Barriers to agricultural intensification

While some intensive farming occurs naturally because of the lack of land, such as in urban and peri-urban cultivation, producers face barriers to intensification. General barriers to intensification include a lack of arable land, lack of financial means, low level of equipment available (mostly non-mechanized), and low water availability. The lack of knowledge of intensive production techniques is also an important obstacle. The challenges women face tend to be socio-cultural, such as land and financing access, and reflect the multiple responsibilities that women must take on within the family.

Women face several challenges with regard to market gardening as a family enterprise with a male head of household and these reflect the multiple responsibilities women must take on within the family. The challenges women face tend to be socio-cultural, and reflect the multiple responsibilities that women must take on within the family. Women are responsible for cleaning, cooking, and caring for children and the family in general, estimated at 6.5 hours per day. Within the family enterprise, women work on average 2.5 hours per day in the production season, providing by far most of the unpaid labor force needed (OECD, 2018; + other sources).

Men (male heads of household) exert quite some influence on how women spend their time, giving priority to women working on the vegetable garden of the family instead of ensuring that their spouses have sufficient time to procure or produce the vegetables and herbs needed for the preparation of the daily meals.

*« l'homme ne te laissera jamais aller faire autre chose tant qu'il y'a des travaux au champ »
productrice de Souris. (Da, 2017)*

Intensification of vegetable gardens managed by male heads of households will increase the time women spend on the family plot, to the detriment of their responsibilities to prepare the sauce, soups or stews for the daily meal.

As intensive agriculture requires more attention and follow-up time than standard cultivation practices, the lack of available time becomes a limiting factor for women.

Women who want to start their own vegetable garden for commercial purposes (beyond having a home garden) face additional social-cultural barriers in comparison to men. Women cannot inherit nor obtain customary property rights over land and water, nor plant trees that are a symbol of claiming land rights. At the utmost women can obtain access rights, most often on marginal lands with low access to water for irrigation.

In addition to obtaining permission from the chief, women must obtain permission from their husbands and the mayor to access land. Apart from access to land and finance, access to services delivered by the government are also limited as compared to that of men. Between 61 – 90% of women who earn their own income can decide on how to spend it (OECD, 2018; Da, 2017). Some evidence is available that women who have the possibility to earn an income that is an important contribution to the family income may increase their bargaining power at household level in favor of having more time to earn their own income instead of working as unpaid labor force on the family plot (Parrot et al. 2017; Gross, 2018).

These barriers can be reduced by officially granting women parts of plots provided by their husbands. By organizing themselves in associations and cooperatives, women can also better access credits, subsidies and donations. Government initiatives can promote women through programs targeted at facilitating women's access to land and financial credit.

In the context of NTFPs, nutritive gardens are a form of intensive agriculture. However, this practice of cultivating NTFPs has yet to be widely adopted and as such barriers to intensification still exist. These barriers include cultural factors such as a superstition that it is 'unnatural' to cultivate these trees and a belief that their cultivation could cause bad luck. There is also general lack of awareness and training around understanding that a small portion of land can be used to obtain a good harvest, such as baobab leaves. Harvesting NTFPs is by tradition a female activity as the leaves and fruits are important ingredients for their daily meals.

4.3.5 Availability of inputs

The quality of inputs available in the geographical zones of vegetable production areas and their applications are far from reliable, and while there is general awareness of the situation, the situation has not improved. Often unlicensed, inappropriate inputs are employed without adhering to post-treatment waiting times. The high costs of quality inputs and equipment are also a limiting factor.

Access to the national subsidy program for fertilizers is cumbersome. Producers have to pay transport costs from the regional to the provincial capital, as well as transport costs to their own farms. They must also directly pay for the subsidized fertilizers. Only a few fruit and vegetable growers have access to this program and this excludes those who have smaller plots and less financial reserves to pre-finance fertilizers, including women (Souratie et al., 2019).

While labor is relatively abundant in some areas, few people are trained in the latest cultivation techniques. This situation is exasperated by a mass exodus of young people to cities or mining sites which significantly reduces the labor force in other areas. Most permanent labor forces used for vegetable production are household members, women and children, sometimes in combination with paid workers. This includes 88% of vegetable producers in Region Centre and Centre Ouest (Gross, 2018).

The amount of available arable land is also declining due to population pressure and desertification. Added to this are land conflicts. Women in particular have limited access to land, compared with men.

Beyond land access, women in general are more disadvantaged than men. Other factors of production depend on financial capacity, and for the poorest women financial opportunities are very limited. Furthermore, even if women are entitled to support services, they often lack opportunities to communicate with them which is exasperated by high levels of illiteracy. These factors not only inhibit the reception of services but further impose difficulty in retaining and applying any advice they do receive. In addition, while women are generally more receptive to agroecology methods, they are often overlooked and many of their skills go unrecognized.

Though lack of access to inputs and services remains an important constraint to intensification and especially for women, there are a variety of support services provided by the government as well as some input distribution companies and NGOs.

The Ministry of Environment, Green Economy and Climate Change offers producers a variety of technical services including:

- Making seed available with the National Forest Seed Centre (CNSF).
- Technical supervision through DGEVCC (La Direction générale de l'économie verte et du changement climatique).
- Planting and protection with the DGEF.
- Research through INERA.

Through the DGEVCC, the Ministry has also developed the nutritive gardens initiative to offer technical skills and training to women in the technique of producing baobab leaves in the garden.

The Ministry of Agriculture has branches which reach the village level, and there are agricultural technicians permanently available for consulting support. In addition, there are the many projects and programs that take place throughout the country. Unfortunately, agents assigned to these areas do not always provide adapted equipment to better address the concerns of producers.

4.3.6 Agricultural intensification and women

While agricultural intensification provides opportunities such as increasing income, this can often overburden women because they are obliged to fill traditional roles at the same time. This is especially the case during the dry season when wells and dams dry up and water becomes a rare resource. During the dry season, women must collect water for family and agricultural use. While better organization and working in cooperation with other women may alleviate some of the burden, it does not address deeper issues.

A key question related to intensification is: on whose vegetable plot or orchard is this taking place — those with male heads of households or the vegetable gardens of women?

Men exert quite some influence on how women spend the rest of their day and the intensification of vegetable and fruit crops on their husband's plots means less time for women to carry out their own income generating activities. For example:

- In the Northern region, a development project supported women from poor to very poor households to produce cabbage and onion. Instead of cultivating these in two turns, which was possible through water retention, the women could only complete one production cycle, because their husbands wanted them to work on the household plot: *« l'homme ne te laissera jamais aller faire autre chose tant qu'il y'a des travaux au champ »* productrice de Sourì (Da et al., 2017).
- Women who have the possibility to earn a daily income that is higher than the wages to be paid for agricultural workers on the household field, have started to pay for these workers and continued their own activities in a mango drying enterprise for export to the EU: they earned CFA1,000 (US\$1.85) per day — about the formal minimum wage — and paid the agricultural worker CFA500 (US\$0.93) (Parrot, 2017).

4.3.7 Conclusion

Periods of product abundance are related with lower prices, as observed with seasonality. For example, in-season prices are lower than off-season prices across crops. However, this does not necessarily imply that increases in production will necessarily lead to continually lower fruit and vegetable prices. For example, if a producer is able to expand production beyond the peak season to increase production during the off-season, the producer may be able to fetch higher prices. If this happened on a national or sub-regional level and patterns of product availability changed substantially, it is possible that pricing would change; however, this situation is unlikely to occur in the near future.

Producers face a variety of barriers to expansion and intensification, including difficulties in accessing land or financial resources. These barriers are magnified for women, who face even further difficulties in obtaining access to land. Women additionally face cultural barriers, such as expectations of how they spend their time. Even if these issues are addressed, there is no clear evidence that intensification will lower consumer prices.

4.4 Reducing the cost price will make production of fruits and vegetables more profitable

4.4.1 Production costs

In Gross (2018), an analysis of the Centre and Centre-Ouest regions show that on average, 54% of all expenditures consists of paying inputs such as gas or oil for motorized pumps for irrigation, chemical fertilizers and manure, phytosanitary products and seeds, 31% consists of paying the labor force, 3% consists of other seasonal purchases, 9% of the purchase of materials, and 3% of obtaining access to resources. More than 50% of inputs are chemical fertilizers, and some 25% are seeds. Investments are rather low and consist of acquiring tillage tools, irrigation and fencing, however farmers also create a stock of seeds to be used in the next season, which represents 13% of their revenue.

The financial balance of 80 vegetable producers shows an average profit of CFA680,000 (US\$1,240) with a median level at CFA440,000 (US\$800), indicating that more producers do not reach the average result than those who reach the average or more. Negative balances for vegetable production have also been documented.

For garden vegetables, the cost of cabbage production was reported to be CFA750,000 (US\$1,367) for production on half a hectare. For amaranth, the cost of production on a quarter of a hectare was reported to be CFA125,000 (US\$227). For fruit tree products, mango production was reported to cost CFA193,000 (US\$352) per ha per year, and papaya was reported to cost CFA3,440,000 (US\$6,272) per ha (2,500 plants). Production costs for the harvesting of néré and baobab products have not yet been financially accounted for but are part of the time spent by women on household chores and care.

4.4.2 Effects of cost reduction strategies

On a micro-scale, the cost of production does not affect farmgate selling prices. These prices are affected by other factors such as the season (production period) and market opportunities. In general, buyers set the prices and there is little room for negotiation (which is especially the case for NTFP). For example, for exported products, such as mango, value chain actors set a price which allows Burkinabe exporters to remain competitive in the international market, and the farmers accept this price.

If yields are high, for example due to intensification, a reduction in the farmgate price will not negatively affect the producer's income. However, if, despite the reduction in the cost of factors of production, the yield is still low, the farmgate price reduction will negatively affect the producer's income. Therefore, it is the farmer that takes the loss when a remunerative price cannot be negotiated. As described by Gross (2018), family labor, including women and young adults, and women's gardening plots could be a sort of buffer for when farm gate prices go down. Of course, there are still implicit losses in unpaid labor and time, especially affecting women and youth workers.

At the macro-level, however, production costs and yield can influence farmgate prices. Lower production costs can lead to optimal input use and good maintenance of plots. This has a positive impact on yields, and if a product becomes very plentiful this can lead to a reduction in its selling price. This is similar to the high season when produce is plentiful and prices are low. Higher yields could also lead to a boost in farmers' incomes.

4.4.3 Conclusion

Production costs are mostly comprised of inputs and labor, together accounting for 80% of costs. Changes in production costs do not affect farmgate prices as farmers tend to be price-takers and are subject to market prices. By improving yields, for example through intensification, farmers can maintain stable incomes when prices are low.

4.5 Efficient value chains can lead to lower fruit and vegetable consumer prices

4.5.1 Increased value chain efficiency

The efficiency of the value chain leads to a harmonized field edge price and a reasonable price for consumers. For mango, Burkina Faso is regionally the most competitive in terms of production. As a price comparison, the farmgate price of mangoes is 250f per kg in Ghana and Senegal, 150f per kg in Côte d'Ivoire whereas only 100f per kg in Burkina Faso. Today in Burkina Faso, 7 t are around 500,000f. Producers are relatively satisfied with these prices even if they are not comparable with other countries.

4.5.2 Coordination in the value chain

To achieve greater efficiency, the fruit and vegetable sector needs to be well structured and a true valuation of production is required in order for hygienic and safe (not contaminated with pesticides) products to be sold at fair values. In addition, value chain actors must be able to grasp the opportunities in their environment which could be encouraged through local and national government interventions.

Generally, the government can support actors in value chains through recognition, strengthening advisory services, facilitating access to specific quality inputs, organizing better measurement processes in product sales and price setting. The government has already developed a strategy to promote and enhance non-wood forest products with action plans rolling out between 2011 and 2025. This strategy takes into account the development of value chains through actions to strengthen organizational, technical, operational and regulatory capacity. Similar promotional strategies could be adopted for other products, such as the development of a national fruit-specific policy, with a strategy and project for the development of fruit sectors, appropriate communication on these sectors for their promotion and integration into food menus or rations, and better supervision of the players in the value chain of these sectors.

4.5.3 Secured markets

A guaranteed market leads to an increase in production and an increase in revenue for the players. Secure and structured markets are especially advantageous for small farmers. However, the value chains for amaranth, cabbage, baobab and néré are not organized, and so unlike vegetables such as tomatoes and onions, there is little market guarantee.

Informal agreements do however have a role to play. In peri-urban areas there are informal agreements between producers and resellers. A study by Ouédraogo et al. (2020) of vegetable producers in the Hauts - Bassins region and Houet province found that despite nonexistent contributions by financial institutions, an important number of producers receive finance (working capital) through informal agreements with wholesalers from the most important markets of Bobo-Dioulasso. This situation makes them dependent upon these wholesalers. A study by Gross (2018) in the Centre and Centre-Ouest regions also shows trends among young adult vegetable producers (typically unmarried men) for specific crops who receive working capital from investors in control of an often export-oriented value chain. Both the producer and investor share the benefits.

Market guarantees can come through formal contracting, though this really only exists for the export market. For exported mangos in Bobo-Dioulasso, there are contracts between international buyers and exporters and between exporters and producers. Mango exporters (dry or fresh) have access to financial services at an interest rate of 8-15% if they are in line with export requirements. This is working capital, or cash flow, for the season and not for long term investments. Some of the organically certified enterprises receive funding from their European counterparts. However, an increase in drying units for mangoes exported to Europe, means that supplies are increasing faster than demand (Agri logic, 2019).

The government also has a role in securing markets by supporting the organization of small producers into cooperatives, improving networking, building outlets for fruit and vegetable sales, promoting contract farming, facilitating access to credit, and supporting standardization. The government could also contract with the producers of the markets to supply the school canteens.

Farmers and intermediary actors however can act independently to obtain market security by organizing in cooperatives and associations or by adopting contract farming. By grouping together as a cooperative, producers can secure a minimum price guaranteed.

4.5.4 Women in the value chain

Women are present throughout the six selected value chains, though this varies greatly by crop and by point along the chain.

Value chains for vegetables

The focus group discussions with private sector actors revealed that women are strongly present in all links of the chain from production to retail. In a sample of amaranth growers on nine different sites in Ouagadougou, 78% were female. These production sites are very close to the street markets where women sell the fresh amaranth at a reasonable price. The most important benefit of amaranth is that it is available all year round, which is one of the reasons why people demand it. It is highly perishable so requires very short distances between the production and consumption site (Hilou et al., 2016). Because amaranth grows within three months, it is an important crop for vegetable producers who do not have enough working capital or need more working capital to grow vegetables that require longer production cycles (Ouédraogo et al. 2019; Gross, 2018). The same focus group discussion also mentioned that men have a monopoly on cabbage production while women have a strong presence in wholesale, retail and transportation. For cabbage, women are deterred by the difficulty of accessing land and the relatively long production cycle of 3-4 months. In the Hauts-Bassins region where cabbage is the most important crop produced (88% of respondents in urban, semi-urban and rural settings), the percentage of male producers approaches 100% (Ouédraogo et al., 2019). The same applies for vegetable production in the 'Region du Nord', where cabbage is also among the most frequently produced vegetables: women are mainly involved in processing and commercialization of cabbage and occasionally have their own garden (Catalystas, 2019).

Fruit trees

For the fruit trees products mango and papaya, men are more involved in production, collection is mixed, and processing and retail remain the domains of women. The main reasons for this are: that women can hardly obtain customary land ownership titles that allow investment in mangoes for at least 20 years; and cultural beliefs do not allow women to plant trees as these are symbols for claiming land ownership.

In the domestic mango sector, nearly all retailers are female and some 30% are semi-wholesalers. 30% of the mango processing units are managed by women and 86% of the temporary labor force is female, who mostly export dried mangoes. However, the national mango juice factory (Dafani) also employs many women and currently produces for the domestic market. No further documentation is available with regard to the role of women in the papaya value chain.

Collecting fruits, vegetables and firewood is part of the household chores of women, as is the processing of these NTFPs and their marketing. A recent trend is that baobab trees are being cultivated and, after two months, start to produce fresh leaves all year around. Current figures show there to be 308 nutritive gardens currently in use.

For baobab and néré, women are the majority in harvesting (75%) and completely occupy processing and retail (100%), whereas exporting remains a male activity (100%). An exception to this is baobab fruit where for marketing female prominence is only 75%. For the wholesale trade there is an equal proportion of men and women, with the exception of baobab leaves where women are involved at 75%.

4.5.5 Conclusion

Value chain efficiency depends on structured and coordinated value chains as well as market security. While the government has offered a variety of support services, domestic value chains in Burkina Faso remain largely informal, unstructured with low levels of coordination. Formal contracting, offering market security for producers, is rare and most contracts rely on informal agreements. Women are often in the informal sector. For example, the non-timber forest product sector operates mostly informally and women are in the majority along much of the value chain.

4.6 Intermediary actors communicate consumer needs to producers and jointly develop innovative food products

4.6.1 Linkages between traders and consumers

Traders and processors can connect through organized efforts such as product promotions, fairs, and supermarkets. However, most often there is no concrete connection with information passing instead through word of mouth and within networks, therefore forming informal connections.

Processors try to meet the needs of their customers by taking their requirements into account when ordering. An example is pre-prepared dishes and meal kits with cabbage and amaranth which have become popular in urban areas.

The most common consumer preferences are that vegetables and fruits have an overall good esthetic appearance. Of course, there are local preferences as well such as red amaranth being prized in Bobo-Dioulasso and green in Ouagadougou. However, higher income consumers who are more educated increasingly look for products that they also perceive as hygienic and safe, i.e., without pesticide residue.

More and more producers are also making direct connections with consumers, circumventing sellers. This is especially common in the growing niche market of organic and agroecological produce which has grown to meet the demands of higher-income consumers. This in turn has resulted in the emergence of alternative mechanisms to certify products intended for the local market. For example, in local markets in Ouagadougou there is a participatory guarantee system which is complemented by the Local and Solidarity Partnerships for Agroecology movement (Tapsoba et al., 2020).

4.6.2 The role of women

There are several examples of successful female entrepreneurs working in both production and processing. For example, in production we have the example of Mrs. Kassongo a papaya producer in the Haut Bassins region (see Box 4.1). Located 15 km from Bobo-Dioulasso, she currently operates fruit production on a total of 8 ha, including 2 ha of papaya. She employs six permanent staff to cultivate papaya and about 40 contractors to plant, irrigate and harvest the crops.

In processing, there are various examples of processors of non-timber forest products, which is a female-dominated activity. One example is Ms. Bibtou who works with baobab leaves and pulp. Ms. Bibtou sources fresh leaves from producers in Kaya, 100 km north of Ouagadougou. To process the leaves, she washes, dries and grinds them before packaging the leaf powder. She also sources baobab pulp from a producer in Po, 142km south of Ouagadougou, to produce baobab juice. Another example is Ms. Gongowho who sources néré pulp to produce cakes which she sells in certain supermarkets of Ouagadougou. However, these cases may be considered somewhat exceptional, and their success is yet to be seen on scale.

Traders pass on consumer requirements to producers such as preferences for certain varieties of cabbage and amaranth. For example, the trader approaches the producer and asks for a particular product to meet the need of a large customer. If the producer is convinced that this market provides new opportunities, then he will make the necessary adjustments to production in order to meet demand.

One emerging consumer trend is concern over the inputs used, particularly pesticides, in vegetable production. This has motivated the emergence of agroecological and organic farming. This in turn has spurred the development of an alternative mechanism to certify products intended for the local market through a participatory guarantee system which is complemented by a Local and Solidarity Partnerships for Agroecology movement in the local markets of Ouagadougou (Tapsoba et al. 2020).

Box 4.2 La Saisonnière: Empowering women through agroecological and organic vegetable farming

From teacher to founder of La Saisonnière Association

As a high school teacher of natural sciences, Mrs. Sedgho helped disadvantaged students and their parents earn an income through extra-curricular activities including soap production and sales. After retiring from teaching in 2001, Mrs. Sedgho organized a group of women to produce vegetables in 2003, which was formalized as an association, La Saisonnière, in 2006.

The La Saisonnière association has three working principles: the good, the clean and the just. The association focuses on recruiting vulnerable women who often come from precarious informal work situations, offering them a well-paid position in agroecological vegetable production with opportunities for professional and personal development. Today the association includes more than 100 vegetable producer members and, beyond vegetable production, also runs training programs to improve the socio-economic empowerment of women, including programs on sewing, carpentry, reproductive health, and functional literacy.

Choosing agroecological and organic farming

The La Saisonnière association began with conventional farming techniques but switched to agroecology in 2010 following complaints from neighboring residents about chemical odors, soil degradation, and association members developing health issues. Today, soil quality has been restored, and all organic fertilizer and pesticides are produced by the association itself. La Saisonnière produce is officially certified as agroecological by the National Council for Organic Agriculture (CNABIO). This certification is also an important marketing opportunity for the association.

Production and profits

There are two production sites located in Bendoga and in Ouagadougou at the Pan-African Institute for Development West Africa and the Sahel (IPD AOS). About 40 women work on each site along with a site manager.

Each site accommodates around 300 beds of vegetables measuring 10 m² each. Each woman is responsible for seven beds, rotating the vegetables grown seasonally to avoid soil depletion. The women pay CFA3,500 (approximately US\$5) each per year for the land and make a profit of CFA137,000



(approximately US\$254) for one season of amaranth or CFA64,343 (approximately US\$120) for one season of cabbage.

Local vegetables including amaranth, kenébodo, sorrel, African eggplant, okra, and bourouvaka are produced from April to September. After, carrots, cabbage, salad, cucumbers, parsley, celery, tomato, and onions are produced from September to March. There is also a small garden of dwarf baobab trees which produce leaves harvested from June to September.

Benefitting from short value-chains

As the consumer niche for agroecological produce is growing, the La Saisonnière association has developed a strong loyal consumer base of about 100 clients and sells consistently to another 100 customers. Customers are registered in a WhatsApp network, and are in direct contact with the association. This short value chain builds trust between the producers and clients who are assured of the quality of the produce they purchase. At the same time, this shorter value chain also allows the association to avoid selling through wholesalers — who they discovered to be mixing their products with lower quality, conventionally grown products to increase their own margins. Selling directly to the customer also



allows the association to maintain higher profit margins compared to selling through an intermediary.

In terms of processed products, processors have developed innovative products to meet consumer demands. For vegetables this includes ready-to-use meal kits. For fruits, a small market exists for dried products such as mango, and there is increasing demand for juices. For non-timber forest products, processors produce more traditional products including dried baobab leaves, baobab juice, and *néré* cakes, though there are also innovations such as baobab coffee (TedoJuice).

4.6.3 Information sharing

Trust plays a central role in Burkina Faso's food system. Consumers form networks with each other based on trust. Consumers also rely on retailers and sometimes directly on producers whom they trust. Finally, producers make informal agreements with traders based on trust.

Trust is fostered by frankness and honesty, the availability of actors, and a diversification of means of communication. Therefore, when actors are more accessible to their counterparts and willing to share information, this builds trust. Communication can be conducted broadly, for example through workshops, fairs and networking, as well as more directly through meetings, WhatsApp groups, email and telephone. With increasing adoption of digitalized communications, there is an increasing trend of e-sales by producers and processors through social networks, which requires a high level of trust between the buyer and seller.

The Burkina Faso government can play a role in building trust and improving information sharing. Presently, the government has implemented various innovation platforms, fairs, promotional days, as well as national and regional fora to foster broad information sharing. Non-timber forest products also have a platform and monthly and quarterly food production and product price newsletters.

The government could go further by taking action to improve the organization of the value chain, for example, by strengthening the capacity of actors along the chain which would help information flow more efficiently. The gender component in value chains must be taken into account, as women often have less access to communication tools and are *more likely to be illiterate making such tools inaccessible*.

Lack of trust in enforcement of standards at the production level as well as retail has led to the development of shorter value chains where consumers prefer to purchase directly from producers. This cultivates higher levels of trust, and consumers have confidence in the products. This is especially the case for organic and agroecological products preferred by higher income consumers. Because

retailers tend to mix standard and organic produce at the market, consumers prefer to source directly from the producer.

4.6.4 Conclusion

Trust is central between actors in the value chain, and consumers — especially higher-income — increasingly want direct contact with producers. This has spurred the development of shorter value chains which foster transparency, building trust. Technology such as WhatsApp has increased information sharing and been critical in producers directly marketing their produce to consumers. Women have especially benefited from these shorter production chains, both as producers and consumers. As producers, women can capture margin typically lost to intermediaries and build trust with their clients. As consumers, women can be assured of the quality of products which they are purchasing.

4.7 Increasing the volume and diversity of fruit and vegetable crops

4.7.1 Introduction of new fruit and vegetable varieties

Introducing new vegetable and fruit varieties on the market may lead to more consumption in certain cases, though this cannot necessarily be generalized. For example, for cabbage and amaranth, while there are multiple varieties on the market, consumers develop preferences for certain varieties, such as laitue cabbage, and tend to focus their consumption on these. It is not clear if having multiple varieties increases the overall levels of consumption, or if consumers consume the same amount but of their preferred variety.

However, new varieties that introduce new characteristics to production could allow for increased production. For example, the introduction of new varieties to improve flavor and texture, the ability to be processed and preserved, and to be produced year-round can contribute to increased fruit and vegetable consumption. While no new mango varieties have been introduced in the last 10 years, new papaya varieties have come to the market, including orange and yellow flesh varieties, which have increased consumption of domestic produced papaya and challenged imported papaya

Aside from variety introduction, new production technologies can also spur increased fruit and vegetable consumption. At the farm level, for example, through innovative cultivation techniques in the nutritive gardens initiative, there is permanent availability of fresh baobab leaves year-round. At the processing level, with multiple processing initiatives developing, consumption of baobab and néré pulps are increasingly accessible, encouraging consumption.

4.7.2 Consumption trends

Cabbage and amaranth are among the most consumed vegetables in Burkina Faso and are used in daily dishes. Cabbage is available from June to February and amaranth is available from March to September.

For fruit tree products, consumption typically follows production seasons: March to August for mango and year-round for papaya. Consumption has increased with processing, e.g., mango juice and dried mangoes. Papaya consumption increases during certain holiday seasons, such as Lent.

Fresh baobab leaves harvested from forests are available and consumed from May to October, whereas fresh leaves from cultivated trees in nutritive gardens are available year-round. Baobab fruit is available from January to March and néré fruit from March to July. The products are consumed more in areas where the tree species is more present. For example, baobab is more present in the northern and Sahel regions for baobab whereas néré is more present in the regions of the Centre-Ouest (Leo) and Haut Bassins (Bobo-Dioulasso, Orodara).

Cultural traditions are also linked with geographical zones, so demands for different fruits and vegetables differ according to traditional recipes and customs. This is also tied with what is available according to the climate. For example, in the regions of Nord, Sahel, central West and South central, baobab leaf sauce is more regular in the family menu than in other regions where there are other varieties of vegetables for sauces such as okra. It should also be noted that baobab fruit pulp is consumed more than néré fruit pulp.

4.7.3 Conclusion

New varieties of domestic papaya on the market have increased consumption of domestically produced papayas. However, this is because the new papaya variety competes with the imported variety. This is more indicative of consumers tending to gravitate towards existing preferred varieties which differ by region and are influenced by cultural traditions.

4.8 Fruit and vegetable prices are higher than other food categories

4.8.1 High prices of fruits and vegetables

Prices for fruit and vegetables are still high compared to other local food products, such as staple foods like cereal grains. Reasons for this include perceptions, imports, price regulations, production and transportation costs, perishability and seasonality.

In terms of perceptions, on the consumer side, there is a perception that certain fruits and vegetables are luxury products and so expect to pay higher prices for these products. On the flip side, market actors consider consumers as price resilient and will buy products even if prices increase. This is particularly the case with mangos where traders consider mango to be a prized product which consumers are willing to spend more on.

In addition, domestically produced fruits and vegetables are on the market with relatively expensive imported fruits and vegetables. While this import competition in some cases could drive down the prices of domestic produce, in other cases domestic produce may be able to offer similar price levels.

Other products on the market, such as cereals, have price regulations to ensure affordability and accessibility. Fruits and vegetable prices however are not regulated, and while they fluctuate throughout the year, they may remain high enough that they are out of reach for the lowest income households.

Some of the most important contributing factors to high fruit and vegetable prices is the cost of production and transportation. The highest cost for production is the cost of inputs. This high cost typically excludes the implicit costs of family labor used in production. Beyond the costs of production, there are transportation costs, which although scarce, tend to be high, especially for products travelling from remote production zones to rural areas. High production costs may also account for why there is limited number of fruit and vegetable producers — and collectors in the case of non-timber forest products — which in turn leads to supply being lower than demand and therefore higher prices.

In addition, there are economic risks involved due to the implicit perishability of the products. On the one hand, producers may sell their products for a cheaper price because they cannot risk waiting and being unable to sell once their harvest spoils. On the other hand, traders incur a risk in taking highly perishable products and therefore can charge consumers an elevated price because of this. The risks of perishability are especially high due to the lack of preservation infrastructure (e.g. refrigerated trucks, cold storage rooms), the low level of processing, and inadequate transportation and logistics.

Tied to perishability, the seasonal nature of production also highly influences prices. During the high season, there is an abundance of fresh produce in the markets, and thus, prices are lower. However, when products are not in the peak of production and are scarcer, prices are higher. Therefore, farmers who can extend their harvesting period beyond the peak hold better price-setting power in this off-season. For example, farmers with access to water for a longer period can produce over a greater number of months and obtain higher prices in the dry season.

4.8.2 Price differences

The physical accessibility and seasonality of fruit and vegetable products could explain differences in pricing between product categories. For example, the farther the product comes, the more expensive it is. Therefore, considering the remoteness of fruit orchards from consumer centers, this could explain higher prices for certain fruits. This is compounded by varying transportation needs depending on the product. In fruit for example, there is a lack of fruit transportation specialists.

Nonetheless, depending on seasonality, not all fruits and vegetables are expensive. While a kg of imported grapes or local strawberries costs CFA3,000 (US\$5.3), in season mangoes will only cost CFA500 (US\$0.88)

4.8.3 Conclusion

Fruit and vegetable prices are higher than other staples foods, particularly cereals. In part, this has to do with policies designed to make certain products such as cereals affordable. However, the higher prices of fruits and vegetables are also reflective of the higher production costs and perishability compared with other staple crops. Variability between crops can depend on differences in accessibility and seasonality.

4.9 Women's participation in fruit and vegetable production and value chain operations leads to higher income and empowerment for women

4.9.1 Examples of women in fruit and vegetable production and value chains

Focus group discussion participants provided several successful examples of women fully integrated in profitable fruit and vegetable production and value chain operations. On the production side, this includes female grower associations, some of which have adopted agroecological cultivation to serve the growing market (Box 4.2). As processors, women typically work as individuals or in groups and associations. Lastly, in urban and peri-urban areas, many women work as sellers and retailers.

Various factors affect the success of female integration including personal traits as well as the socio-cultural environment. Personal traits were identified as initiative, commitment, motivation, leadership, determination, perseverance, risk-taking, vision, combining know-how with knowledge, and innovation. Environmental factors included network, culture and tradition, and market circumstances. Women with a better network should have increased accessibility to the resources necessary to integrate and innovate. On the other hand, women usually need men's permission to pursue economic activities away from the home. In addition, secure and guaranteed markets for products must exist.

The experiences of these individuals can be scaled by using these examples as reference points and capitalizing on them, modelling patterns of experimentation and promoting these models. To encourage women to try these models of success, a mentoring system could be developed to supervise young women.

Currently, there are some training programs available for women interested in joining the fruit and vegetables industry, and these industry promoters have benefited from technical and financial support from the government.

4.9.2 Commercial pathways

Commercializing and scaling fruit and vegetable value chains may increase women's control of their personal incomes, and the control of their time spent in favor of time spent on their own economic activities. This requires the consent and moral support of their husbands and the extended family. Apart from these social-cultural burdens to be overcome, other factors are to be taken into account to increase women's income and their empowerment, such as training and education, access to finance and to appropriate and modern processing technologies. Furthermore, at the macro-level, women's equal participation in the agricultural sector has the potential to increase Burkina's GDP from 15-20%.

Women need to have more access to primary education and to professional courses to enhance their entrepreneurial, financial, management skills and those skills required to scale up their participation in the processing and trading of fruits and vegetables. While those courses may exist, women often have less access to training opportunities than men, so accessibility for women must be prioritized. Training should also focus on finding ways of adding value to activities, such as storage, processing and trading skills including transport and allowing direct sales. A 2019 survey of garden producers found that female producers who also invested in sales earned higher incomes (Souratie et al., 2019).

Access to finance to acquire work capital is also of utmost importance. Women not only need to become acquainted with obtaining work capital but their access to those financial institutions, supporting the scaling up of storage, processing and trading of fruits and vegetables need to also be addressed.

However, training and access to finance alone are not sufficient, as men (usually husbands) tend to hold the most authority and monetary power in the household. Women's financial autonomy is limited because they have limited decision-making power over their own revenues. At the national level, 14% of women are not consulted when their revenues are used for expenditures by their husbands, parents or other family members. In 50% of households, daily decisions are made by men only, and this rises to 80% of households for long-term investments. The main factors behind this are poverty, education levels and living in rural areas (OECD, 2018). Therefore, even if a woman begins to become financially successful, the husband may hinder his wife's empowerment by increasing her household burdens.

Nonetheless, the power dichotomy in a household may depend on the relative earnings of the male head of the household and the woman. For example, if the woman's income becomes important in a household where the male's income alone is not sufficient, then the woman may gain bargaining power. However, if the male's income is already substantial, then the woman's income may be considered supplementary and used primarily for children's needs, personal female needs and daily meals (Gross, 2018). In general, the use of revenues obtained by poor to very poor women are used for food and nutrition, school fees and women's and children's clothing (Nadège, 2017). It's important to note also that both men and their wives have their own autonomous space: women do not always know what their husband is doing, and men may not know how much women earn (Heron, 2016).

New approaches and strategies must consider this cultural context and involve men in order to facilitate the integration and understanding of men. Promoting women's financial independence is important because women typically invest up to 90% of their revenues in their families and their community in contrast to men who invest only 30-40% of their revenues in their families (OECD, 2008; Souratie et al., 2019).

The most important pathways towards increasing women's economic participation in the long term include:

- Addressing cultural perceptions, norms and practices that influence the division of labor and control over production factors at household and community level, in particular that of girls and boys.
- Addressing the gendered relations between household income and expenditures for healthy food.
- Increasing literacy levels of boys and girls beyond that of primary school.

These pathways towards increasing women's economic participation preferably are based upon increasing their financial autonomy rather than contributing to the production of fruits and vegetables by the male head of household as unpaid labor force.

Despite the barriers, some women are achieving financial autonomy. The organization of women into formalized associations, women's cooperatives, and federations can help increase the income controlled by women. This for example, may give women a space to keep their earnings and to re-invest in their own businesses outside of the household and therefore outside of their husband's or family's control. Further organization increases women's financial autonomy through increased access to production inputs, processing equipment and storage facilities. This requires organizational, financial, commercial and technical competencies and helps women to benefit from economies of scale and find more attractive markets. A federation that processes, innovates NTFP products like the baobab fruit, which currently has a status of superfood, and commercializes other NTFPs is expected to reach many more consumers in urban areas who currently do not trust the quality of processed NTFPs nor like their taste. Other examples of women's associations are CEPROFEM (Cercle d'Éveil pour la Promotion de la femme), which produces dried mangoes, mango juices and confitures.

There are also examples of successful female entrepreneurs who tend to be well-educated women who have started their own businesses (see Box 4.3 for the example of Danie's Cake). These women source their primary resources from their villages of origin through socio-culturally defined networks and have direct relations with their clients who trust the quality and like the taste of the product. A survey conducted by the Chamber of Commerce and Industries among female entrepreneurs formally registered (9% of all registered entrepreneurs in 2012), shows that 24% of the women interviewed were younger than 30 years; 75% of these entrepreneurs had a master or PhD degree, or had finished secondary school (CCI-FB, 2018). This in sharp contrast with 80% of the population of 25 years and older not having any instruction level at all (INSD, 2015).

Examples of successful female entrepreneurship include moderately sized processing units: Agrodéogracias in Ouagadougou, processing and marketing local fruit juices; Tout Super in Ouagadougou, processing and marketing of agro-food products, or women who are producing tomato sauce for the 'high-end' consumer market (Catalystas, 2019).

Most of these female entrepreneurs face difficulties in obtaining access to finance (53% of interviewees) and are 35% are confronted with administrative bureaucracies (CCI-BF). Strategies to support these entrepreneurs could consist of informing them about procedures to access finance and to stimulate them to become members of an association of like-minded entrepreneurs like business-hubs.

Box 4.3 Danie's Cake: Female Entrepreneurship in NTFP Processing

A passion for patisserie

Mrs. Delma Danielle Gongo's interest in patisserie started in high school where she sold cakes to her classmates. After graduating from university with a Master's degree in Agricultural and Environmental Economics from the University of Koudougou in 2009, Mrs. Gongo started her business Danie's Cakes with a loan of CFA10,000 (US\$19) from her mother, selling her cakes in shops and supermarkets across Ouagadougou. Today, Mrs. Gongo employs thirteen staff, and services 15 cities.

Néré Cakes – the Importance of Quality Inputs

Danie's Cakes often faces supply problems for two critical inputs for production: eggs and néré. For eggs, the main problem is shortage, such as during the holiday season. For néré, the most important problem is quality. In 2017, Mrs. Gongo planned the launch of a new product: néré cakes. However, the néré pulp purchased was contaminated with sand, and product launch had to be delayed to 2018. To circumvent the issue, in 2018 Mrs. Gongo ordered néré pods and staff extracted the pulp themselves. However, with poor storage conditions for the néré pods, a considerable amount of stock was lost. In 2019, the néré cake was finally launched, though there have been continuing issues in finding reliable suppliers of either quality néré pulp or of néré pulp.



Insights into the néré Supply Chain

From her experiences in sourcing néré, Mrs. Gongo observed several value chain inefficiencies. First, pricing for both poor quality and high quality néré pulp were found to be unexpectedly low, at a price of CFA750 (US\$1.39) per basin. Therefore in addition to improving the production conditions of néré pulp to prevent product contamination, néré pulp could be marketed at higher prices. Further, more reliable supply of néré pods and pulp could also increase product demand among processors.

Production and Market Opportunities

Cakes are produced by a team of 3 women and 1 man, led by a professional pastry chef. The team packages cakes in either sachets or boxes, with more delicate cakes requiring the box packaging. Cakes are currently distributed by a team of five, using two motorcycles and a van. The main market, Ouagadougou is split into five distribution zones which are serviced three times a week.

Accounting for all costs of input and distribution, current revenues amount to CFA1,500,000 a week (US\$2,770). Profits amount to 5-10% of revenues (US\$139-277). Current demand exceeds production volume, and Mrs. Gongo plans to expand production capacity such as through staff recruitment, new production space acquisition, and capital investments (equipment, distribution vehicles).

Mrs. Gongo also looks to expanding market opportunities. For example, the box packaging necessary for certain cakes is not affordable to most customers outside of Ouagadougou. As a means of market expansion, Mrs. Gongo is looking into sourcing lower priced boxed packaging in order to deliver a greater variety of more affordable products to clients outside of Ouagadougou.



4.9.3 Business models that work for women

Economic activity that better promotes the inclusion of women and the development of their leadership can include, production, processing and sales, though this varies by product. For example, in mango the most important opportunities for women are identified in processing, whereas in papaya the most significant opportunities are in production and sales. Roughly 30% of mango drying units are owned by women, and an estimated 86-90% of employment in processing and exportation of mangoes is female (Agri Logic 2019; Parrot, 2017). While dried mango is currently predominantly export focused, a niche domestic market does exist.

Key to enabling women's ambition and projects is addressing the socio-cultural burdens they face in addition to their usual activities. Addressing these strategies should bring men and women together in the same financial empowerment projects. In particular, because it is usually men who have the decision-making power, awareness must be drawn to women's rights and value. This of course must be done bearing in mind the cultural sensibilities of different localities. For example, women in Tchériba are culturally autonomous, while those of Boulbi are subject to male decision-making. As a result, working to empower women in these two communities could differ significantly, with more acceptance in Tchériba and resistance from men in Boulbi. Addressing cultural barriers facing women is especially important in lifting the social burdens associated with women's access to land and orchard planting for fruit trees.

Cooperatives and associations have been found to be important and supportive structures for female inclusion and development. For example, the Fédération Nationale des Femmes Rurales du Burkina (FENAFER-B, National Federation of Rural Women of Burkina) assists women in accessing land rights. Another example is, the Fédération des Industries Agroalimentaires du Burkina (FIAB, Federation of Agri-Food Industries of Burkina Faso) which defends the interests of its members, facilitates their access to training, funding, and assists members' participation in product promotional fairs.

In addition to cooperatives, female inclusion, social, and economic empowerment depends on financing and access to credit. This could be through financial institutions, such as a micro-credit program or through an association or cooperative with an organized system of savings and internal loans.

While access to land and financing are necessary for the inclusion and success of women in fruit and vegetable production, it is also important to ensure that women have access to innovative, high-performance, and low-cost technologies. This is important for producers, processors, and retailers. Technologies include production and processing technologies as well as communication technologies enabling women to interact with the networks and clients.

4.9.4 Conclusion

Female integration in the value chain has been successful though depends on a variety of factors. As women face problems such as access to credit and skills training, grouping together in associations or cooperatives has proven beneficial. In addition, depending on the sector, different parts of the value chain are more accessible to women than others. For example, in the mango sector, the processing sector offers the most important opportunities for women. Finally, awareness raising, and educational programs which target men to foster the empowerment of women would also be beneficial as men typically hold positions of authority in the household.

4.10 Public enforcement of standards will enhance food safety for fruit and vegetable consumers

4.10.1 Relevant standards

There are national, regional and international standards in Burkina Faso. Standards include those determining the appropriate use of fertilizers, seeds and processing substances as well as regulating hygiene practices, storage methods, and packaging. Standards are often assessed through certification systems.

National standards include standards for regulating food production, including farming practices as well as food processing. The Agence Burkinabé de Normalisation, de la Métrologie et de la Qualité (ABNORM, *Burkina Faso Agency for Standardization, Metrology, and Quality*) is responsible for implementing the national policy on standardization, certification, quality control and promotion, metrology and accreditation, as well as for drawing up national standards from the identification of needs and acquiring approval for implementation (WTO, 2017). ABNORM provides technical guides and support to encourage implementation. The Direction de la Protection des Végétaux et du Conditionnement, Direction Générale des Productions Végétales, Ministère en charge de l'Agriculture (DPVC, *Directorate for the Protection and Packaging of Vegetables, Directorate General of Vegetable Production, Ministry of Agriculture*) is also responsible for phytosanitary measures. There is also a national agroecological certification program for farms.

There are also standards at the UEMOA level such as those for non-timber forest products. However, the application of these standards at the national level remains unknown.

Most of the standards and private certifications exist for exported products, such as mango. Inspections for these export-oriented products are done by the certification bodies themselves. However, some of these certifiable products also end up on the domestic market when, for example, they are rejected from the export market. However, this is not an area which has been capitalized on. International standards include ECOCERT, CERTISYS, FLOCERT, WFTO, HACCP, and Global GAP.

Standards enforcement is performed by the responsible authorities through the establishment of control or monitoring committees, field inspections and laboratory analyses. Monitoring compliance with standards through controls makes it easier to certify production.

At the national level, the National Public Health Laboratory (LNSP) of the Ministry of Health carries out sanitary controls which are confirmed by a sanitary quality certificate. DPVC operates a network of 21 phytosanitary control posts on the land borders and at Ouagadougou Airport (WTO, 2017).

However, the reality is that controls are not common and there is a low level of follow-up by public authorities. The standards and certification processes are far from straightforward, and products do not have quality standards. Although the presence of product certification structures has led to a certain level of awareness, the perception of various actors is that standards are challenging and difficult for producers and processors to achieve.

Aside from increasing enforcement, there are other ways the government could intervene to encourage the adoption of standards. The government could better support the implementation of standards through increasing awareness of what standards exist and how to apply them. Likewise, the government could subsidize standards so that implementation is accessible to actors.

4.10.2 Consumer trust in local standards

Most often, domestic consumers are not always sufficiently informed about standards to appreciate them. For those consumers who are informed of the existence of these standards, they value them. However, those who value standards are often also aware of the limited enforcement of standards on the domestic market. Beyond lack of enforcement of product standards, there is the additional problem that retailers often do not respect standards and will dilute a batch of organic produce with non-organic produce to increase their own profit margins.

Certain certifications however are trustworthy, such as the CNABIO (Conseil National pour l'Agriculture Bio) national program for certifying agroecological farms. Educated buyers will therefore buy directly from these farms as well as other farms they trust will implement the correct production methods. In this way consumers circumvent retailers who they lack trust in.

4.10.3 Conclusion

There are public standards and mechanisms for quality control; however, in practice these controls are seldom performed, and standard enforcement is minimal. Private standards exist, though mostly for the export market. While most consumers are uninformed, there is a growing niche of concerned consumers, aware of both the problem of lack of enforcement in production and the lack of respect for standards by many retailers. There are a limited number of certifications on the domestic market considered trustworthy.

4.11 Nudging and public extension will improve fruit and vegetable consumer awareness and consumption preferences

4.11.1 Policies and strategies

Specific policies and strategies have been developed and implemented to promote healthy eating among the Burkina Faso population. Current nutrition policies are mainly focused on combating malnutrition and micronutrient deficiencies in children aged 6-59 months and pregnant women in accordance with UNICEF and World Health Organization (WHO) programs. There are also programs to consume more local products including *Let's Consume Burkinibé* and *Consommons local* of the West African Economic and Monetary Union, though this is not only for fruit and vegetables. There are also programs to increase the processing of local products.

Burkina's National Economic and Social 2016 – 2020 Plan includes under its human capital development strategy a specific objective to improve the population's health status. This plan explicitly states the need to improve the nutritional status of the population, in particular those of women and children.

The 2016 National Policy on Nutrition of the Ministry of Health mentions a number of strategies to foster food and nutrition security, of which the most relevant for the fruits and vegetable sector are:

- To strengthen the value chains of NTFPs, develop vegetable products that are rich in nutrients, food fortification and improve women's access to production factors.
- To strengthen nutrition education, including maintaining girls at school, public extension actions, school feeding programs and school gardens.
- Public extension actions to promote the consumption of fortified foods once they become available.
- Regarding obesity, to improve health services, and promote good nutritional practices and a healthy lifestyle.

In addition, there is also a growing political will to promote healthier eating. Other groups are beginning to be targeted: adolescents, women of childbearing age, individuals with disabilities, and the elderly, for whom a nutrition guide has been developed by the Ministry of Health's nutrition department as part of the 2008-2012 program. The promotion of nutrition is considered in the missions and activities of the ministries in charge of rural development (agriculture, livestock and environment). There is even a presidential decree encouraging the consumption of national agricultural products in public structures and at ceremonies (Decree No. 2017-002/PM/CAB, passed in 2017), though while tomatoes and onions are mentioned, other fruits and vegetables are not. Activities to raise awareness are also organized, and local dishes are promoted.

Furthermore, different branches of the government have started the School Gardens Project (Ministry of Education) as well as the Nutritive Gardens project (Ministry of the Environment) to encourage both production and consumption of healthy, local foods.

Historically, there have been strategies in place for local consumption such as the *Consommons local* (*Let's Buy Locally*) program during the time of the revolution, from 1984-1987. However, these measures to force people to consume vegetables produced in Burkina, in particular green beans, were more for patriotic and political reasons. Nonetheless, there have been lasting effects, and today the green bean has an important presence in the seasonal menu of families.

The government also organizes campaigns to sell cereals such as rice and millet at prices that are accessible to the country's poorest consumers. However, these campaigns and initiatives have never included fruits and vegetables. This highlights the emphasis on food security for this population but not necessarily on nutrition security.

Today fruits including mango and vegetables including cabbage and amaranth as well as non-timber forest products are considered in national policies and strategies. However, currently there is no policy or strategy for the promotion of papaya.

These policies have encouraged Burkinabe people to consume more vegetables and fruits which in turn has boosted the fruit and vegetable sectors. At the social level, impacts have included a new awareness of gender consideration in policies and strategies while economic impacts have included job creation. Furthermore, there has been a decline in the rate of malnutrition in the country. However, much work remains to be done.

Kabore et al. (2020) for example reported that the implementation and operationalization of the integrated communication plan for Burkina Faso's latest nutrition policy (2017) has not taken place. In addition, WHO (2017) has reported that the performance of the Conseil National de Sécurité Alimentaire (CNSA), which ensures the central coordination of food and nutrition security interventions, is rather weak at both central and decentralized levels. For example, its institutional position, analytical capacities, and data collection and analysis tools are currently inadequate. Furthermore, targeting of special categories of the population is not being carried out. Interventions regarding nutrition can be found under the Ministry of Agriculture, the Ministry of Education, and the Ministry of Health. Coordination efforts with NGOs and the private sector is insufficiently taking place at a national and decentralized level and makes the implementation of the National Nutrition Policy difficult. Too many consultation bodies work on the same issues but without coordination by the Government.

In addition, while lower-income consumers highest concerns are addressing hunger, higher-income and especially urban consumers are very concerned with food quality and enriching their diets. Therefore, to address these consumers, policies should also focus on food and plant safety at the producer level. Having confidence in the products produced will encourage consumption.

4.11.2 Systemic constraints for women

Policies targeting production have enabled women to cope with the multiple constraints and challenges through technical and financial assistance for fruit and vegetable production. These different policies developed and implemented emphasize gender by promoting and valuing women, giving them constant priority across all sectors. The non-timber forest products Nutritive Gardens program, for example, has improved their nutritional status despite the sale of part of their production for the purchase of other foods; however, this has not done enough to bring women's nutrition to an acceptable level.

Policies on nutrition, food security, WASH (Water, Sanitation, and Hygiene), social protection and education have enabled women to improve their food diversity, vegetable consumption, improve hygiene conditions, obtain access to safe drinking water and increase their income and knowledge of nutrition.

Often established government programs remain in the institutional sphere, building a medical perception of nutrition problems though not necessarily leading to behavioral changes for populations, particularly in rural areas. Likewise, the nutritive garden initiative was undertaken as an educational initiative and ended up being more sales-driven than, for example, promoting the consumption of NTFPs.

In addition, most policies and laws are about the equity and equality of women and men; however in practice women still face significant barriers to equality. The majority of malnourished persons are women and girls living in rural areas. These women are responsible for producing food for daily meals as well as sales. Women also have the tendency to spend their income on food and other household needs (WFP, 2017).

4.11.3 Illustrative examples

As previously mentioned, training producers is an important program opportunity which could provide women with employment opportunities and revenue while also providing the community with better access to food. The Nutritive Garden initiative is a good example of this. The initiative is led by the Ministry of the Environment with the support of its technical and financial representatives and is operationalized with private individuals, particularly women organized in groups. This initiative helps to address the following consumer concern: access to fresh leaves and baobab all year round.

The Ministry of Agriculture (DTAN/MAAH) also has programs to promote good food and nutrition practices by increasing the diversity and accessibility of food. The Ministry of Health's ANJE programs promote best practices to prevent nutrition-related diseases, supplement diets with micro-nutrients and manage malnutrition. There is also the Presidential program 'alive, a balanced meal.'

Consumer concerns are considered, to some extent, in the development and implementation of these policies and activities. However, in practice, implementation technicians sometimes encounter sociocultural barriers which limit their actions or impact on the target population.

There are also various communication programs aimed at raising awareness. For example, agri-food days (JAL) are held every October as well as promotional days for local products. These activities are carried out by producers-processors (APROMAB), associations and NGOs. During these events there are themed debates where consumers can voice their opinions, which in turn may influence the products to be developed and the varieties to be promoted. Other notable days which often address nutrition issues includes the National Day to Fight Noncommunicable Diseases, International Diabetes Day, and World Food Day. There are also radio broadcasts and TV shows to promote consumer awareness.

However, despite a national communication plan on nutrition that included messages through television, radio, journals, videos and smartphones, this plan has not been operationalized or implemented (Kaboré et al., 2020). This brings into question the efficacy of the communication programs aimed at raising consumer awareness of the importance of diet — including fruit and vegetables — for nutrition.

Aside from production assistance and consumer-oriented nutrition programs, there are also certification programs. The *Ministre du Commerce, de l'industrie et de l'artisanat (MICA, Ministry of Business, Industry, and Artisanship)* is running an initiative on product certification. Likewise, the Ministry of the Environment has a program to certify non-timber forest products.

4.11.4 Conclusion

There are a variety of government programs aimed mostly at consumers, focusing on nutritional awareness. There are also a variety of promotional programs, encouraging consumers to buy local produce, which also support producers. Certain programs are targeted towards women. While there may be greater awareness, there is little evidence of the impact of these policies.

4.12 Increased food safety, consumer awareness and responses to consumer preferences lead to higher acceptability of fruits and vegetables

4.12.1 Available, affordable, acceptable

If fruits and vegetables were more readily available, affordable, and acceptable (culturally and also in terms of taste preferences), the consumption of fruits and vegetables would certainly increase significantly. Of course, acceptability includes cultural factors such as traditional meals, and consumption habits, as well as awareness of the health benefits of fruits and vegetables.

On the international market, for example, there is already a high mango demand as it is perceived as a healthy fruit, which has become a priority for international consumers. If such perceptions also existed on the domestic market, fruit and vegetable consumption could increase. Changing perceptions would require greater awareness of the health benefits of fruits and vegetables.

4.12.2 Consumer motives and barriers

Top motives for fruit and vegetable consumption include availability (seasonality), accessibility (price), and cultural and behavioral norms. On the other hand, top barriers to fruit and vegetable consumption include eating habits, unavailability, cost and product quality. Naturally, some factors act as both motivators and barriers such as behavior, with certain behaviors and norms encouraging consumption and others acting as barriers to consumption. Likewise low prices encourage consumption whereas high prices discourage consumption.

While rural households consume their own produce before sending excess produce to markets, urban households are dependent on what is available and accessible at the market. In Hama-Ba et al. (2017), factors influencing the consumption of leafy green vegetables were ranked. In Ouagadougou, the factors were prioritized as 1) seasonality, 2) food habits, 3) sociocultural background, 4) availability, 5) knowledge of nutritional value, 6) easiness to prepare, 7) price and 8) 'conditionnement' (visual quality and packaging).

4.12.2.1 Motives

Availability and accessibility are key motivators for consumption and are linked with seasonality. For example, when a product is in season, it is more readily available on the markets and typically more accessible due to its lower price point. This accessibility and availability will also differ by geographic region, with different crops available and accessible in different regions. However, acceptability and

hence willingness to consume even if the product is available and financially accessible depends on norms.

Research on vegetable availability by Hama-Ba et al. (2017) included a questionnaire on consumption patterns in Ouagadougou, an urban center, and Loumbila, Koubri and Kongoussi, three vegetable production sites, as well as 400 interviews on traditional vegetables including amaranth. Hama-Ba et al. concluded that vegetable production positively influences the availability, diversity and frequency of consumption. However, awareness raising activities on post-harvest treatment and transformation are necessary to increase the nutritional value of their consumption.

Norms motivating consumption of fruit and vegetables includes cultural and traditional norms as well as behavioral norms. For example, certain vegetables and fruits are already included in traditional meals and so consumers are accustomed to eating them. This is especially true of many indigenous species such as baobab leaves which are consumed in traditional meals as well as during certain traditional and cultural ceremonies.

Behavioral norms such as habits and preferences are also motivators. For example, people who have grown up eating fruits and vegetables will have the motivation to continue this habit in adulthood. Research has shown a positive relationship between childhood fruit and vegetable consumption and adult consumption (Kabore et al. 2020). In addition, many people form new consumption habits based on an interest in improving their health. In this case, consumers look to fruit and vegetable consumption for food diversification, nutrition and other health concerns. Papaya for example is consumed for vitamin A, B and C as well as mineral salt levels, but also because it helps with digestion and gastric conditions.

4.12.2.2 Barriers

Likewise, norms can act as a barrier to fruit and vegetable consumption. For example, if eating habits don't traditionally include fruits and vegetables this can be difficult to change. Fruit and vegetable consumption also depends on what is traditionally consumed in the local culture.

In addition, fruits and vegetables must meet certain quality standards, which range from the aesthetic looks of the product to organoleptic quality (taste/smell/texture) to food safety (including chemical residues and hygiene). On a superficial level, consumers will not consume produce which does not look appealing. Consumer also won't consume products which taste bad, for example, if produce is over- or under-ripe or is too sweet or bitter. But perhaps the most hindering quality concerns are those related to food safety.

There is growing concern for food quality in terms of food safety which has spurred from increasing education and awareness on issues such as the misuse of synthetic chemicals. This could discourage fruit and vegetable consumption as they may be considered contaminated from high levels of pesticide use. Even with organic produce entering the markets, because this is often mixed with normal and perhaps contaminated produce, consumers may not buy at all from retailers.

However, many consumers are not aware of food safety issues and face more fundamental barriers such as lack of availability and affordability, which again can both relate to seasonality and geography. Fruits and vegetables are already more expensive food products, and, given the generally high costs of the products, many families no longer consume them.

Prices, however, fluctuate with seasons and geographic locality. Certain products are not available or only available at a prohibitively high price for much of the population when the product is out of season. Which products are in season and grown locally depends on the micro-climate of the geographic zone. This is especially relevant for rural areas which may not be able to access products due to lacking of suitable (and affordable) transportation for products from farther away as well as the prohibitively high costs associated with such products. Furthermore, some products are often very difficult to find on the market due to a lack of supply, which is especially the case for indigenous products such as baobab and *néré*. For these reasons, inaccessibility is often a barrier to fruit and vegetable consumption.

4.12.2.3 Actions to increase fruit and vegetable intake

There are however certain actions which the government and stakeholders can take to improve fruit and vegetable consumption. At the consumer level, the state can conduct awareness and promotion campaigns, and advertisements about the health benefits of fruits and vegetables to encourage consumption at the household level as well as in schools.

Other actions include ensuring food security within households, by increasing the consumption of these products primarily by vulnerable groups such as children, women and the elderly, in terms of their nutritional value. Women could also be educated about the importance of consuming their own fruit and vegetable production. In addition, campaigns could be implemented to raise awareness among families to help women in childcare during their income-generating activities.

At the producer level, the government can support trainings for producers on input use for farmers as well as processing and preservation inputs for processors so that producers can achieve higher levels of production standards. This will improve food quality and encourage more consumers to increase fruit and vegetable consumption. Furthermore, trainings can be given to promote the production of products adapted to the diets of children, women and the elderly.

4.12.3 Conclusion

Consumers are motivated to eat more fruits and vegetables when products are available and accessible, though this often depends on seasonality and geography. Cultural factors also shape consumer preferences. Generally, consumers are concerned with prices and superficial aspects of produce, though there is growing awareness of food safety. Increasing fruit and vegetable consumption will depend on increasing public education as well as producer awareness on food safety.

5 Conclusion

5.1 Main findings

In this report we have provided an overview of the fruits and vegetables sector in Burkina Faso and drilled deeper into the selected products: cabbage, amaranth, mango, papaya, baobab leaves and fruits and néré. With a focus on these products, we held interviews and hosted five focus group discussion workshops to analyze how innovations in these value chains can offer new opportunities for women to increase their autonomy and provide more access to nutrition for women and their children.

We found that while there are several producer- and consumer-oriented programs in place by the government, these are not sufficiently effective. On the producer side, this often has to do with the low economic capacity of communities in general, and the cultural barriers and burdens women face in particular. Especially prominent in rural areas, the undermining factors include difficult access to water and adequate land, lack of appropriate production and transportation equipment, poor adequate skills in business management. In the same vein, the socio-cultural constraints that keep women fully dependent on their husbands should also be considered. Then, the burdensome family-care duties leave women less time to spend on intensive agriculture, which requires more attention and time for monitoring. Therefore, the lack of available time becomes a limiting factor for them.

On the consumer side, consumer awareness campaigns are likewise not sufficiently effective, likely due to lower-income women's limited access to communication technologies and low levels of education and literacy. Consumer pricing campaigns and other government interventions on food strategy are currently more focused on cereals, due to a concern for sufficient calories. but would benefit from including fruits and vegetables to redirect the focus to nutrition security and making fruits and vegetables accessible to the lowest income households.

Meanwhile, private investments, including producer certification programs, tend to be focused heavily on the export-oriented value chains, and therefore do not benefit fruit and vegetable production for local consumption. While certain informal agreements exist, such as wholesalers providing necessary capital to producers up-front, the lack of finance and access to a secure market for these products along with price fluctuations dissuade producers from entering. In addition, lack of access to adequate or appropriate inputs remains a barrier for production intensification. Inadequate input utilization, especially pesticides, has also resulted in unsafe chemical residues on produce.

While trust plays a central role in many of the informal contracts and negotiations in the market, there is often a growing lack of trust on the consumer side. For example, there is a new segment of conscious consumers who are concerned not only with nutrition but also with accessing safe food products. These consumers do not trust that safety standards in production are applied and enforced, and they do not trust that retailers on the market are always selling products at the level of quality claimed. This consumer movement has driven a niche production market which cultivates via organic or agroecological methods. Often consumers purchase directly from the specialized producer, avoiding the retailers on the market.

Despite the barriers that women face, there are women who are earning a good living from producing fruits and vegetables. This may happen for individual women as female entrepreneurs, though this requires the support of the husband and family. More typically, women are successful in collectives, through associations or cooperatives, allowing them to pool resources and jointly apply in order to access financing.

Most women who earn an income avail of the autonomy to decide how to use it, hence increasing their bargaining power at the household level. Indications exist that women's agricultural and non-agricultural incomes have a stronger positive statistic association with household food diversity scores

than household incomes obtained from cash crops. Women's prominent roles in the fruit and vegetable value chains includes their dominant presence in the transformation and processing of these products, as well as their dominant presence as retailers of these products.

Investments in the fruit and vegetable value chain could increase access to vegetables for consumers but also increase the participation of women.

For example, increasing access to quality cabbage is important from a nutritional standpoint and could increase the earnings of women in the value chain. Similar to cabbage production, men and women cultivate amaranth while women take charge of the commercialization. Ensuring access to high-quality amaranth would support nutrition security while supporting the women in the sector.

Also for baobab fruit, investments could be made in cultivation and the value chain could be better organized, significant profits could be made from harvesting the fruit at maturity. Women entrepreneurs would be able to sell the seeds not just for animal feed but they could also process the pulp into a higher quality powder to sell regularly on the markets — similar to how Baobab fruit powder is sold on the market. This would increase consumer access to the fruit powder, providing an important source of nutrients for children and adults alike, particularly during seasons when fresh fruit is less available. Improvements in the value chain for baobab leaves would benefit the women who operate the value chains and provide women and children with nutrition security through the highly nutritious fruits and vegetables which the tree provides.

Improvements in the mango value chain, particularly in the domestic-oriented value chain would offer important benefits for women involved in the value chain and contribute to nutrition security as mango is an important source of vitamins and in particular vitamin A.

As stated before, papaya is increasingly being consumed and cultivated in Burkina Faso, though the quality of domestic papaya is less than imported papaya. With the efforts made by searchers from the National Institute for Environment and Agricultural Research (INERA), five new varieties of papaya developed in 2007 and 2020 are currently available in orchards and markets but still in limited quantity. With adequate investments into improving product quality, increasing the production volume and improving the distribution strategy, the papaya sector could substitute imported papaya, offering improved wages for women in the sector, and domestically contributing to nutrition security.

5.2 Discussion

In order for more women to be successful in the future, projects in support of women need to combine the following interventions: those addressing cultural barriers to women's autonomy; access to adequate equipment needed in different parts of the value chains, as well as adequate inputs and technical advisory; and capacity development in business management and the creation of networks.

Depending on the region, women in Burkina Faso can be culturally autonomous or rather be subject to the decisions of the men. Appropriate strategies should be found to address the situation in accordance to the context. Cultural barriers and burdensome family-care duties are social issues that have to do with the mindset of the decision makers in the society as well as the women who are negatively affected. Therefore, In the areas where it is necessary, coaching/sensitization programs will be organized for men, opinion leaders, who usually have the decision-making power. An inclusive gendered approach would require the involvement of both husbands and wives so that women can obtain a more autonomous space to earn an income.

Overall fruit and vegetable production would benefit from broad investment in access to production technologies as well as appropriate and safe inputs. For farmers, this means access to adequate fertilizers and pesticides as well as the knowledge of how to use them safely. For processors, new transformation technologies can expand production capacity. Adequate transportation and storage would also be a game-changer.

The growing demand for organic vegetables also provides opportunities for producers and especially women to enter a high-margin market with a short value chain. However, access to digital technologies and digital literacy is increasingly important in connecting producers with consumers, especially in niche markets. As women in Burkina Faso are less literate than men on average, it is important that investments are made to close this gap and to provide more women with access to digital technologies to build their network in the value chain and directly with consumers. The creation and support of formal, mainly female associations or cooperatives specialized in the processing and storage of fruits and vegetables are most likely to:

- Make it possible to acquire the equipment needed to process or store fruits and vegetables; and
- Improve the bargaining position of the cooperatives vis-à-vis wholesalers.

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Appendix 1 Fruit and vegetable supply chains by product

Visualisation filière « feuilles de baobab » jardin nutritive :
Cas de Sapouy .

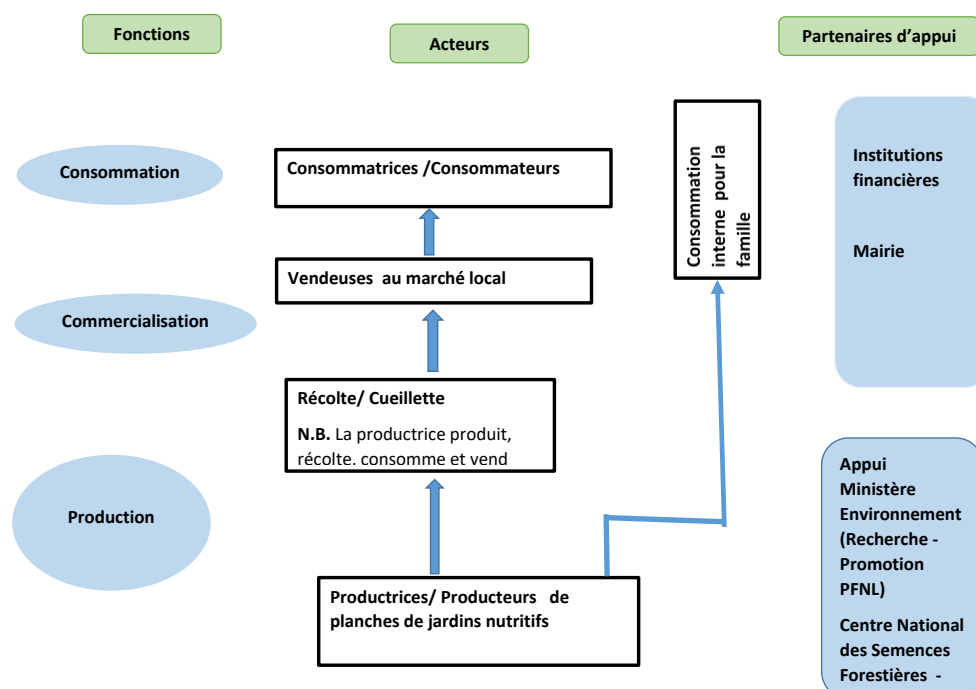


Figure A1.1 NTFP nutritive garden value chain
Source: Authors' compilation from expert interviews.

Chaîne de valeurs « PFNL » dans la nature

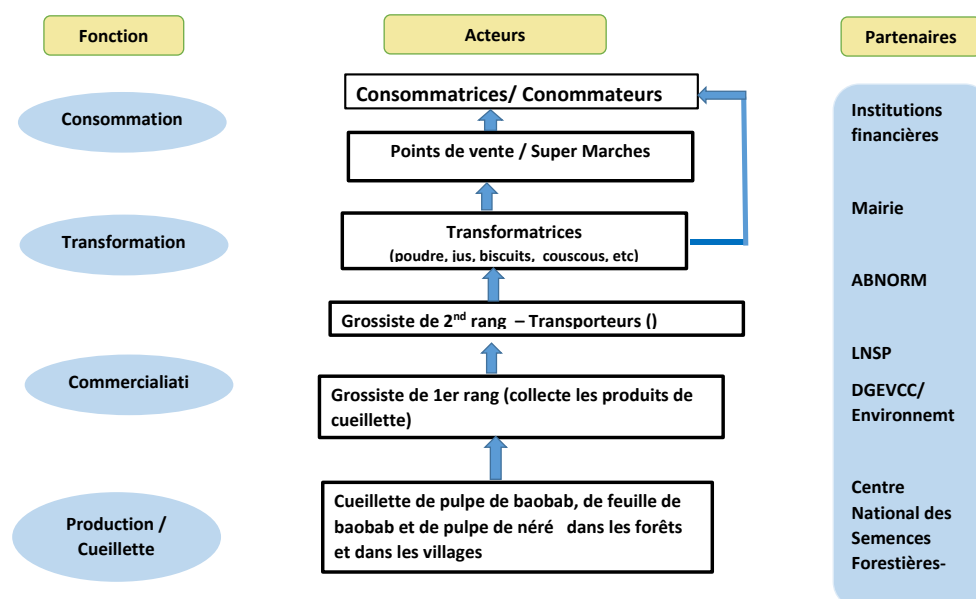


Figure A1.2 Wild NTFP value chain
Source: Authors' compilation from expert interviews.

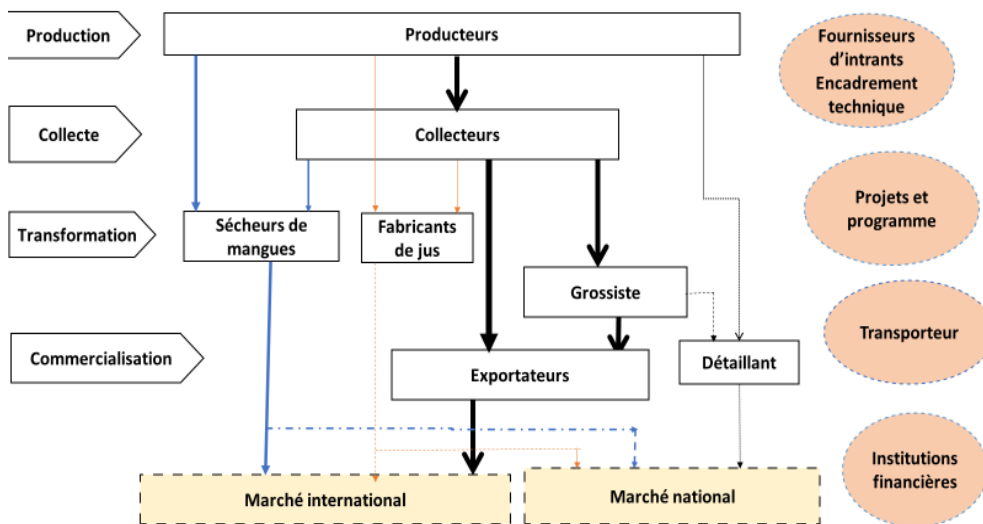


Figure A1.3 Mango value chain

Source: Authors' compilation from expert interviews.

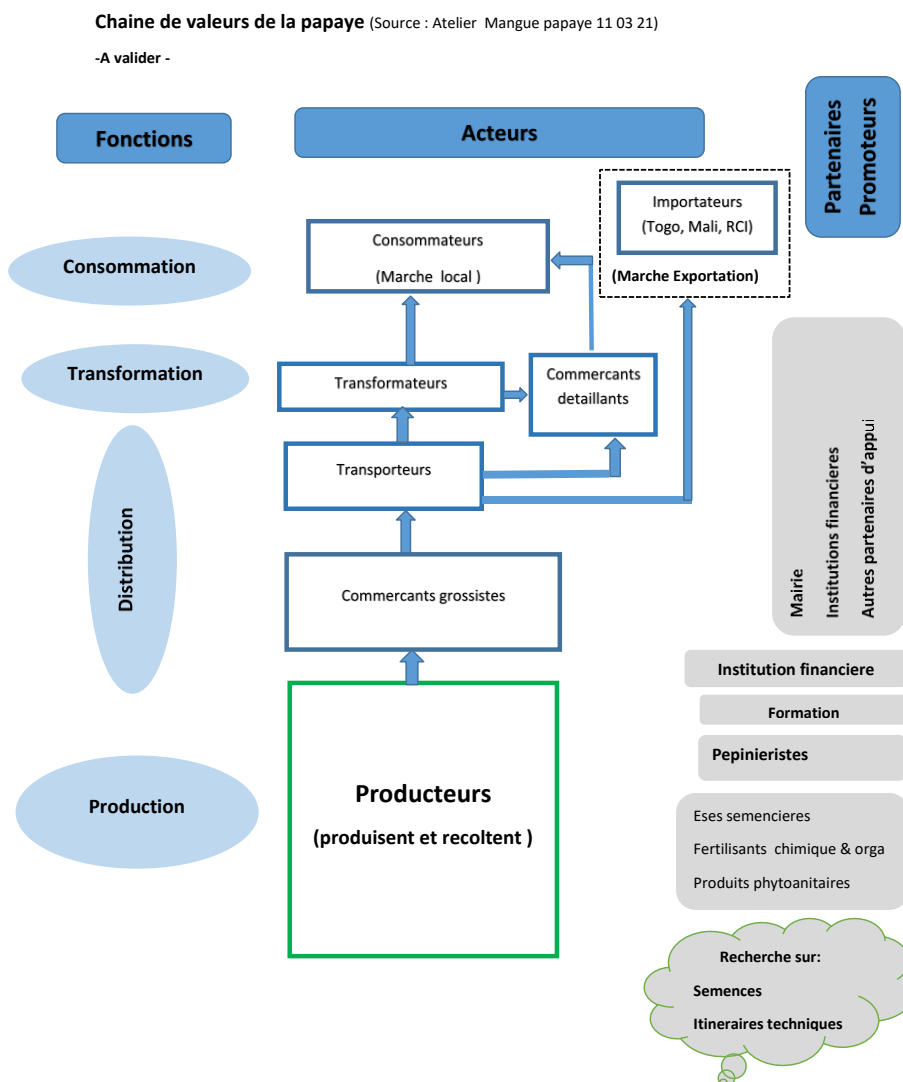


Figure A1.4 Papaya value chain

Source: Authors' compilation from expert interviews.

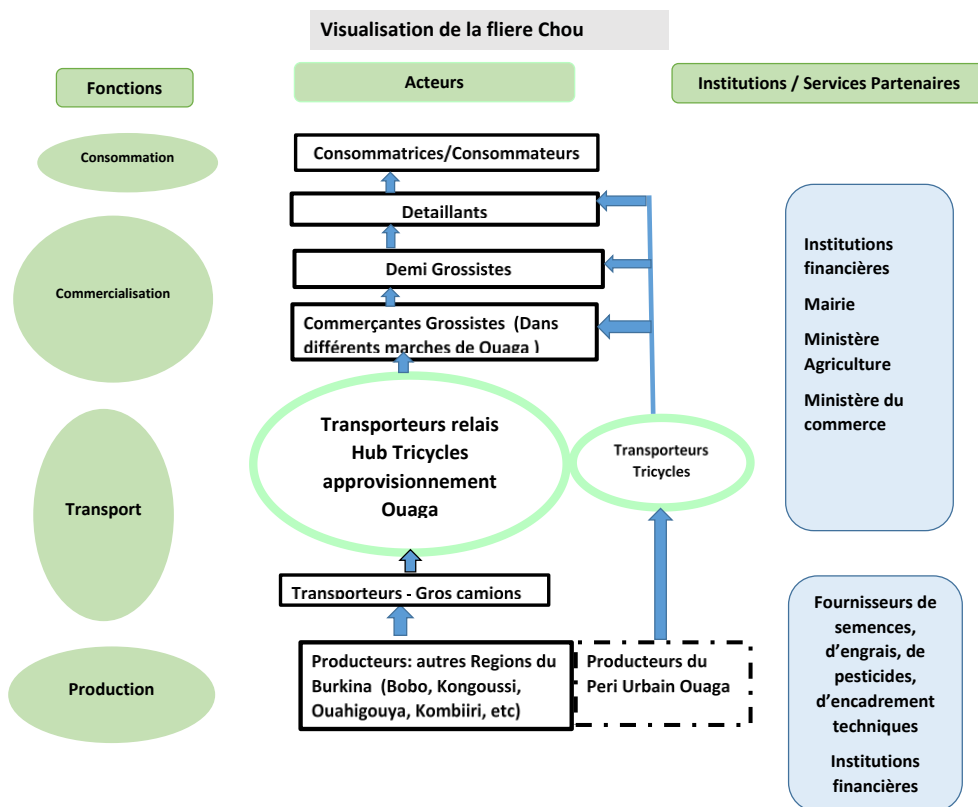


Figure A1.5 Cabbage value chain

Source: Authors' compilation from expert interviews.

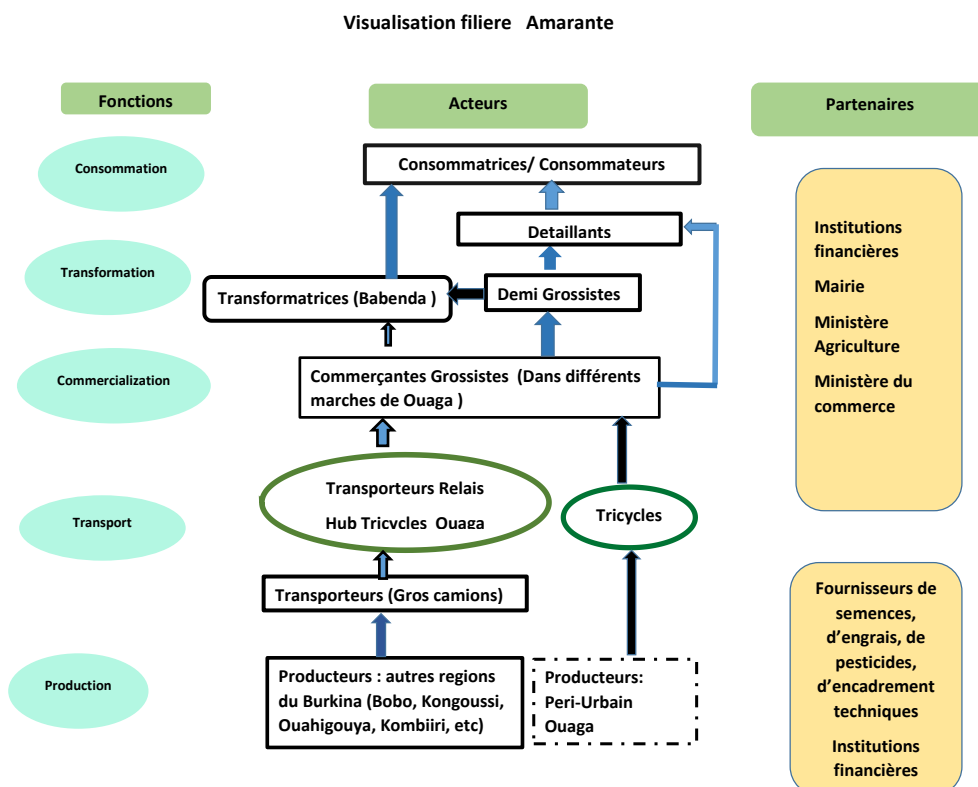


Figure A1.6 Amaranth value chain

Source: Authors' compilation from expert interviews.

Appendix 2 Workshop participants and interviewees

Table A2.1 *Participants at the focus group discussion on cabbage and amaranth*

N°	Gender		Affiliation	Sector	Title
	M	F			
1	1		Nankosem	Seeds	Development Worker
2	1		Individual	Cabbage	Producer
3	1		Individual	Cabbage	Producer
4		1	Individual	Amaranth	Sales
5		1	Individual	Vegetables	Producer
6		1	Natilgué Farm	Amaranth	Producer
7		1	Individual	Cabbage	Sales
8	1		Individual	Cabbage	Producer
9	1		Napoko Farm	Vegetables	Producer
10		1	Individual		Retired ociologist/ consumer
11		1	Taradore Restaurant		Promotor and consumer
12		1	Caisse Populaire		Teller and Loumbila cashier manager
13		1	Individual		Processor
14	1		Loumbila City Hall		Representative
15		1	IRSAT/ DTA		Research Engineer
16		1	BOUTAPA		Seeds and inputs sales/Technical Manager
17	1		Individual		Consumer

Table A2.2 *Participants at the focus group discussion on the non-timber forest products baobab and néré*

N°	Gender		Affiliation	Sector	Title
	M	F			
1		1	Danie's	Néré	Processor, Patisserie
2	1		Tégawendé	Baobab	Commercial fruit processor
3	1		Individual	Baobab	Consumer
4		1	DGEVCC	NTFPs	Head of Promotion and Market Access
5		1	FAMA	Baobab	Processor
6		1		Baobab	Consumer
7	1		Moringa de Boussouma Farm	Baobab	Producer
8	1		DGEVCC	NTFPs	

Table A2.3 Participants at the focus group discussion on mango and papaya

N°	Gender		Affiliation	Sector	Title
	M	F			
1	1		UNPN.B	Mango	Production/Processing
2		1	Individual	Mango /Papaya	Production/Processing
3		1	Sahel Délices	Fruits	Fruit and vegetable sales and distribution
4		1	INERA	Papaya	Plant research
5		1	INERA	Papaya	Plant research
6		1	SNV	NGO - Support Services	Capacity assistance
7	1		APROMAB AT	Mango	Technical Assistance
8	1		APROMAB	Mango	Consumer
9		1	APEMAB	Mango	Harvest and export technicien
10	1		APEMAB	Mango	Exporter
11	1		APROMAB	Mango	President APROMAB
12	1		UNPN.B	Mango	Producer
13	1		APROMAB	Mango	Production/processing Honorary President of APROMAB
14	1		USAM	Mango	Processor
15	1		UNPN.B	Mango	Producer
16		1	PTRAMAB/Association Paoline	Mango	Processor
17	1		APEMAB	Mango	Exporter President APEMAB
18	1		INERA	Papaya	Researcher /Promoter /Papaya variety development

Table A2.4 Participants at the focus group discussion on gender

N°	Gender		Affiliation	Sector	Title
	M	F			
1		1	SNV	Agriculture	Gender and social inclusion advisor
2		1	MAAHM/DTAN-DGPER	Agriculture	Processing Promotion
3	1		MAAHM/DGPV/DDPA	Horticulture	Promotion and development of horticultural products
4		1	Consultant		Gender and development expert
5		1	DGEVCC/MEEVCC	NTFPs	Head of promotion and market access
6		1	Consultant		Gender and development expert
7		1	Ministère de la Femme MFSNFAH	Genre	Administrator of social affairs
8	1		ABNORM	Standards and product certification	Agro-food engineer/ certification services
9	1		NANKOSEM	Vegetable seed distribution	Directeur commercial et développement
10		1	LNSP	DCANA	Biomedical expert
11		1		Gender	Consultant
12		1	La Saisonnière	Agroecology	Retired Professor
13		1	Taradôre Restaurant		Processor
14		1	Ministère Enseignement supérieur et Recherche CNRST/IRSAT/DTA	Research	Support Services
15		1	Ministère de la Femme DGFG/MFSNFAH	Autonomisation and Gender	Gender Promotion Advisor

Table A2.5 Participants at the focus group discussion on policy

N°	Gender		Affiliation	Sector	Title
	M	F			
1	1		DPV-PFNL/DGEVCC	NTFPs	Promotion and valuation of NTFPs
2	1		DGPV/DDRA	Agriculture	DDPA/SSE Agent
3		1	Ministère Enseignement superieur et Recherche CNRST / IRSAT/ Département Technologie Alimentaire (DTA)	Food Technology Research	Researcher
4		1	Laboratoire National de Santé Publique (LNSP)	Enforcement	Laboratory researcher
5	1		Ministère de l'Agriculture / INERA	Agricultural Research	Researcher
6	1		Conseil National pour la Sécurité Alimentaire (SE- CNSA)	Food Security	Food security expert
7		1	Ministère de la Santé Direction de la Nutrition	Nutrition	Malnutrition prevention expert
8	1		Ministère de l'Agriculture / DGPV/MAAHM	Agriculture	Vegetable production expert
9	1		Ministère de l'Agriculture / DGPV/MAAHM	Horticulture	Horticultural Production Development Expert
10	1		Ministère de l'Agriculture / DGEVCC/MAAHM	Agriculture sectoral studies and statistics	Project and Program Development

Table A2.6 Key informant interviews

Title, Affiliation	
1	Secretary General, Ministère de l'Agriculture et des Aménagements Hydrauliques Agricoles (MAAHA)
2	Director General of Vegetable Production
3	Project Coordinator for Vegetable Production
4	Director of Processing and Consumption Promotion of local products
5	Director of Foresight and economic Promotion of Agricultural Value Chains
6	Head of Malnutrition Management and Prevention
7	Researcher at INERA Kamboinsin
8	Director of Business and development at NANKOSEM (seed enterprise)
9	Head of Napoko farm (in Lumbila)
10	Founder of 'l'Association La Saisonniere ' (organic farm)
11	Founder of 'Danie's cake'
12	Papaya Producer
13	Secretary General, Ministère en charge de l'Environnement
14	Director General, Economie Verte et du Changement Climatique (DGEVCC)
15	Baobab leaf processor /Juice producer (baobab, mango), Jus Fama
16	Wholeseller/retailer/consumer
17	Director, Centre National de spéculations en fruits et légumes
18	Genetics researcher, specializes in papaya
19	Transporter/retailer
20	Papaya producer
21	Nutritive garden Baobab (Sapouy)

Appendix 3 Papaya varieties developed by INERA

Table A3.1 *Papaya varieties developed by INERA*

Varieties	FBPA-1	FBPA -2	FBPA-3	FBPA -4	FBPA--1-13-1
Year of creation of the variety	2007	2007	2007	2007	2020
Production cycle	6 months	6 months	6 months	6 months	6 months
Other relevant information	Round orange-fleshed fruit	Round fruit with yellow flesh	Long fruit with orange flesh	Long fruit with yellow flesh	Small round fruit less than 500 grams orange flesh

Appendix 4 Mango production statistics

There are about 15,000 farmers involved in mango production in Burkina Faso. Of these, less than 10,000 are organized into 24 cooperative societies divided as shown in Table A4.1: 13 in the Hauts Bassins region, six in the Cascades region, four in the Centre Ouest region and one in the Boucle du Mouhoun region. These 24 cooperative societies are grouped in a national company called the National Union of Mango Producers of Burkina Faso (UNPMB).

Table A4.1 Region breakdown of UNPM-B's 24 member co-operatives

Regions	Cooperative Societies
Haut Bassins	13
Cascades	6
Boucle du Mouhoun	1
Centre Ouest	4
Total	24

Source: UNPM-B Presentation - 2020 Bilan Workshop.

With the technical support of the DGEES (Ministry of Agriculture), APROMAB conducted a census in 2017-18, which provided up-to-date data on the sector. Although limited to four out of seven regions, the data collection covered the largest production regions (87% of productive mango trees in Burkina, Faso).

As a reminder, the number of trees counted nationally by the 2008 RGA was 2,274,000. And the census area, 6,744 mango growers (Table A4.2). The total area of all these orchards is 19,737 ha with approximately 1,936,277 mango trees planted.

Table A4.2 Breakdown of producers by region

Regions	Producers	Percentage	Male 98%	Women 2%
Haut Bassins	4,059.9	60.2	3,979	81
Cascades	1,638.79	24.3	1,606	33
Boucle du Mouhoun	532.77	7.9	522	11
Centre Ouest	512.54	7.6	502	10
Total	6,744	100.00	6,609	135

Source: DGEES-MAAH-APROMAB Census Report (2018).

At the level of the 'transformation' link, the Professional Organization of the Transformation of the Mango of Burkina Faso (PTRAMAB) comprises 121 members spread across the national territory as shown in the table below (Table A4.3).

Table A4.3 PTRAMAB members

Localities	Members
Bobo-Dioulasso	62
Orodara	21
Toussiana	12
Banfora	11
Ouagadougou	7
Niangoloko	3
Ouahigouya	2
Reo	1
Zoula	1
Léo	1
Total	121

Source: PR-er PTRAMAB Report 2020.

The processing link generates permanent and temporary jobs with a high proportion of female employment (86%). According to PTRAMAB's presentation at the 2020 Review Workshop, all jobs created by the link were valued for the period at 16,306, of which 1,257 were permanent and 15,049 were temporary (see chart below).

Table A4.4 Jobs generated by mango processing

Types of processing	Employment type	Women	Men	Total
Dried mango	Permanent	931	311	1,242
	Temporary	13,098	1,880	14,978
Subtotal 1		14,029	2,191	16,220
Mango purée	Permanent	6	9	15
	Temporary	67	4	71
Subtotal 2		73	13	86
Total		14,102	2,204	16,306
Percentage		86%	14%	100%

Source: PR-er PTRAMAB Report 2020.

At the 'marketing' link, the Professional Association of Mango Exporters and Traders in Burkina Faso (APEMAB) has 22 members including 16 traders and six packaging centers.

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