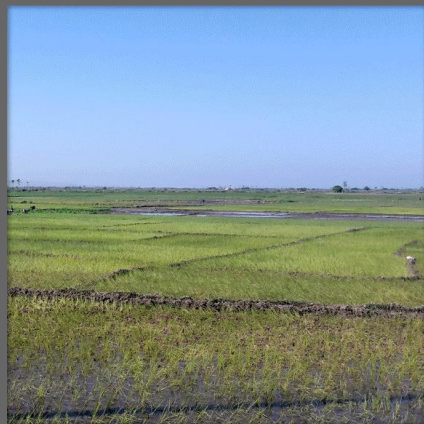




# HAITI

## STAPLE FOOD MARKET FUNDAMENTALS

### MARCH 2018



This publication was produced for review by the United States Agency for International Development. It was prepared by Chemonics International Inc. for the Famine Early Warning Systems Network (FEWS NET), contract number AID-OAA-I-12-00006. The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States government.



**USAID**  
FROM THE AMERICAN PEOPLE

## About FEWS NET

Created in response to the 1984 famines in East and West Africa, the Famine Early Warning Systems Network (FEWS NET) provides early warning and integrated, forward-looking analysis of the many factors that contribute to food insecurity. FEWS NET aims to inform decision makers and contribute to their emergency response planning; support partners in conducting early warning analysis and forecasting; and provide technical assistance to partner-led initiatives.

To learn more about the FEWS NET project, please visit <http://www.fews.net>

## Disclaimer

This publication was prepared under the United States Agency for International Development Famine Early Warning Systems Network (FEWS NET) Indefinite Quantity Contract, AID-OAA-I-12-00006. The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States government.

## Acknowledgments

FEWS NET gratefully acknowledges the network of partners in Haiti who contributed their time, analysis, and data to make this report possible. See the list of participating organizations in Annex 1. Participants in the Markets and Trade Workshop.

Cover photos @ FEWS NET and Flickr Creative Commons.

## Table of Contents

Executive Summary .....	1
Preface .....	3
Key Concepts .....	5
1. Haiti Staple Food Market Fundamentals .....	8
1.1. Introduction.....	8
1.2. Domestic food supply .....	8
1.3. Domestic food demand .....	10
1.4. Domestic food trade .....	10
1.5. International food trade .....	11
2. Cross-cutting Issues.....	14
2.1. Agroecological context .....	14
2.2. Macro-economic context.....	15
2.3. Infrastructure.....	16
2.4. Social context.....	17
2.5. Political and institutional context.....	18
3. Rice (local and imported) .....	19
3.1. Consumption .....	19
3.2. Production .....	19
3.3. Structure of the marketing system.....	20
3.4. Performance of the marketing system .....	22
4. Maize (local and imported) .....	25
4.1. Consumption .....	25
4.2. Production .....	25
4.3. Structure of the marketing system.....	26
4.4. Performance of the marketing system .....	28
5. Sorghum .....	31
5.1. Consumption .....	31
5.2. Production .....	31
5.3. Structure of the marketing system.....	32
5.4. Performance of the marketing system .....	33
6. Wheat (imported grains and flour) .....	36
6.1. Consumption .....	36
6.2. Production .....	36
6.3. Structure of the marketing system.....	37
6.4. Performance of the marketing system .....	38
7. Pulses (dry beans and peas) .....	40
7.1. Consumption .....	40
7.2. Production .....	40
7.3. Structure of the marketing system.....	41

7.4. Performance of the marketing system .....	43
8. Bananas (plantains) .....	46
8.1. Consumption .....	46
8.2. Production .....	46
8.3. Structure of the marketing system .....	47
8.4. Performance of the marketing system .....	48
9. Roots and Tubers .....	50
9.1. Consumption .....	50
9.2. Production .....	50
9.3. Structure of the marketing system .....	51
9.4. Performance of the marketing system .....	52
10. Edible Oil .....	54
10.1. Consumption .....	54
10.2. Production .....	54
10.3. Structure of the marketing system .....	54
10.4. Performance of the marketing system .....	55
11. Areas of Future Investigation .....	57
12. Market Monitoring Plan .....	58
Annex 1. Participants in the Markets and Trade Workshop .....	61
Annex 2. Conversion Factors to Cereal Equivalent .....	62
Annex 3. Market Integration .....	63
References .....	66

## List of Figures

Figure 1. Map of Haiti .....	1
Figure 2. FEWS NET’s approach to market monitoring and analysis .....	3
Figure 3. FEWS NET presence and remote monitoring countries .....	4
Figure 4. Seasonal calendar for Haiti .....	8
Figure 5. Location of processing facilities in Haiti .....	9
Figure 6. Share of calorie availability of main food groups, average, 2009–2013 .....	9
Figure 7. Transport options for food products .....	11
Figure 8. Belladère (Haiti) – Elías Piña (Dominican Republic) border crossing .....	12
Figure 9. Ouanaminthe (Haiti) – Dajabon (Dominican Republic) border crossing .....	12
Figure 10. Elevation, Haiti .....	14
Figure 11. Average annual rainfall, 2000–2014, Haiti .....	14
Figure 12. Land cover, Haiti .....	14
Figure 13. Major natural events affecting Haiti .....	15
Figure 14. Contribution of Haiti’s economic sectors to GDP, 2011/12–2015/16 .....	16
Figure 15. Annual inflation rate in Haiti, 2011–2016 .....	16
Figure 16. Road network in Haiti .....	16
Figure 17. Population distribution by Department, Haiti, 2015 .....	17
Figure 18. Rice production and price map, Haiti .....	19
Figure 19. Rice field in Artibonite Department .....	19
Figure 20. Production of paddy rice in Haiti, MT, 2012–2016 .....	20
Figure 21. Rice (milled) imports in Haiti, MT, 2011–2016 .....	20
Figure 22. Marketing of rice .....	21
Figure 23. Rice marketing channels, Haiti .....	21
Figure 24. Retail price of local rice (Shella, HTG/lb) in selected markets, 2012–2016, Haiti .....	22
Figure 25. Retail price of imported rice (Bull, HTG/lb) in selected markets, 2012–2016, Haiti .....	22
Figure 26. Seasonal index for Croix des Bossales (Port-au-Prince) local rice retail price, Haiti, 2012–2016 .....	22
Figure 27. International export rice prices and wholesale price in Port-au-Prince, Haiti, 2012–2016 .....	23
Figure 28. Rice (local) production and trade flow map, Haiti .....	24
Figure 29. Maize production and price map, Haiti .....	25
Figure 30. Production of maize in Haiti, MT, 2012–2016 .....	26
Figure 31. Maize imports in Haiti, MT, 2012–2016 .....	26
Figure 32. Marketing of maize .....	27
Figure 33. Maize marketing channels, Haiti .....	27
Figure 34. Wholesale prices (HTG/lb) of local and imported ground maize in Croix des Bossales (Port-au-Prince), Haiti, 2012–2016 .....	28
Figure 35. Retail price of local ground maize (HTG/lb) in selected markets, 2012–2016, Haiti .....	28
Figure 36. Retail price of imported ground maize (HTG/lb) in selected markets, 2012–2016, Haiti .....	28
Figure 37. Seasonal index for Croix des Bossales (Port-au-Prince) local ground maize retail price, Haiti, 2012–2016 .....	29
Figure 38. Maize (local) production and trade flow map, Haiti .....	30
Figure 39. Sorghum production and price map, Haiti .....	31

Figure 40. Production of sorghum in Haiti, MT, 2012–2016 .....	32
Figure 41. Marketing of sorghum: sorghum in grain and ground sorghum .....	32
Figure 42. Sorghum marketing channels, Haiti .....	33
Figure 43. Retail prices (HTG/lb) of sorghum in selected markets, Haiti, 2012–2016 .....	33
Figure 44. Seasonal index Fonds-des-Nègres sorghum retail price, Haiti, 2012–2016 .....	34
Figure 45. Sorghum production and trade flow map, Haiti .....	35
Figure 46. Formal wheat (all products) imports, 2011–2016, Haiti .....	36
Figure 47. Formal wheat flour imports, 2011–2016, Haiti.....	36
Figure 48. Wheat marketing channel, Haiti .....	37
Figure 49. Wheat flour brands, Haiti.....	37
Figure 50. Retail price of wheat flour (HTG/lb) in selected markets, 2012–2016, Haiti.....	38
Figure 51. Seasonal index for Croix des Bossales (Port-au-Prince) and Ouanaminthe wheat flour retail prices, Haiti, 2012–2016 .....	38
Figure 52. Bean and pea production and price maps, Haiti.....	40
Figure 53. Production of pulses in Haiti, MT, 2012–2015 .....	41
Figure 54. Pulses imports in Haiti, MT, 2011–2015.....	41
Figure 55. Bean and pea marketing channels, Haiti.....	42
Figure 56. Marketing of pulses in Haiti .....	42
Figure 57. Retail price of black beans (HTG/lb) in selected markets, 2012–2016, Haiti .....	43
Figure 58. Retail price of red beans (HTG/lb) in selected markets, 2012–2016, Haiti .....	43
Figure 59. Seasonal index for Croix des Bossales (Port-au-Prince) local black and red beans retail price, Haiti, 2012–2016....	43
Figure 60. Pulses (beans and peas) production and trade flow map, Haiti .....	45
Figure 61. Banana production map, Haïti .....	46
Figure 62. Production of bananas in Haiti, MT, 2011–2015 .....	46
Figure 63. Banana marketing channels, Haiti.....	47
Figure 64. Banana trade, by bunch .....	48
Figure 65. Banana retail, by hand/unit .....	48
Figure 66. Wholesale prices (HTG/lb) of bananas in Croix des Bossales (Port-au-Prince), Haiti, 2012–2016.....	48
Figure 67. Seasonal index for plantain musquée wholesale price in Croix des Bossales (Port-au-Prince), Haiti, 2012–2016 ...	48
Figure 68. Banana (plantain) production and trade flow map, Haiti .....	49
Figure 69. Tuber production map, Haiti .....	50
Figure 70. Production of the main tubers in Haiti, MT, 2012–2015 .....	50
Figure 71. Tuber imports in Haiti, MT (cereal equivalent), 2011–2016 .....	51
Figure 72. Tuber marketing channels, Haiti .....	52
Figure 73. Wholesale prices (HTG/lb) of roots and tubers in Croix des Bossales (Port-au-Prince), Haiti, 2012–2015.....	52
Figure 74. Trade of roots and tubers, by bucket .....	52
Figure 75. Retail of roots and tubers, by pile .....	52
Figure 76. Root and tuber production and trade flow map, Haiti .....	53
Figure 77. Formal edible oil imports, 2011–2015, Haiti.....	54
Figure 78. Marketing of edible oil in Haiti.....	55
Figure 79. Retail price of edible oil “Mazola” (HTG/gal) in selected markets, 2012–2016, Haiti .....	55

Figure 80. Seasonal index for Croix des Bossales (Port-au-Prince) edible oil (Mazola) retail price, Haiti, 2012–2016 .....	55
Figure 81. FEWS NET’s approach to market monitoring and analysis .....	58
Figure 82. Rice price in selected markets in Haiti and the United States, 2010 - 2017.....	64
Figure 83. Black beans price in selected markets in Haiti and the United States, 2010 - 2017 .....	64
Figure 84. Black beans price in selected markets in Haiti and the Dominican Republic, 2010 - 2017 .....	64



## List of Tables

Table 1. Annual per capita requirements of the main staples .....	9
Table 2. Commodity balance (MT cereal equivalent), Haiti, 2011/12–2015/16 average .....	10
Table 3. General nonpreferential duty rates to staple foods, as applied in 2016 .....	11
Table 4. Food products banned from land-based imports, Haiti .....	12
Table 5. Occurrence of natural disasters in the period 2000–2016 .....	15
Table 6. Seasonal calendar for irrigated rice (Artibonite Department) .....	20
Table 7. Correlation coefficient for local rice prices in selected markets .....	23
Table 8. Seasonal calendar for maize .....	25
Table 9. Correlation coefficient for local ground maize in selected markets .....	29
Table 10. Seasonal calendar for sorghum .....	31
Table 11. Correlation coefficient for sorghum in selected markets .....	34
Table 12. Correlation coefficient for wheat flour prices in selected markets .....	39
Table 13. Seasonal calendar for beans and peas .....	40
Table 14. Correlation coefficient for local black beans in selected markets .....	44
Table 15. Correlation coefficient for local red beans in selected markets .....	44
Table 16. Approximate weight of banana bunches .....	47
Table 17. Seasonal calendar for tubers .....	51
Table 18. Average yield of tubers (MT/ha) in Haiti and Dominican Republic .....	51
Table 19. Examples of cooking oil brands consumed in Haiti .....	54
Table 20. Correlation coefficient for edible oil prices in selected markets .....	56
Table 21. Existing food/agricultural market monitoring systems in Haiti .....	59
Table 22. Aspects relevant for short- and/or long-term monitoring of key food staples markets .....	59
Table 23. Participants in the markets and trade workshop .....	61
Table 24. Conversion factors to maize equivalent .....	62
Table 25. Data used for market integration analyses .....	63



## Acronyms and Abbreviations

<b>BRANA</b>	<i>Brasserie Nationale d'Haïti, S.A.</i>
<b>CARICOM</b>	Caribbean Community
<b>CARIFORUM</b>	Body of the Caribbean Group of African, Caribbean and Pacific (ACP) states
<b>COMTRADE</b>	United Nations Commodity Trade Statistics Database
<b>CNSA</b>	<i>Coordination Nationale de la Sécurité Alimentaire</i>
<b>DR</b>	Dominican Republic
<b>FAO</b>	Food and Agriculture Organization (United Nations)
<b>FEWS NET</b>	Famine Early Warning Systems Network
<b>GDP</b>	Gross domestic product
<b>IDB</b>	Inter-American Development Bank
<b>IICA</b>	Inter-American Institute for Cooperation on Agriculture
<b>ha</b>	Hectares
<b>HT</b>	Haiti
<b>HTG</b>	Haitian gourde
<b>HUHSA</b>	<i>Huileries Haïtiennes S.A.</i>
<b>IHSI</b>	<i>Institut Haïtien de Statistique et d'Informatique</i>
<b>kg</b>	Kilograms
<b>km</b>	Kilometers
<b>LAC</b>	Latin America and the Caribbean
<b>lb</b>	Pound
<b>LMH</b>	<i>Les Moulins d'Haïti</i>
<b>MARNDR</b>	<i>Ministère de l'Agriculture, des Ressources Naturelles et du Développement Rural</i>
<b>mm</b>	Millimeters
<b>MT</b>	Metric tons
<b>NGO</b>	Nongovernmental organization
<b>ORE</b>	<i>Organisation pour la Réhabilitation de l'Environnement</i>
<b>SIMA</b>	<i>Système d'Information sur les Marchés Agricoles</i>
<b>USAID</b>	United States Agency for International Development
<b>USD</b>	United States dollar
<b>USGS</b>	United States Geological Survey
<b>WFP</b>	World Food Programme

## Executive Summary

- This FEWS NET Market Fundamentals report presents findings to inform regular market monitoring and analysis in Haiti. Among other uses, the information presented in this report can be used to support the design of food security programs, including but not limited to informing USAID Bellmon analyses for food assistance programs in Haiti.
- This study is based on desk research, fieldwork using rapid rural appraisal techniques covering all 10 departments of the country (**Figure 1**), and a three-day stakeholder consultation workshop carried out in the capital city of Port-au-Prince during February 2017 (see Annex 1, **Table 23**).
- The main staple foods in the country are rice, maize, wheat flour, sorghum, pulses (beans and peas), tubers (yams, cassava or yuca, and sweet potato), bananas (particularly plantains), and edible oil. These are consumed to varying degrees across the territory, based on supply and demand dynamics. Overall, a high level of market dependence exists, with poorer households purchasing up to 85 percent of their food needs in the markets.
- Generally, Haiti's food supply is ensured through domestic production and imports from the global market (including cross-border imports from neighboring Dominican Republic). Levels of self-sufficiency vary across commodities, but Haiti is structurally deficit in rice, the most relevant staple in the country. As well, the country is fully dependent on imports of wheat and edible oil, as these are not produced domestically.
- Crop production in Haiti is mostly rainfed, making Haitian agriculture highly vulnerable to the adverse effects of climatic events such as erratic and insufficient rainfall, storms/hurricanes, flooding, and droughts. Constraints to agricultural production include limited access to and use of production inputs (including financing), incidence of pests and diseases, soil degradation, and implementation of unimproved cropping practices. Postharvest losses are large due to inadequate handling and storage infrastructure.
- With respect to food imports, the United States and the Dominican Republic are Haiti's main trade partners for cereals and pulses and Malaysia for edible oil. Formal imports are concentrated in a small group of enterprises, leading to asymmetric power relationships along the chain. Large-scale modern processing facilities are operated by some of the major importers. Small-scale processing takes place across the country, relying mostly on outdated equipment. Informal imports from the Dominican Republic are substantial, but remain difficult to quantify.
- The network of traders (Madame Saras, small-scale traders, and retailers) collecting products from producers and distributing/retailing commodities across the country toward final consumers comprises a large number of actors, with no evident barriers to entry. Physical accessibility and transport possibilities are key factors affecting food availability in remote areas. Transactions are usually done on the spot, with producers typically price takers and consumers shifting demand to other commodities in response to price changes. The staples' marketing chains tend to be fragmented and display little organization among market actors. Madame Saras are key actors in the chain, facilitating the flow of locally produced commodities from production to consumption sites. Generally, market information is spread across actors following private business networks.
- The main domestic consumption markets are Jérémie, Les Cayes, Gonaïves, Port-de-Paix, Cap-Haitien, and the broader Port-au-Prince area, which includes Petion Ville, Carrefour, Delmas, Cité Soleil, and the Croix des Bouquets and Croix des Bossales markets. For all commodities analyzed, the largest flows of locally produced staples are directed toward the broader Port-au-Prince market area. Flows of imported products move in the opposite direction, originating mainly in Port-au-Prince and transiting toward the rest of the country. Transport costs capture a large share of the transaction costs along the chain.

**Figure 1.** Map of Haiti



Source: FEWS NET.

- The seasonality of harvests results in some intra-annual variation in prices for locally produced staples. Prices vary across markets, but prices in Port-au-Prince tend to be among the lowest across commodities. Prices of imported products show less variation over time.
- Broadly speaking, prices in Haitian markets display co-movement with each other. Moderate to strong price correlations are generally observed between markets, with a tendency of northern markets presenting stronger correlations among each other and southern markets presenting stronger correlations with each other. Prices in Port-au-Prince correlate with most markets at varying degrees across commodities. At the international level, Haiti is generally integrated with the world markets, as price trends in Port-au-Prince reflect those of key international markets.
- Several initiatives in Haiti carry out market monitoring activities across the country. From the public sector, the Ministry of Agriculture, Natural Resources, and Rural Development (*Ministère de l'Agriculture, des Ressources Naturelles et du Développement Rural*, MARNDR) and the National Coordination of Food Security (*Coordination Nationale de la Sécurité Alimentaire*, CNSA) monitor prices in key collection (MARNDR) and consumption (CNSA) markets. FEWS NET collects retail prices for several commodities in major consumption markets across the country. Development-oriented agencies such as the World Food Programme (WFP) and the Food and Agriculture Organization (FAO) of the United Nations also collect retail prices on a regular basis.

## Preface

Markets and trade information and analysis are key inputs in FEWS NET’s integrated food security analysis. FEWS NET relies on a common understanding of a given population’s livelihoods (food and income sources and typical coping strategies used to handle shocks) as well as an understanding of typical market conditions and outcomes. Together, these are used to identify and quantify the magnitude of market-based anomalies and their potential impacts on food security outcomes of the poor and very poor (**Figure 2.** ).

**Figure 2.** FEWS NET’s approach to market monitoring and analysis



Source: FEWS NET (2014).

Several types of information help inform the understanding of typical market conditions that affect the food and income sources of the poor and very poor. These include: the geography of supply and demand for a particular commodity (for example, maize) or category of commodities (for example, staple foods); the role of different actors in the marketing system (from small-scale producers to industrial food processors); the seasonality of specific events or activities; aggregate import-dependence, particularly in the case of staple foods; and key programs and policies. These factors affect the stability of food availability and access (food prices and income levels) and therefore three of the four pillars of food security (food availability, access, utilization, and stability). Collectively, an understanding of these key elements constitutes the FEWS NET Markets and Trade Knowledge base.

Under FEWS NET III (FY 2012–2016), Markets and Trade Knowledge base information is compiled into “Market Fundamentals” reports that seek to provide readers with a general understanding of market dynamics during a typical year. These consolidated documents are elaborated for both presence and remote monitoring (RM) countries, with references to relevant external documents and resources when they are available. Two pilots were carried out in FY 2014, one in Sudan and one in Burkina Faso, to test the appropriateness of the approach, the usefulness of the products, and the level of effort required.

During the first year of rollout (FY 2015), the Market Fundamentals reports focused largely on staple food market structure and behavior. Such reports can be prepared for cash crop, livestock, and labor markets following a similar approach. Of particular interest to the FEWS NET project are markets identified as important sources of food and income for the poor and very poor based on an understanding of the livelihoods of those populations. The Markets and Trade Knowledge team aims to eventually have a staple food Market Fundamentals report for each FEWS NET country and region. Other reports (focusing on cash crop, livestock, and labor markets) will be added in a modular fashion as time and resources permit.

FEWS NET monitors markets in presence as well as RM countries (Figure 3). A presence country is monitored by FEWS NET staff working in a local country office. RM countries are typically covered by analysts in a nearby country using a lighter analytical approach to identify anomalies and deteriorating conditions. FEWS NET also monitors staple food markets in other countries or regions that are relevant to understanding food availability and access for the poor and very poor in FEWS NET countries (for example, Benin, Pakistan, Kazakhstan, South Africa, and Mexico, among others).

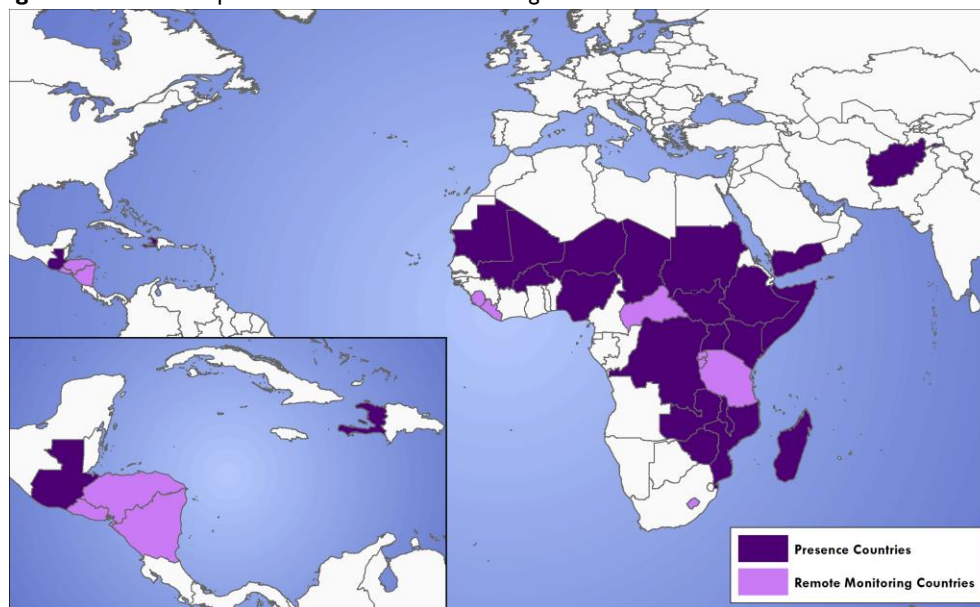
The Market Fundamentals reports will continue to inform the project’s regular market monitoring in terms of the commodities covered in the project’s Markets and Trade database, Price Bulletins, Price Watch, and special reports (**Figure 2.** ). The specific markets and commodities covered in country-specific reports will depend on a number of factors. The reports focusing on staple food markets touch on the following:

- Cross-cutting issues that affect all markets in a given country or region: The political and macroeconomic environment and key national-level programs and policies that influence food and income sources.
- For each commodity market
  - Market structure, including the relative importance of local production versus imports in aggregate food availability and access, including the geographic distribution of production and consumption, and key actors in the marketing chain.
  - Market behavior/conduct, including purchase or selling behavior of key actors present in the marketing chain.

- Market performance outcomes, including production trends, inter- and intra-annual price variability, and regional or international competitiveness.
- Key indicators that analysts need to monitor over the course of the marketing year that could affect food availability and access of the poor and very poor.

FEWS NET's widely recognized production and trade flow maps are incorporated into the report for commodities produced and consumed both locally and regionally as a means of illustrating the relative importance of certain markets and trade flow patterns in assuring food availability and access throughout the country. However, when a commodity is grown almost entirely as an exported cash crop or imported almost exclusively from international markets, other relevant diagrams and illustrations are used.

**Figure 3.** FEWS NET presence and remote monitoring countries



Source: FEWS NET.

## Key Concepts

The following provides the definitions of several key terms used throughout the report. For more detail on these definitions and other useful terms, consult the [FEWS NET Markets and Trade Glossary](#).

**Marketing system:** This includes the entire commodity distribution system from production to consumption. A marketing system describes the key actors and the linkages between different stages of the distribution process of a given commodity. The marketing system also describes the spatial and functional relationships between market actors.

**Marketing year:** This refers to the period during which agricultural production from a given year's harvest is sold. This period typically extends from one harvest of a particular commodity to the next, and is very similar to the consumption year used in FEWS NET's livelihoods work in many cases.

**Price:** The cost or value of a good or service expressed in monetary terms. It is the financial cost paid when one buys a unit of a specific product or service. Prices, in the purest sense, indicate value that has been added to a particular commodity. This value added can be changes in the form (e.g., production or milling), place (e.g., transportation), or time (e.g., storage) of a commodity. Price signals can carry information about cost of production, transportation, storage, perceptions and desires as well as, in some instances, distortions

**Incentive:** Something that incites an action or provides a motive (e.g., potential profits, benefits or gain from performing a particular economic activity).

**Food balance sheet:** This presents a comprehensive picture of the pattern of a country's food supply during a specified reference period. A food balance sheet shows for each food item – i.e., each primary commodity and a number of processed commodities potentially available for human consumption – the sources of supply and its utilization

**Commodity balance sheet:** This shows balances of food and agricultural commodities in a standardized form. The scope of standardization is to present these data in a less detailed form for a selected number of commodities without causing any significant loss of the basic variables monitoring the agriculture sector. The selected commodities include the equivalents of their derived products falling in the same commodity group, but exclude the equivalents of by-products and derived commodities, which through processing, change their nature and become part of different commodity groups.

**Unimodal areas:** Unimodal areas are agroecological zones with one distinct rainy season with one rainfall peak and typically a single harvest.

**Bimodal areas:** Bimodal areas are agroecological zones with either a single prolonged rainy season with two rainfall peaks or two or more distinct rainy seasons (which could each be unimodal or bimodal), resulting in two or more harvests. The amount of rainfall can be equivalent between rainy seasons or one may be dominant (for all commodities or for a single crop), resulting in differing yields between seasons.

## Commodity Classifications

Commodity-specific classifications of surplus and deficit areas are established based on historical production figures and on FEWS NET staff and key informants' knowledge of the consumption patterns of particular areas of a given country. When surplus and deficit areas are identified in aggregate, the determination is typically based on total local production, expressed in kilocalorie terms, compared to total local needs (also expressed in kilocalorie terms). Estimated staple food needs are typically established by local governments and updated as consumption patterns change.

**Surplus-producing area:** A geographic area that produces sufficient quantity of a given commodity (or set of commodities, like cereals) to cover local demand and to supply other areas. An area can likewise be defined either as having a minor surplus, meaning that in a normal year slightly more of a commodity is produced than required to meet local needs, or as having a major surplus, meaning that production in a given area largely surpasses local needs.

**Deficit area:** A geographic area that does not produce enough of a given commodity to meet local demand.

**Self-sufficient area:** A geographic area that produces sufficient quantity of a commodity to cover local demand. This area rarely produces: either (1) enough to supply other areas, or (2) too little to meet local needs.

## Market Types

**Reference market:** A market that provides information about supply, demand, and price conditions in other nearby markets or key markets that influence the performance of others.

**Collection market:** A rural market where relatively smaller-scale traders (or trader agents) purchase directly from producers.

**Assembly market:** A market where relatively smaller quantities of a commodity are accumulated or aggregated, usually from different farmers and small-scale traders.

**Wholesale market:** A market where traders generally sell to traders. The volumes traded in each transaction tend to be relatively larger (for example, multiple 50-kg bags and even metric tons).

**Retail market:** A market where commodities are sold directly to consumers. The volumes traded during each transaction tend to be relatively small (for example, per kg or locally used bowl or other unit of measure).

## Formal versus Informal Trade Flows

**Formal trade flows:** Formal trade flows typically involve the exchange of large quantities of a given commodity, transported by road, rail, or sea. These trade flows are inspected, taxed, and reported in official government statistics, and abide by the requirements of the local legal system (including national-level laws and regional trade agreements). For example, in some countries, an importer or exporter is required to obtain a license from the local government or regional trade body that gives authority to engage in import or export activities. Formal trade can often also be thought of as legal trade.

**Informal trade flows:** Informal trade flows typically occur outside of the formal trade system (described above). These exchanges are typically not recorded in official government import and export statistics and are not inspected and taxed through official channels. These trade flows are typically undocumented, unlicensed, and unregistered. Informal trade flows can vary from very small quantities carried by bicycle across small border crossing areas or via barge in large volumes exchanged over long distances.

## Trade Flow Magnitude and Frequency

**Large trade flows:** The volumes traded (through either formal or informal channels) are estimated to be more important than other trade flow volumes in aggregate terms over the period of analysis. In unimodal FEWS NET countries, this represents the relative importance of trade flows between different geographic areas over a given marketing year. In bimodal areas, these may be season-specific. Because it is not possible to estimate actual trade flow volumes between markets in most FEWS NET countries, these are estimated based on discussions with key informants familiar with the staple food market system of a given country or region.

**Medium trade flows:** The volumes traded (through either formal or informal channels) are estimated to be somewhere in between large and small flows in terms of the aggregate volumes traded over the period of analysis. These are estimated through the same process as large trade flows (above).

**Small trade flows:** The volumes traded (through either formal or informal channels) are estimated to be less important than other trade flow volumes in aggregate terms over the period of analysis. These are estimated through the same process as large trade flows (above).

**Occasional trade flows:** These trade flows either take place during very specific times of year (for example, in the lean season only) or when certain specific conditions present themselves. These are typically not as important (in aggregate quantity) as other more regular types of trade flows.

## Price Analysis

**Coefficient of variation:** One of many measures of price variability, this is computed by dividing the standard deviation of a given price series by the mean.

**Average seasonal index:** This is calculated to demonstrate the extent to which prices during a given month in a given place differ, on average, compared to prices during other months of the year.

**Price differential:** This refers to a spatial or temporal difference in prices (also see spatial and temporal/seasonal arbitrage).

**Correlation coefficient:** Measures the association between two variables. A value of 0 indicates no association and a value of 1 perfect positive association.



**Freight on board (FOB):** This term is the market value of goods at the point of uniform valuation (the customs frontier of the economy from which they are exported).

**Cost insurance freight (CIF):** This is the price of a good delivered at the frontier of the importing country, including any insurance and freight charges incurred to that point, and before the payment of any import duties or taxes.

**Export parity price (XPP):** The monetary value of a product sold at a specific location in a foreign country, but valued from a specific location in the exporting country.

**Import parity price (IPP):** The monetary value of a unit of product bought from a foreign country, valued at a geographic location of interest in the importing country.

## 1. Haiti Staple Food Market Fundamentals

### 1.1. Introduction

Almost 80 percent of Haitian households engage in agricultural activities as part of their livelihoods. The contribution of agriculture to food and/or income varies across the territory, but more often than not, returns to agriculture are low and unreliable due to environmental and climatic events that adversely affect the island year after year. Rice, maize, pulses (beans and peas), roots and tubers, and plantains stand among the most relevant staple foods produced and consumed in the country.

While Haiti was self-sufficient for the key staples back in the early 1980s, the opening of the economy/market in 1985 marked the beginning of an increasing dependence on food imports. Nowadays, Haiti imports most of the rice consumed in the country, as well as considerable amounts of other staples. Wheat products as well as edible oil are entirely sourced or locally manufactured based on imported ingredients. On the other hand, Haiti has developed a thriving agro-export sector for cash crop commodities.

Haiti faces important development challenges that prevent a large proportion of the population from satisfying their basic needs. Haitians experience food prices that are approximately 30–77 percent higher than in other countries in the Latin America and the Caribbean (LAC) region, after taking into account differences in income levels and purchasing power of the population (Pop 2016). Unstable domestic staple food supply, coupled with market power disparities, increasing population pressure, and limited economic opportunities that constrain households' access to food, contribute to high levels of food insecurity in the country.

This report covers the basic market fundamentals for rice, maize, sorghum, wheat, beans and peas, roots and tubers, bananas and plantains, and edible oil. It also provides an overview of overall market conditions and several cross-cutting issues that affect Haiti's staple food markets.

### 1.2. Domestic food supply

The main staple food crops in Haiti are bananas (plantain), rice, maize, wheat flour, tubers, beans, peas, and sorghum. The main tubers produced are sweet potatoes, cassava (yuca), and yams. Among cereals, rice is the most important crop, followed by maize and sorghum. Many varieties of beans and peas are grown across the country, the most relevant of which are black beans, red beans, and pigeon (or congo) peas. Higher-value commodities such as fruits (mangoes, papayas, pineapples, avocados, and citrus fruits), cocoa, tobacco, coffee, and sugarcane are also produced. Cocoa, mango, mangosteen, and guava stand among the main agricultural exports (Jean-Pierre, Kiremidijan, and Paul 2013; MARNDR 2014; Pop 2016).

Favorable climatic conditions facilitate year-round agricultural production (Figure 4). Haiti has three production cycles: the spring season, which extends from March to July; the summer/fall season, from July to November; and the fall/winter season, which takes place between November and March (MARNDR 2014). However, differences in the timing of planting and harvesting occur based on location and crop and variety (short- or long-cycle) used. Spring is considered the main season since it contributes about half of total annual production of cereals, pulses, and tubers (CNSA 2014).

**Figure 4.** Seasonal calendar for Haiti

Season	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Rainy season												
Hurricane season												
Lean season												
Spring season harvest												
Summer/fall season harvest												
Fall/winter season harvest												

Source: Authors' elaboration.

Although agricultural production is spread across the country, Artibonite, Ouest, and Centre Departments account for more than half of the cultivated area and production volume in most staples considered in this document. North Department is also important for tuber and banana production (MARNDR 2012b, 2014, 2017).

Production is predominantly rainfed and most of it takes place at the smallholder level, with about three-quarters of the production units smaller than 1 hectare (ha). According to the most recent agricultural census, about 1 million smallholders were in Haiti in 2009, of whom about 25 percent were women. Youth (up to 29 years of age) account for approximately 11 percent of all agricultural producers. Over 95 percent of the production units in the country rely on family labor (MARNDR 2012b). Productivity levels are low due to: limited use of production inputs (quality seeds, fertilizers, pesticides); limited access to irrigation (only available to about 13 percent of all production units); lack of access to financial resources for investment; incidence of pests and diseases; occurrence of adverse climatic events (i.e., droughts, hurricanes, or erratic rainfall pattern); land fragmentation that prevents large-scale production; soil degradation; and the continued use of unimproved cropping practices. As well, the late delivery (relative to the cropping calendar) of inputs/resources from government programs has been reported as a factor hindering production (MARNDR 2012b; CNSA 2014; FEWS NET 2017; Pop 2016).

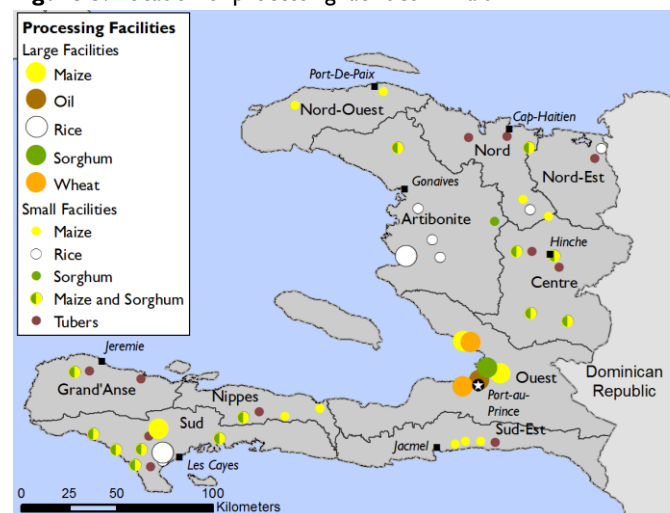
The Haitian government and other agencies consider 2009, the year the agricultural census took place, as the reference year for production estimates. Production in 2009 was not hampered by any major adverse natural or climatic events. Government spending was also available for supporting the agriculture sector and hence, record harvests were achieved (CNSA 2013).

The food processing industry is characterized by the presence of a few large-scale (industrial) facilities and a large number of small-scale operations (Figure 5). For instance, for large-scale processing of maize and wheat, Les Moulins d'Haïti and Cereales d'Haïti transform imported grains into different products (flour, meal, pasta, snacks, other) in facilities near Port-au-Prince. Processing of vegetable oil is largely focused on mixing and

bottling imported refined oil. Processing of sorghum into alcoholic and nonalcoholic drinks increased over the past years (FEWS NET and CNSA 2017; FEWS NET 2017).

Small-scale processing takes place locally, conducted by a large number of small-scale mills spread across the country. These mills process different products, mostly using outdated and poorly maintained equipment, a situation that compromises the quality of the end product and extraction rates (FEWS NET 2017).

**Figure 5.** Location of processing facilities in Haiti



Source: FEWS NET (2017).

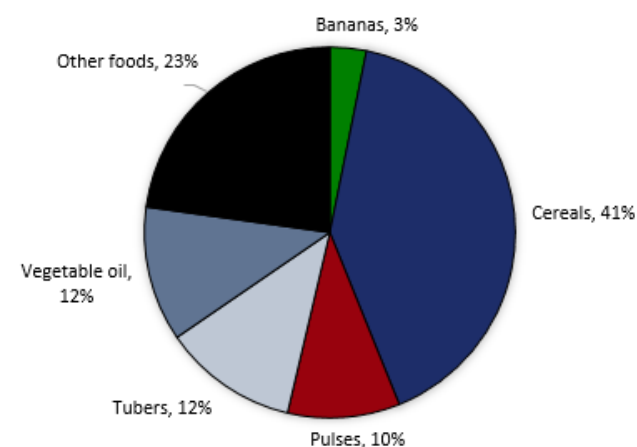
**Table 1.** Annual per capita requirements of the main staples

Product	Requirement (kg/capita)
Rice	50
Maize	20
Wheat	14
Sorghum	5
Beans and peas	25
Tubers	88
Bananas (including plantains)	45

Note: Tubers includes sweet potato, cassava, and yam.

Source: CNSA (2014).

**Figure 6.** Share of calorie availability of main food groups, average, 2009–2013



Source: Authors' calculations based on FAOSTAT data.

### 1.3. Domestic food demand

Rice is the most important cereal in Haiti, with an average annual consumption of 50 kilograms (kg) per person. Maize, wheat, and sorghum are consumed to a lower extent (**Table 1**). Consumption of tubers and plantains is also widespread, estimated at 88 kg/capita and 45 kg/capita on average, respectively. At the aggregate level, cereals and tubers contribute to half of total calorie availability (**Figure 6**).

The consumption estimates in **Table 1** reflect country averages, but it is recognized that regional differences in consumption occur based on preferences, seasonality, availability, price levels, and household purchasing power (FEWS NET 2017). Tubers and plantains are often consumed in substitution of more preferred staples (mainly rice). Beans and peas are regularly served as an accompaniment to the main staples.

Market dependence is high, even in areas with high levels of agricultural production. Generally, poorer households across the country purchase between 45–85 percent of all of their food in the market (FEWS NET 2005). This dependency puts households in a vulnerable position given the volatile prices of staple foods (FEWS NET 2005).

Based on estimates of total production and of domestic requirements, Haiti is considered self-sufficient in maize, sorghum, tubers, and plantains (**Table 2**). The country is structurally deficit in its most relevant staple, rice, and in pulses. Self-sufficiency for rice and beans/peas was 14 percent and 51 percent, respectively, over the 2011–2016 period. Imports, both formal and informal, are key for fulfilling domestic food demand, particularly for items with no domestic supply such as wheat and edible oil.

**Table 2.** Commodity balance (MT cereal equivalent), Haiti, 2011/12–2015/16 average

Element	Rice	Maize	Sorghum	Wheat	Beans and peas	Tubers	Banana	Edible oil
Production	79,512	230,776	89,056	-	156,666	289,423	112,387	-
Imports	431,425	57,147	-	315,064	23,575	5,070	20,730	124,850
Total supply	510,937	287,923	89,056	315,064	180,241	294,493	133,117	124,850
Domestic requirements	561,550	261,350	89,209	150,752	304,602	297,329	132,646	108,628
Domestic balance	(50,613)	26,573	(153)	164,312	(124,361)	(2,836)	471	16,222

Note: The conversion factors used for calculating cereal equivalents are presented in Annex 2, **Table 24**.

Source: Authors' calculations based on CNSA and WFP (2011), CNSA (2013, 2014), COMTRADE (2017), and FAO (2016) data.

### 1.4. Domestic food trade

For locally produced staples, farmers usually sell their output at the farm gate to local traders and Madame Saras, or in rural collection markets to other traders, Madame Saras, and final consumers. The products then move along the chain toward regional markets and urban markets. The main domestic consumption markets are Jérémie, Les Cayes, Gonaïves, Port-de-Paix, Cap-Haitien, and the broader Port-au-Prince area, which includes Petion Ville, Carrefour, Delmas, Cité Soleil, and the Croix des Bouquets and Croix des Bossales markets. For all commodities analyzed, the largest flows of locally produced staples are directed toward the broader Port-au-Prince market area. Other medium and minor flows supply the rest of the markets in the country (FEWS NET 2017). Commodity flows are heavily dependent on road availability and accessibility, rather than on distance between source and destination markets.

Madame Saras are a key actor in the marketing chain of many locally produced food staples. They are women traders who perform collection, aggregation, and distribution activities, facilitating the flow of commodities from producing areas (rural Madame Saras) to consumer markets (urban Madame Saras). Generally, they handle small loads and resort to public or rented transportation to mobilize (several times a week) their products.

Transport/distribution capture a large share of the transaction costs along the chain. At the local level, products are transported to local markets by foot, motorbike, "Tap-Tap" (buses or large vehicles used for public transportation) and animal (horses, donkeys). From there, transport takes place by trucks of varying sizes (CJ Consultants 2012; FEWS NET and CNSA 2017; FEWS NET 2017) (**Figure 7**). Physical accessibility is a major factor affecting food trade and food availability in remote areas.

**Figure 7.** Transport options for food products

Source: FEWS NET and CNSA (2017).

## 1.5. International food trade

Imports are sourced from several countries, but the United States and the Dominican Republic are by far Haiti's largest trading partners. The United States dominates formal imports of rice, beans, maize meal and flour, and wheat grain. The Dominican Republic is the main partner for wheat flour and plantains, and Malaysia for vegetable oil. Informal imports of rice, wheat flour, ground maize and maize meal, beans, biscuits, plantains, and condiments and seasonings from the Dominican Republic are reported to be of considerable size (CFI 2016; FEWS NET and CNSA 2017). Fieldwork as well as some literature suggest that the major food importing and food processing enterprises (Cristo SA/Deka Group/Bongu, *Huileries Haïtiennes*/HUHSA, Stanco, Carribex, and Arlequin) display a nonaggressive, no-compete behavior toward each other. That is, these companies offer products having no or little overlap with those of the other larger enterprises, supporting the development of monopolies (Schwartz 2015; FEWS NET 2017).

According to customs information, 75.0 percent of all imports (by value) enter by land, 24.5 percent by sea, and only 0.2 percent by air. Imports occurring by land enter Haiti through the main cross-border points of Malpasse (Haiti/HT) – Jimani (Dominican Republic/DR), Ouanaminthe (HT) – Dajabon (DR), Belladère (HT) – Elías Piña (DR), and Anse à Pitre (HT) – Pedernales (DR). Among these, 60 percent of all trade (by value) is registered in Malpasse–Jimani, due to its proximity to Port-au-Prince. It is followed by Ouanaminthe–Dajabon with 28 percent, which serves the broader Cap-Haitien area. The ports in Port-au-Prince and Cap-Haitien are the main ports of entry by sea (CFI 2016; FEWS NET 2017).

Imports to Haiti are subject to duty fees. Agricultural machinery and production inputs, including seeds and fertilizers, benefit from having no import tariffs, facilitating their importation into the country. Tariffs to staple foods vary (**Table 3**). Nongovernmental organizations (NGOs) are exempt from customs duties for the import of food products.

**Table 3.** General nonpreferential duty rates to staple foods, as applied in 2016

Commodity	Applied tariff (%)	Notes
Rice	4.4	2.5% for paddy rice, 5.0% for husked, brown, or milled rice
Maize grain	10.0	0.0% for seeds, 20.0% for other uses
Maize flour	20.0	
Sorghum	7.5	0.0% for seeds, 15.0% for other uses
Wheat grain	0	
Wheat flour	25.0	
Leguminous, dry	7.9	5.0% for most peas, except pigeon peas, which are at 15.0% 5.0–22.5% for beans, tariff variable
Leguminous, fresh	40.0	Applicable to both peas and beans
Sunflower oil	15.0	Also applicable to coconut and palm kernel oil
Other vegetable oils	7.5	Applicable to soybean, groundnut, olive, and palm oils

Note: These rates reflect Most Favored Nation rates.

Source: WTO (2016).



Imported commodities flow in the opposite direction as local commodities. Imports from the international market enter mostly in Port-au-Prince and move toward the rest of the country (Latino and Musumeci 2016; FEWS NET 2017). Imports from the Dominican Republic enter at the different border points and move to the different markets in Haiti following established trade routes (FEWS NET 2017).

The seasonality of harvests results in some intra-annual variation in prices for most locally produced staples. The price of imported products shows less variation over time. Given Haiti's high reliance on international markets for some of its key staples, Haiti is generally integrated with the world markets.

Cross-border trade with the Dominican Republic is a major source of food and nonfood products, such as clothing, household items (plastic, boxes), detergent, and fertilizer. The total size of Haitian imports from the Dominican Republic is estimated at USD 1.423 billion. Unregistered imports are estimated at USD 375 million, or 26 percent of total imports (CFI 2016). Citizens from both countries residing in border areas regularly cross to the other side to sell and buy different types of goods. Generally, border crossing by individuals is fairly unrestricted during market days. **Figure 8** and **Figure 9** show the border crossing points at Belladère and Ouanaminthe, respectively.

In October 2015 the Haitian government declared an import ban for 23 products from the Dominican Republic (**Table 4**). The ban only applies to imports made by land. Imports by air or sea that pass through customs are not affected. This measure was taken to reduce informal imports (with consequent revenue losses at customs) from the Dominican Republic, and to protect the population from poor-quality products, which had proliferated and posed an increasing health threat to the population. For instance, wheat flour was found to have dangerous levels of potassium bromate, which has been linked to cancer and hence banned in many countries (CFI 2016).

Haiti participates in a number of initiatives that are relevant for the food marketing system. For instance, the Caribbean Community (CARICOM) Single Market and Economy (CSME) aims to create a single economic space among its 12-member states for the production and trade of goods and services and to support regional growth and development. The Caribbean Community Agricultural Policy (2011), the CARICOM Agribusiness Development Strategy (2012), the CARICOM Regional Food and Nutrition Security and Plan (2010), the CARIFORUM–European Community Agreement (2008), and the Caribbean Basin Initiative (CBI) with the United States are further examples of such initiatives. Among their objectives, these initiatives aim to support trade and marketing of the food sector by following a value chain approach and by pointing to key investments needed for increasing competitiveness and sustainability in the sector (FAO 2015a).

Generally, the marketing system for locally produced staples is competitive, with no evident barriers to entry. A large number of actors participate at all stages from production to retailing. Price is usually determined by negotiation. The different actors rely on their networks for accessing market information. Imports are concentrated in a few actors, a situation that has led to higher consumer prices (Pop 2016). However, as the

**Figure 8.** Belladère (Haiti) – Elías Piña (Dominican Republic) border crossing



Source: FEWS NET and CNSA (2017).

**Figure 9.** Ouanaminthe (Haiti) – Dajabon (Dominican Republic) border crossing



Source: FEWS NET and CNSA (2017).

**Table 4.** Food products banned from land-based imports, Haiti

Cereals or cereal-based products	Other products
Wheat flour	Cooking oil
Pasta	Drinking water
Maize (ground, meal)	Butter
Biscuits	Margarine
	Powdered juice
	Snack ("chee co")

Source: CFI (2016).

products move to the wholesale and retail level, they join the marketing structures for local products, which are competitive. Traders and retailers usually handle both local and imported commodities (FEWS NET 2017).

Several constraints limit the performance of the staple marketing system in Haiti, namely: disregard for standardization and product grading based on quality; poor and limited infrastructure availability (storage, processing facilities); high transaction and transport costs complicated by poor road infrastructure; a high level of postharvest losses; limited access to financial services; fragmentation of the marketing chain; lack of organization among market actors; and asymmetric market information and market power. Imports are affected by the exchange rate (particularly against the US dollar and the Dominican peso), cross-border dynamics with the Dominican Republic, and protective measures such as tariffs and ban of imports by land of certain food items. In addition, low purchasing power makes demand for staples very responsive to price changes.



## 2. Cross-cutting Issues

Markets and trade in Haiti are strongly influenced by a number of factors, including geography, climate, and the macroeconomic and political environment. Certain issues raised in this section have varying impacts, depending on the commodity in question, and are examined in greater detail in later commodity-specific sections of the report.

### 2.1. Agroecological context

#### Climate and geography

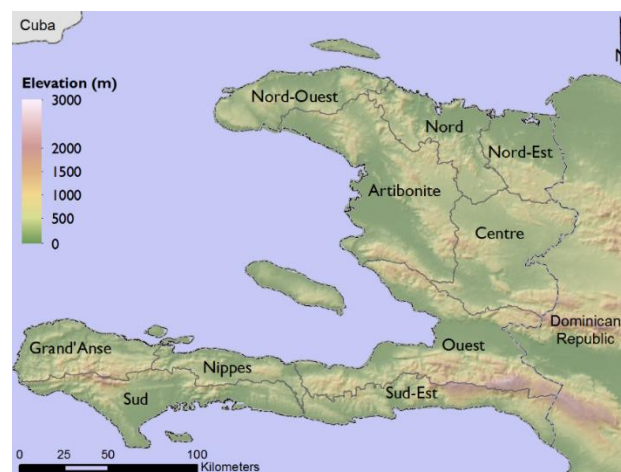
Haiti is characterized by a mountainous terrain. Approximately 60 percent of the territory has slopes over 20 percent and only about 30 percent has slopes under 10 percent (**Figure 10**) (MARNDR 2013b). Annual rainfall is distributed in two rainy seasons. The first one extends from April to June and the second one from August to November (FEWS NET et al. 2015). Generally, rainfall ranges between 800 mm and 3,200 mm across the country (MARNDR 2012a). This seasonal pattern and moderate temperatures make agricultural production possible throughout the year. Nord, Ouest, Artibonite, and Sud-Est Departments have comparatively lower levels of rainfall than the rest of the departments (**Figure 11**).

#### Agricultural potential and challenges

Environmental degradation is a major problem in Haiti and has far-reaching impacts. Forest cover, once estimated at about 60 percent of the territory, has reduced to less than 1 percent. Deforestation and inappropriate cultivation practices have contributed to soil erosion, degradation, and desertification. This situation sets the ground for higher risk of drought, flooding, and landslides, and larger losses caused by climatic events such as storms and hurricanes (Johnson Williams 2011). Over 85 percent of soils are severely degraded or facing degradation at a fast rate, threatening the livelihoods of the population all across the country (MARNDR 2013a).

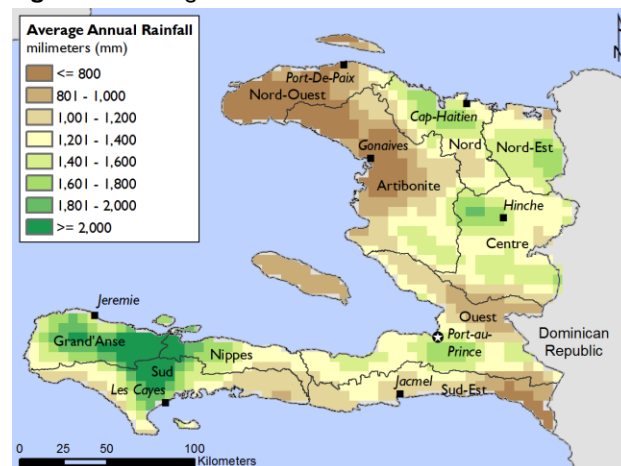
While agricultural production takes place in all Departments (**Figure 12**), less than 20 percent of the area under cultivation is deemed appropriate for agriculture (MARNDR 2013b). The inherent properties of soils (chemical composition, physical properties), coupled with a rugged topography and soil degradation, make the prospects of agricultural production questionable under a system of low use of inputs and unimproved crop management practices. A variety of projects carried out by national and international development actors, local authorities, and other partners (including the private sector) have worked toward increasing agricultural productivity and sustainability of staple and cash crops in several areas of the country, with mixed results (FAO 2015b; Molnar et al. 2015; PAPHYRUS 2016).

**Figure 10.** Elevation, Haiti



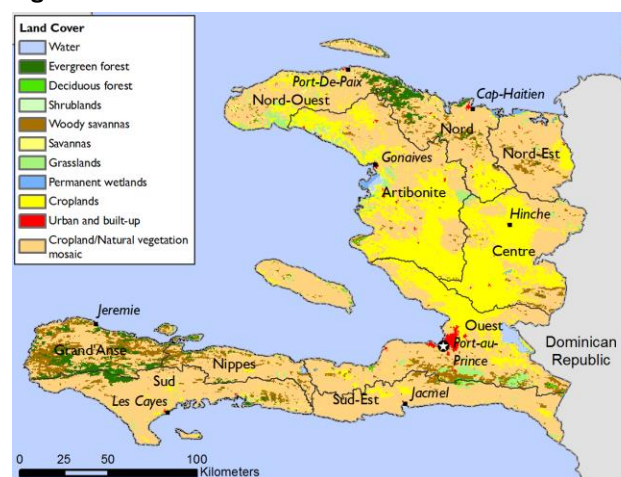
Source: NASA (2014).

**Figure 11.** Average annual rainfall, 2000–2014, Haiti



Source: Authors' calculations based on data from USGS/EROS (2016).

**Figure 12.** Land cover, Haiti



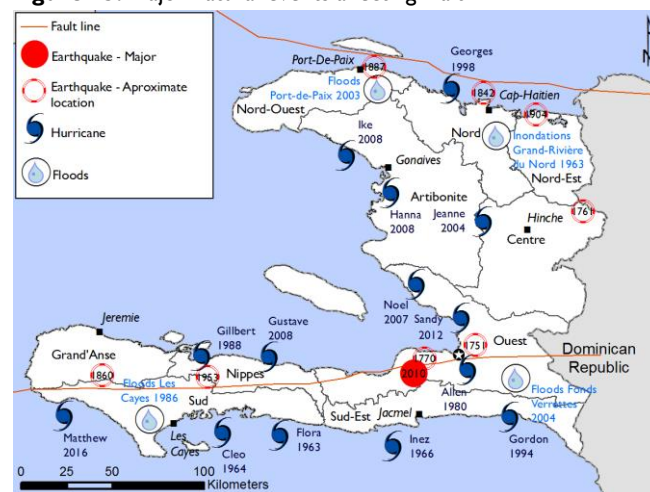
Source: USGS (n.d.).

## Vulnerability to natural hazards

Haiti is highly vulnerable to natural hazards and is in fact, among the countries most vulnerable to disasters in the world (Government of Haiti 2014). Repeated events of hurricanes, storms, floods, droughts, and earthquakes have affected the country over time, causing considerable disruptions in Haiti's development (**Figure 13**).

According to the International Disaster Database, between 2000 and 2016 Haiti experienced 74 natural disasters, resulting in the loss of 237,176 lives and affecting a total of 12,688,458 persons over this period (**Table 5**). Among these events, the 2010 earthquake accounted for 93 percent of fatalities and 29 percent of the total affected persons (Guha-Sapir, Below, and Hoyois 2016). According to the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Hurricane Mathew (2016) affected 2.1 million persons, with 1.4 million in need of humanitarian assistance (OCHA 2017). Measured in terms of events per square kilometer (km), Haiti surpasses all other LAC countries (Singh and Barton-Dock 2015). Floods and storms account for the broad majority of disasters experienced.

**Figure 13.** Major natural events affecting Haiti



Source: Reproduced from Government of Haiti (2014).

**Table 5.** Occurrence of natural disasters in the period 2000–2016

Type of disaster	Number of events	Total number of fatalities	Total number of affected persons
Drought	3	0	4,635,000
Earthquake	1	222,570	3,700,000
Epidemic	7	7,168	585,453
Flood	37	3,106	647,721
Storm	26	4,332	3,120,284
Total	74	237,176	12,688,458

Note: Epidemic events refer to outbreaks of bacterial and viral diseases; floods include coastal, flash, riverine, or other floods; and storms include convective, extra-tropical, tropical cyclone, and other storms.

Source: Guha-Sapir, Below, and Hoyois (2016).

In response to these and many other events registered in years prior to 2000, Haiti has received significant humanitarian assistance. With the occurrence of the 2010 earthquake, Haiti received unprecedentedly large aid flows.

## 2.2. Macro-economic context

Agriculture contributes to 21 percent of gross domestic product (GDP) in Haiti, accounting for 99 percent of the contribution by the primary sector (**Figure 14**). Economic growth slowed down in past years, with GDP's annual growth rate decreasing from 5.5 percent in 2010/11 to 1.4 percent in 2015/16. Growth has been mainly driven by the secondary and tertiary sectors, more specifically on the industry, construction, and commerce and services branches of economic activity (Institute Haïtien de Statistique et d'Informatique (IHSI) 2015). Political instability, reduced investment, and underperformance of the agriculture sector due to adverse climatic factors in several consecutive years contributed to the reduction in economic growth.

Haiti imports more than it exports, resulting in a negative trade balance. While exports represent about 21 percent of GDP, imports represent 51 percent (World Bank 2016). Exports are largely undiversified, with apparel dominating trade (knit shirts, sweaters, suits, undergarments, etc.) at about 90 percent of total exports. Rice is the item with the largest import share (7.7 percent in 2015), followed by products relevant to the apparel sector (shirts, fabrics, etc.) (MIT Media Lab Macro Connections n.d.).

Unemployment is high, estimated at 40 percent (USAID Haiti 2017). For those employed, agriculture and the urban informal sector are the main sectors of employment, capturing 40 percent and 47 percent, respectively, of the labor market. Informal micro, small, and medium enterprises create the broad majority (80 percent) of new jobs in Haiti. The private formal sector employs only 7.5 percent of the labor force. Shortage of skilled labor and widespread informality hinder the population's access to better employment opportunities. Wages are low. About 70 percent of workers earn less than the minimum wage, which by mid-2017 reached 300 Haitian gourde (HTG) per day, forcing many of the poor to have two or more income-generating activities (Singh and Barton-Dock 2015).

In the 2011–2016 period, the average annual inflation rate was 8.8 percent (Figure 15). Food and drinks alone account for 50.30 percent of the consumer price index (CPI). Transport is the next major expense category, accounting for 13.74 percent of the CPI (Banque de la République d'Haiti 2017). These two expense categories have a strong influence on the inflation rates observed. According to the Haitian Statistical Office (IHSI), the increases in inflation registered in past years were, among others, due to the depreciation of the HTG versus the USD and the lower availability of local produce in the markets (IHSI 2015). To stabilize inflation and the external value of the HTG, the Central Bank of Haiti implemented different monetary policies, such as building and maintaining international reserves and improving domestic revenue mobilization (though the fiscal deficit remains a major problem). Further, debt relief diminished Haiti's external debt (Singh and Barton-Dock 2015).

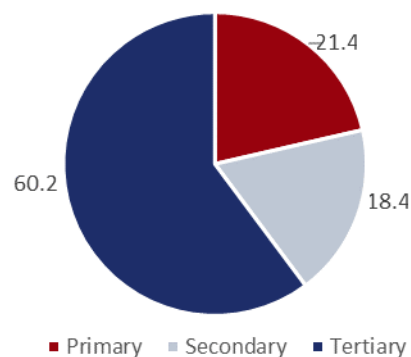
### 2.3. Infrastructure

Haiti's road infrastructure is poorly maintained and underdeveloped. The network's extension is estimated at about 3,400 km, but updated information is lacking. Primary roads cover about 700 km, connecting the major cities in the country and converging in Port-au-Prince. Secondary and tertiary roads cover approximately 1,500 km and 1,200 km, respectively (Figure 16). Less than 20 percent of the roads are paved (Logistics Cluster Unit Haiti 2012). Poor road conditions can make

transit difficult in some areas, particularly at night, due to the absence of lighting, traffic signs, guard rails, and road markings (Overseas Security Advisory Council (OSAC) 2016).

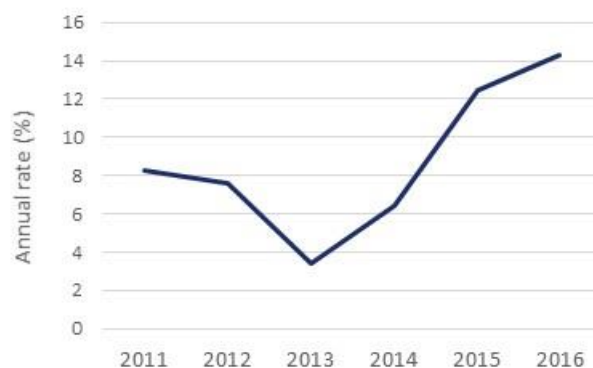
Haiti lacks a broad and well-developed irrigation infrastructure. The availability of generally sufficient rainfall over the year supports the reliance on a rainfed production system (MARNDR 2015). However, prolonged drought periods caused by a diversity of factors, including the El Niño phenomenon, have severely undermined production over time and reinforced the importance of developing and improving irrigation infrastructure. In 2013 the MARNDR announced a plan to expand access to irrigation to 43,500 ha by rehabilitating and/or expanding the current network (MARNDR 2013a). After initial progress achieved in some Departments, the new administration reaffirmed the government's commitment to support

**Figure 14.** Contribution of Haiti's economic sectors to GDP, 2011/12–2015/16



Source: Authors' calculations based on Banque de la République d'Haiti (2017).

**Figure 15.** Annual inflation rate in Haiti, 2011–2016



Source: Banque de la République d'Haiti (2017).

**Figure 16.** Road network in Haiti



Source: Authors' elaboration based on OpenStreetMap (2017).

infrastructure development and rehabilitation through work on irrigation channels and rural roads, particularly in Artibonite, Sud, Grand’Anse, and Nippes Departments, where works have been taking place.

Storage facilities in Haiti are scarce. After the 2010 earthquake, the humanitarian community relied heavily on mobile storage units since the available infrastructure was either occupied or damaged. The area around Port-au-Prince (including the port and the international airport) and areas where industry has established remain the main areas offering warehouse space, which is often in poor conditions (Logistics Cluster Unit Haiti 2012).

## 2.4. Social context

### Population

By 2015, approximately 10,911,819 persons lived in Haiti, of whom about 52 percent were in urban settings. The population is generally young: 42 percent are younger than 18 years of age (IHSI 2015). Ouest Department (where Port-au-Prince is located) hosts 37 percent of the total population, followed by Artibonite and Nord Departments (16 percent and 10 percent of the population, respectively). The rest of the departments host between 3–7 percent of the total population (**Figure 17**).

Haiti is urbanizing as people increasingly move from rural areas to urban centers. Settlements in urban spaces often take place in less accessible and least-serviced locations, which are often prone to disasters. Floods, hurricanes, and earthquakes can have particularly devastating consequences for those populations living in informal and precarious dwellings (Singh and Barton-Dock 2015).

### Poverty and human development

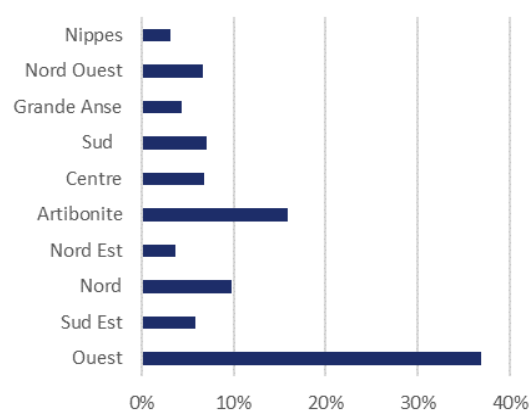
Extreme poverty declined over the past years, reaching 24 percent in 2012. However, most of this progress was achieved in urban areas, most notably in Port-au-Prince. About 80 percent of the 2.5 million Haitians living in extreme poverty reside in rural areas. Nord-Est and Nord-Ouest Departments register the highest incidence of poverty. With recurrent needs and limited income, about 48 percent of Haitians aged 15 years or more borrow money. The main source of finance is family and friends, followed by private informal lenders (World Bank 2014).

General living conditions are challenging: about 11 percent of households have access to tap water in the house; 36 percent have access to energy (electricity, solar, or generators); and 31 percent have access to improved sanitation facilities (Singh and Barton-Dock 2015). Further complicating this situation, about 40 percent of the population does not have access to essential health services. Preventable conditions such as respiratory infections, diarrheal diseases, tuberculosis, preterm birth complications, and birth-related complications are among the top 10 causes of death in Haiti (WHO 2015).

Illiteracy and low educational attainment represent major barriers to development. Persons aged 25 years or older have, on average, less than five years of schooling. In fact, half of the adult population is illiterate. Among the major factors compromising progress in education are the shortage of qualified teachers and the high costs of education relative to earnings, as over 85 percent of Haitian schools are privately managed (UNDP 2015; USAID Haiti 2016). Estimates from 2014 indicate that 26.5 percent of persons aged 15 or more borrow money to cover education or school fees (World Bank 2014).

For many Haitians, emigration is the personal and household/family strategy for sustaining and/or improving their living standards. By 2012, 69 percent of Haitian households received domestic or international transfers. With approximately 1 million Haitians living outside Haiti, international transfers (mainly from the United States, the Dominican Republic, Canada, and France) represent more than 20 percent of Haiti’s GDP. Money received through remittances from the Dominican Republic tend to benefit households in rural areas to a larger extent than remittances received from the United States. However, overall, poor households have less access to remittances than better-off households. Residents in Sud-Est and Sud Department tend to benefit more from domestic transfers, while those in Nord, Nord-Est, and Nippes Departments benefit more from international remittances (Singh and Barton-Dock 2015).

**Figure 17.** Population distribution by Department, Haiti, 2015



Source: Authors’ calculations based on IHSI (2015).



In addition to the challenges posed by poverty, income inequality is large, as assessed by the level of the Gini coefficient for inequality (0.6). According to this measure, Haiti has the highest income inequality in the LAC region. While inequality has reduced in urban areas, it has increased in rural areas. Weather-related shocks affecting rural-agricultural incomes, as well as labor opportunities, have affected certain areas disproportionately (Singh and Barton-Dock 2015).

Gender inequalities still prevail in Haiti. Women receive less education than men, face greater health (including reproductive health) challenges, are more likely than men to face domestic violence, and have less opportunities in the labor force and in the public sphere. Women are 20 percent more likely than men to be unemployed, and those who do work earn 32 percent less than men (Singh and Barton-Dock 2015).

Recent political tensions with the Dominican Republic (2015–2016) resulted in deportation and return of migrant workers and Dominicans of Haitian descent from the Dominican Republic to Haiti. By January 2017, close to 170,000 returnees were identified. About 47,000 persons still live in 31 camps (OCHA 2017). This number adds to the number of internally displaced persons from the 2010 earthquake and Hurricane Mathew in 2016 in need of humanitarian assistance.

### **Civil unrest, insecurity, and violence**

Generally, Haitians have limited trust in the government and in democratic processes. With decades of facing a lack of opportunities, poverty, inequality, and poor governance, the population often resorts to protests and violent expressions of discontent. Lawlessness and violence contribute to an atmosphere of insecurity and instability (Singh and Barton-Dock 2015).

Crime statistics are considered to be underreported. Assaults and armed robberies to persons, vehicles (standing or in transit), and residences are frequent. These are predominantly executed by small organized groups that tend to operate in specific areas. Urban areas tend to be more affected than rural areas. The limited response capacity by the Haitian National Police facilitates criminal activity (Overseas Security Advisory Council (OSAC) 2016).

## **2.5. Political and institutional context**

During the past three decades Haiti experienced 18 changes of president and 20 major cabinet changes, all of which resulted in major regime changes. Political instability was accompanied by underperformance of government institutions, and poor governance and accountability. In addition, the fiscal deficit has resulted in low spending in key areas of development (such as education and health). Some degree of political stability was achieved in the past five years (Singh and Barton-Dock 2015), but the scenario under the new administration starting in 2017 remains uncertain.

The Strategic Plan for the Development of Haiti (PSDH) Toward 2030 laid out by the government in 2012 is a continuation of previous efforts, such as the National Strategy for Growth and Poverty Reduction 2007–2010 and others, that set the priorities and pathway for development in the aftermath of the 2010 earthquake. The PSDH focuses on four main areas of development and/or reconstruction (territorial, economic, social, and institutional) and strives for creating regional development poles. Programs related to economic development focus on modernization of and support to different economic activities such as agriculture, fisheries, manufacture, tourism, etc. At the institutional level, the PSDH aims to strengthen and modernize public institutions, and to improve security and rule of law (Gouvernement de la République d'Haïti 2012).

In 2013 the MARNDR launched a three-year program of agricultural revival (*Programme Triennal de Relance Agricole 2013–2016*) that revised the Ministry's priorities and course of action. The program's objectives included modernization of the MARNDR, improvements in agricultural productivity, promotion of agroindustry, and reversal of land degradation through promotion of sustainable natural resource management (MARNDR 2013a).

### 3. Rice (local and imported)

Rice is the most consumed staple in Haiti. Its production is concentrated in Artibonite Department and in irrigated areas in Sud, Nord, Nord-Est and Centre Departments (**Figure 18**). Once self-sufficient on rice, Haiti is now highly dependent on imports due to the domestic production's inability to cover the growing demand, to low import tariffs, and to the considerable price differential between imported and local rice. Women play a prominent role in different aspects of rice production and marketing. While the imported rice subsector is highly concentrated in a few importers and distributors, the local rice subsector is characterized by the presence of a large number of actors at different stages of the marketing chain.

#### 3.1. Consumption

Annual rice consumption in Haiti is currently estimated at 50 kg per person, on average, with rice contributing to approximately 21 percent of daily calorie availability (CNSA 2014; FAO 2016). Rice is the most consumed staple in the country nowadays, but this was not the case 30 years ago, when annual consumption was 13 kg per person. Considerable increases in rice consumption were facilitated by the opening of the domestic market to imported rice in 1986 (Cochrane, Childs, and Rosen 2016).

Local rice is preferred over imported rice, as it is perceived to have better taste and to be of higher nutritional quality. However, as imported rice is cheaper than local rice, consumers (particularly those with limited purchasing power) opt for imported rice. In rice-producing areas, revenues from rice sales are often used to purchase imported rice and other household necessities. Rice is preferred over other staples, such as maize and tubers, in both urban and rural areas. Rice is mostly consumed together with beans and/or other accompaniments such as meat if household finances allow (Fintrac 2013; FEWS NET 2017).

#### 3.2. Production

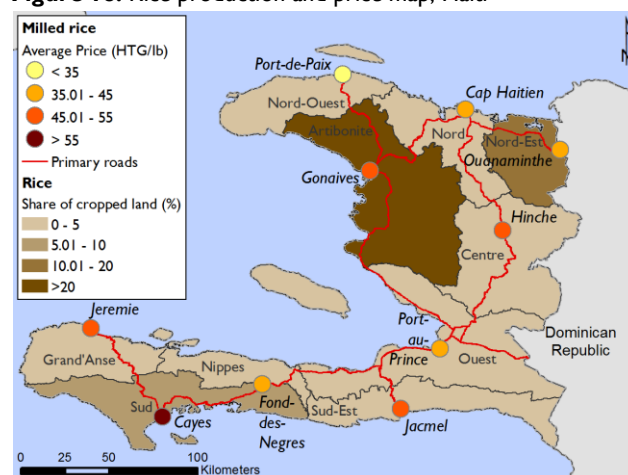
Contrary to its relevance for the Haitian diet, rice occupies only 5 percent of the cultivated area at the national level (Van Vliet et al. 2016). Artibonite Department is the largest rice producer in Haiti, registering between 70–88 percent of total land under its cultivation (**Figure 19**). Rice is also cultivated in Sud, Nord, Nord-Est, and Centre Departments, but their contribution to the total land under cultivation is lower, in the range of 1–5 percent (MARNDR 2017).

Rice is cultivated mostly under irrigation (Van Vliet et al. 2016), but rainfed production also takes place in the humid mountains in Nord, Nord-Ouest, and Nord-Est Departments (MARNDR 2015).

Yields are low, in the range of 1.75–3.50 MT/ha of paddy rice. The national average is estimated at 3.00 MT/ha of paddy rice, which is low compared to other producing areas in the LAC region such as the Dominican Republic (6.55 MT/ha) and Colombia (5.90 MT/ha) (CNSA 2013). Over the period 2012–2016, average production of paddy rice was 156,864 MT (**Figure 20**), equivalent to 91,258 MT of milled rice, assuming an extraction rate of 0.6. Overall, production levels vary from year to year, particularly due to the effects of climatic events.

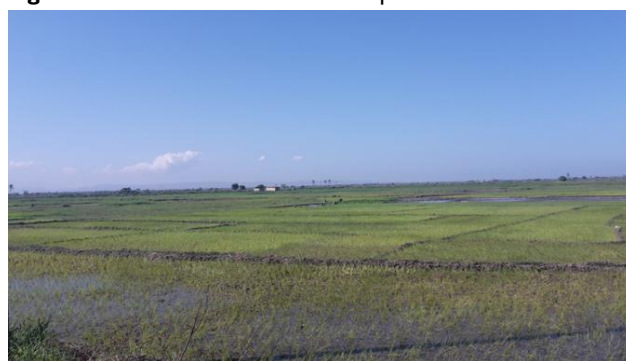
Rice is cultivated in all three seasons in the main producing areas (**Table 6**). However, other areas only have one (Centre Department) or two seasons (Nord, Nord-Est, Nord-Ouest, Grand'Anse Departments). The spring season accounts for approximately 36 percent of total production (CNSA 2013, 2014; MARNDR 2015).

**Figure 18.** Rice production and price map, Haiti



Source: Authors' calculations based on CNSA (2013), MARNDR (2017), and CNSA and FEWS NET (2017).

**Figure 19.** Rice field in Artibonite Department



Source: FEWS NET and CNSA (2017).

**Table 6.** Seasonal calendar for irrigated rice (Artibonite Department)

Season	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Spring	P			H								
Fall						P			H			
Winter	H									P		

Note: P = Planting, H = Harvesting

Source: MARNDR (2015).

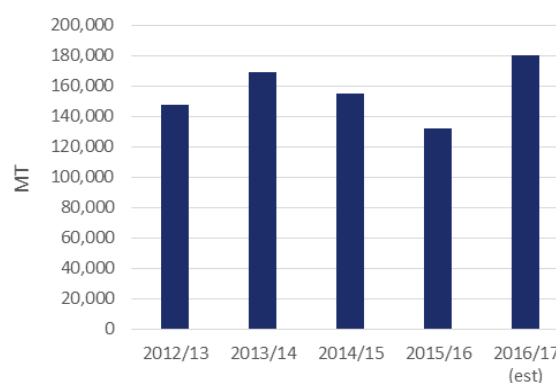
The main varieties of rice cultivated are: Shella, Shelda, TCS10 white, TCS10 yellow, Ti solèy, and M8. While TCS10 is the variety most widely produced, Shella and Shelda are considered of superior quality (MIC and PNUD Haiti 2014). Production levels have not been able to keep pace with the increases in demand. About 80 percent of all rice consumed in the country is imported. Tchako, Méga, Bull, and 10-sou-10 are the main varieties/brands imported. The United States, Vietnam, and the Dominican Republic are the main trading partners, accounting for 81 percent, 7 percent, and 5 percent of total formal rice imports, respectively, during the past years (MARND 2015; Cochrane, Childs, and Rosen 2016; COMTRADE 2017). Rice (rice scrap and long rice) from the Dominican Republic is also informally imported to markets in border areas (FAO and WFP 2010). During the 2011–2016 period, an average of 437,919 MT of milled rice was imported annually (COMTRADE 2017) (**Figure 21**).

The main constraints to rice production are: lack of financial resources needed by producers for investing and improving production; lack of technical support; increasing price of fertilizers; untimely access to inputs; lack of availability of quality inputs (particularly of seeds); lower availability of labor (due to emigration) coupled with its increasing cost; deterioration of irrigation infrastructure; incidence of pests and diseases; and the impacts of climatic factors (Bayard 2007; MARND 2015). Harvest and postharvest losses are estimated at 30 percent (Jean-Pierre, Kiremidjian, and Paul 2013).

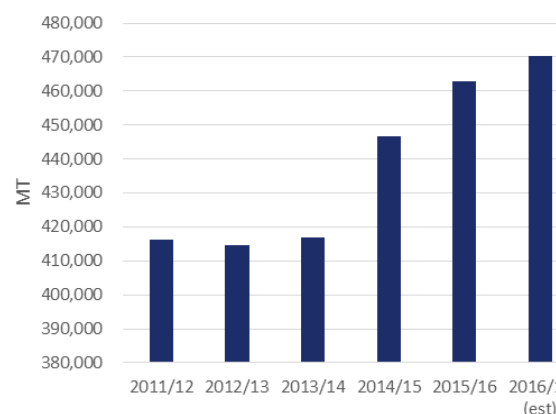
### 3.3. Structure of the marketing system

A large number of actors participate in the local rice marketing channel, which is considered to be competitive. Production is carried out by a large number of small-scale producers who sell the harvest to local Madame Saras or medium-scale processors, such as the Compagnie Haitienne de Production Agricole SA (CHPA). (**Figure 23**). These actors process (mill) and pack the product. Rice from CHPA is sold under the Ti Malice brand. Madame Saras distribute to retailers in the local consumption markets and to urban Madame Saras who further move the product toward the major consumption markets in Jérémie, the broader Port-au-Prince area, Port-de-Paix, and Cap-Haitien (FEWS NET 2017). A share of rice is consumed locally, particularly in the small producing areas, but the larger flows (including the rice from Artibonite Department) are directed toward the main urban markets (**Figure 28**). Women play a prominent role in different aspects of local rice production. They participate in planting and harvesting activities, and bring the paddy rice to the mills. Retail is entirely dominated by women and about half of the wholesalers are women (FEWS NET 2017).

Formally imported rice enters predominantly through Port-au-Prince and Cap-Haitien (FEWS NET 2017). Importers send the rice to local distributors spread in major towns across the country who then sell to wholesalers, who in turn sell to retailers and these, to final consumers. Imports are concentrated in a few importers, of which RiceCo S.A., CGC, Group Caroli, and Tchaco S.A. are the most important. The Government of Haiti also imports rice (as purchase or as donation from other countries), which is then sold to larger-scale traders (importers, distributors, or wholesalers) in public sales that are announced in local newspapers (FEWS NET 2017).

**Figure 20.** Production of paddy rice in Haiti, MT, 2012–2016

Source: CNSA (2013), MARND (2014), MARND (2017).

**Figure 21.** Rice (milled) imports in Haiti, MT, 2011–2016

Source: Authors' calculations based on COMTRADE data.



**Figure 22.** Marketing of rice

Source: FEWS NET and CNSA (2017).

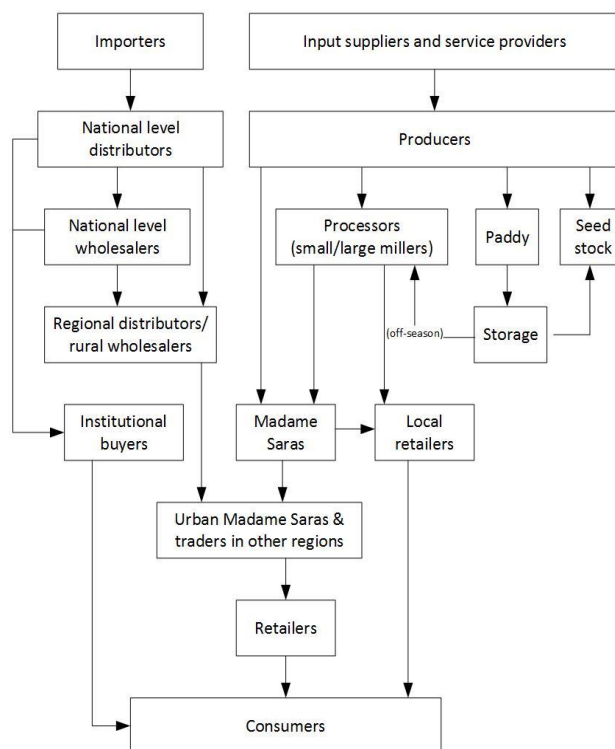
The import tariff for rice is low, a situation that facilitates imports. In 2016, the applied import tariff was 2.5 percent for paddy rice and 5.0 percent for milled rice (WTO 2016). Flows of imported rice go in the opposite direction as those of local rice, originating mainly in Port-au-Prince and Cap-Haitien and moving toward the rest of the country.

A study from 2016 indicated that in the 2011–2012 period, the rice import sector was “moderately concentrated,” based on results from the Herfindahl-Hirschman Index, a standard measure for assessing market concentration (Pop 2016). Importers do not keep stocks as they have the ability to make regular purchases over the year, but wholesalers do tend to keep larger stocks. This behavior grants them some power in the market dynamics (FEWS NET 2017). Beyond rice, importers, distributors, and wholesalers are also involved in the trade of other imported commodities, such as wheat flour and oil, and in the trade of local maize and beans (Latino and Musumeci 2016; FEWS NET 2017).

Rice processing involves many steps. After harvest, paddy rice is cleaned, parboiled (for producing yellow rice), dried, de-husked, and milled (for producing white rice). By 2007, between 450–500 mills were operating in the country, mostly relying on outdated equipment (Bayard 2007). In 2010, 221 mills were reported to be operating in the Artibonite Valley (Fintrac 2013). The quality of milling equipment affects rice quality and hence, price prospects, since poorly performing equipment results in rice with high levels of foreign matter and of broken grains (Cochrane, Childs, and Rosen 2016). It has been documented that the large agroindustry prefers sourcing from imports due to lower price, the possibility of purchasing large quantities as demand arises, and the ability to maintain consistent product quality (Van Vliet et al. 2016).

At the retail level, rice is sold predominantly by the cup or marmite (2.7-kg can). Supermarkets repack the product in plastic bags that hold about 2 pounds (lbs) of product. At the other levels, sales are done by marmite, 25-kg bag, or 50-kg bag (FEWS NET 2017) (Figure 22).

A number of other actors participate in the rice chain at different stages, including: MARNDR, the Customs Agency, development projects funded by governments such as the United States, Taiwan, and China, international organizations and NGOs (FAO, WFP, Oxfam, BID), local organizations (*Organisation pour la Réhabilitation de l'Environnement* (ORE), *Organisme de Développement de la Vallée de*

**Figure 23.** Rice marketing channels, Haiti

Source: FEWS NET (2017).

*l'Artibonite* (ODVA)), financial institutions (cooperatives, *Microcredit National*, *Société General de Solidarité*, *Association pour la Coopération avec la Micro Entreprise*, *Fondasyon*), academic institutions (IICA, local universities), and large-scale consumers (school feeding program, restaurants, community restaurants from the Ministry of Social Affairs and Labor, etc.). These organizations/institutions support the chain by facilitating access to inputs (including seeds), mechanization, and credit; supporting the functioning of the current irrigation infrastructure; providing technical assistance; and making large-scale purchases (Bayard 2007; Jean-Pierre, Kiremidijan, and Paul 2013; FEWS NET 2017).

The different actors in the chain generally access market information from their business networks. At all stages, prices are established by negotiation between the parties involved. Insights from the field assessment indicate that traders adjust their selling prices based on the amounts to be purchased by their clients (FEWS NET 2017).

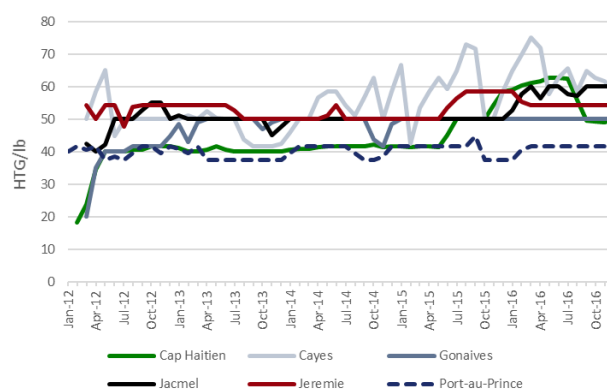
The rice marketing system faces several constraints that hamper its operation and performance: lack of storage facilities; outdated and poorly maintained milling equipment; lack of packaging and handling possibilities; weakness of the HTG; poor road infrastructure; high transport costs; and an insufficient domestic supply, which constrains the scaling up of the sector (Cochrane, Childs, and Rosen 2016; FEWS NET 2017).

### 3.4. Performance of the marketing system

Generally, the rice price varies depending on origin (local or imported), location (Figure 24, Figure 25), brand, quality, and amount purchased. The “Shella” local rice is the most expensive in the country. Its price is about two times the price of imported rice. Other local rice types that are considered of inferior quality have price levels similar to imported rice (Fintrac 2013). Prices for “Shella” are lowest in Port-au-Prince, the largest consumer market. In this market, “Shella” rice tends to be cheaper closer to the end of the year (October to December) relative to the rest of the year. The highest prices occur between February and March, coinciding with the end of the winter harvest (Figure 26). Among other markets, Les Cayes displays the largest price variability in the 2012–2016 period. Prices in consumption markets of Jérémie, Jacmel, and Gonaïves are comparatively more stable.

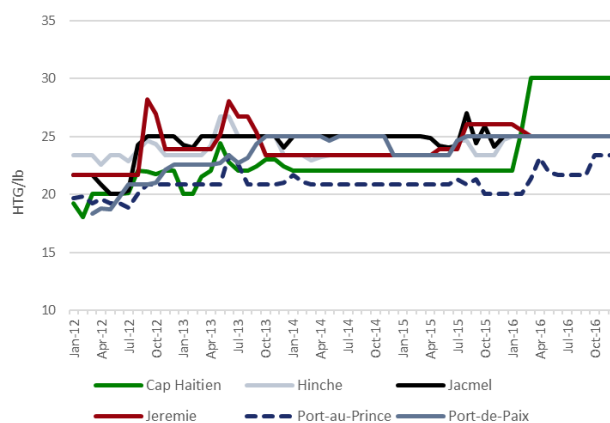
Prices for imported rice are lowest in Port-au-Prince and Cap-Haitien, the main entry points for imported rice. Deficit areas such as Jérémie, Jacmel, or Port-de-Paix register the highest prices (Figure 25). The costs of transporting rice vary depending on the route and distance covered, but range between 10–75 HTG/25-kg bag (FEWS NET 2017). Given the regularity of purchases from the international market, the price of imported rice is fairly stable over the year.

**Figure 24.** Retail price of local rice (Shella, HTG/lb) in selected markets, 2012–2016, Haiti



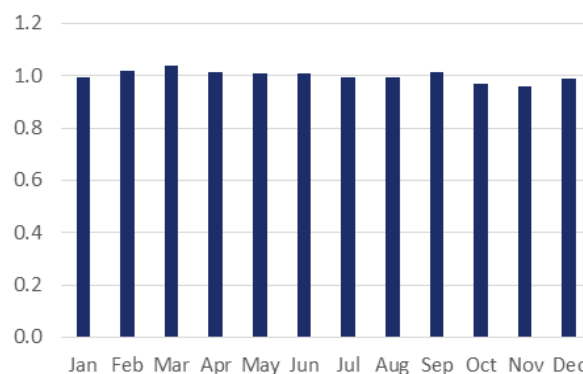
Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

**Figure 25.** Retail price of imported rice (Bull, HTG/lb) in selected markets, 2012–2016, Haiti



Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

**Figure 26.** Seasonal index for Croix des Bossales (Port-au-Prince) local rice retail price, Haiti, 2012–2016



Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

Port-au-Prince is considered the reference market for the analysis of rice market dynamics in the metropolitan area, which includes Pétion Ville, Carrefour, Croix des Bouquets, Salomon, Delmas, Tabarre, and Cité Soleil. It is the main port of entry to Haiti for imported rice from the international market. **Figure 27** compares export prices for the United States and Vietnam, as well as wholesale prices in Port-au-Prince and the Dominican Republic. The fact that the United States stands as the main supplier of imported rice to Haiti is well reflected in prices observed in Port-au-Prince, which closely follow the U.S. trend. Annex 3. Market Integration, displays market integration results.

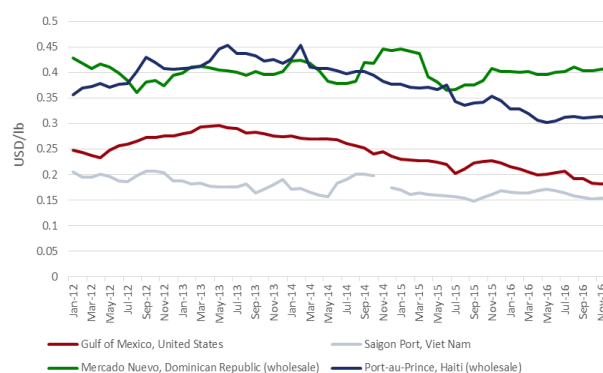
Moderate to strong price co-movement (corresponding to correlation coefficients above 0.5 in pairwise price comparisons) is observed between Cap-Haitien and Cayes, Cap-Haitien and Gonaïves, Cap-Haitien and Jacmel, and Cap-Haitien and Jérémie. Prices in Port-au-Prince show weak co-movement with the other markets analyzed (**Table 7**); however, as shown in **Figure 27**, they closely follow U.S. prices.

No quality standards exist in the domestic rice market. Quality is assessed based on grain variety, length, fatness, smell, taste, degree of breakage, and impurities (Bayard 2007; Fintrac 2013). From consumers' perspectives, the perceived nutritional quality, taste, and cooking time are relevant quality characteristics (FEWS NET 2017).

**Table 7.** Correlation coefficient for local rice prices in selected markets

Market	Cap-Haitien	Cayes	Gonaïves	Jacmel
Cap-Haitien	1			
Cayes	0.606**	1		
Gonaïves	0.516**	0.199	1	
Jacmel	0.718**	0.389**	0.426**	1
Jérémie	0.529**	0.397**	0.046	0.275*
Port-au-Prince	0.136	0.484**	0.086	0.336**

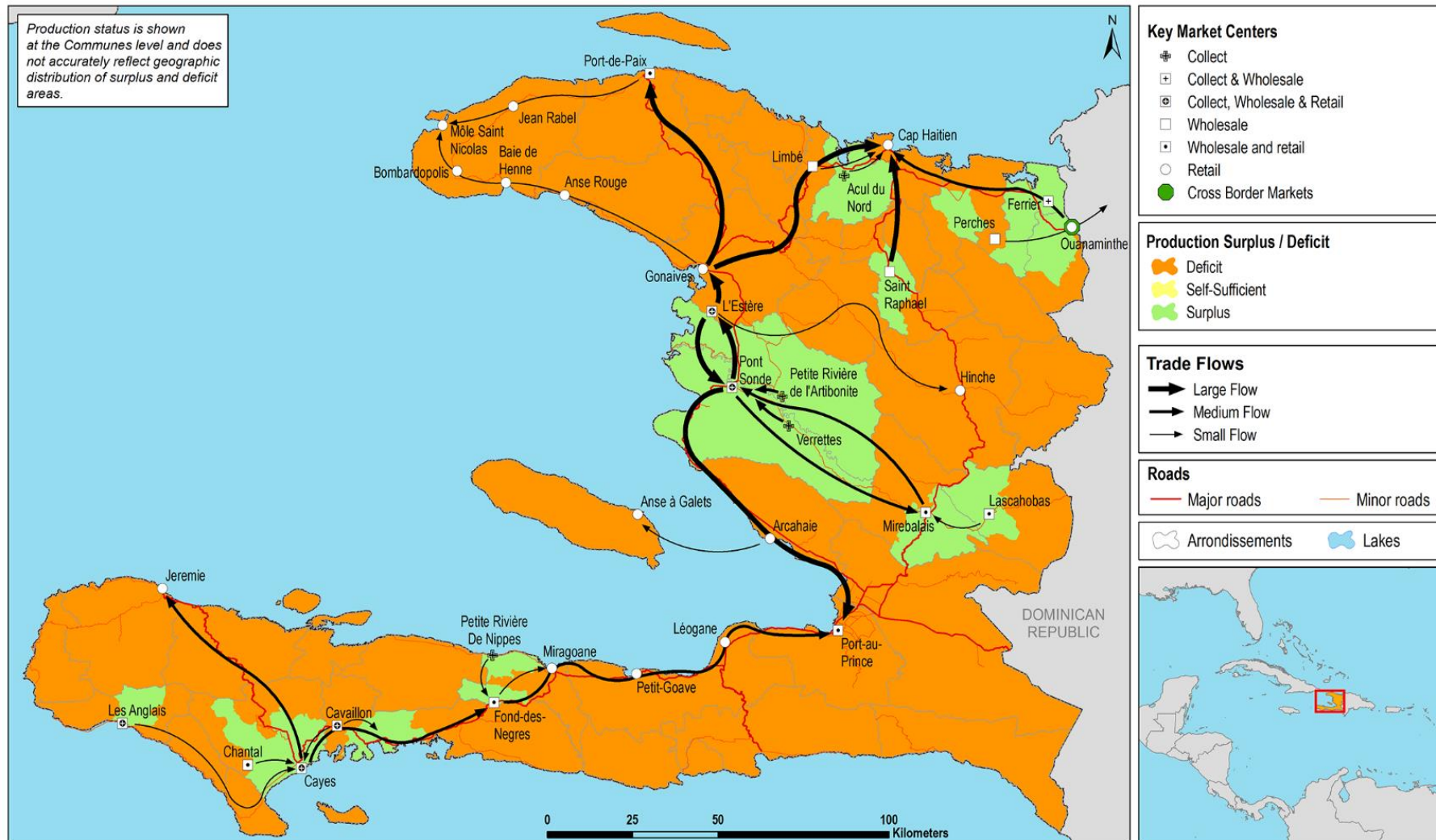
**Figure 27.** International export rice prices and wholesale price in Port-au-Prince, Haiti, 2012–2016



Source: Authors' calculations based on data from SIMA (2017); FAO (2017); EAAPDEA (2017); World Bank (2017).

Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

**Figure 28.** Rice (local) production and trade flow map, Haiti



Note: FEWS NET Production and Trade Flow Maps provide a summary of the geography of marketing systems that are relevant to food security outcomes during an average marketing year or season. The maps are produced by FEWS NET in collaboration with stakeholders from local government ministries, market information systems, NGOs, and private sector partners, using a mix of qualitative and quantitative data.

Source: FEWS NET (2017).



## 4. Maize (local and imported)

Maize is the second most consumed cereal in Haiti, but the most widely cultivated crop in the country. While it is grown in all departments, Ouest, Artibonite, Centre, and Sud Departments provide around two-thirds of total production (**Figure 29**). Increasing demand for food and nonfood uses makes local production insufficient to cover domestic demand. The local maize marketing system is competitive, characterized by the presence of a large number of actors at different stages of the marketing chain. Madame Saras are a key actor in the chain as they act as intermediaries between producers and consumers. Maize is an important commodity in cross-border flows with the Dominican Republic.

### 4.1. Consumption

Annual maize consumption in Haiti is currently estimated at 20 kg per person, on average (CNSA 2014), but its consumption is higher in maize-producing areas. Maize contributes to approximately 10 percent of daily calorie availability (FAO 2016). Before the opening of the domestic market to rice imports in 1985, maize consumption was larger than that of rice, but since then its consumption has reduced relative to rice (Jean-Pierre, Kiremidijan, and Paul 2013).

Estimates suggest that about 10 percent of maize produced is consumed fresh (boiled or grilled) and 70 percent of maize is consumed as processed product (maize flour, coarse/ground maize or “*mais moulu*,” maize wine, etc.) (Jean-Pierre, Kiremidijan, and Paul 2013). Maize flour is used to cook porridges or to produce corn-based drinks (such as AK 100 or “*Akasan*”) (Fintrac 2013). Ground maize is consumed in a variety of dishes, accompanied by beans, cooked vegetables, and/or meat (FEWS NET 2017). Consumers often prefer imported maize meal and flour over local products as they are regarded to be of better quality and taste (FAO and WFP 2010; Fintrac 2013; Jean-Pierre, Kiremidijan, and Paul 2013). Maize is a substitute for rice in households’ food consumption (FEWS NET 2017).

### 4.2. Production

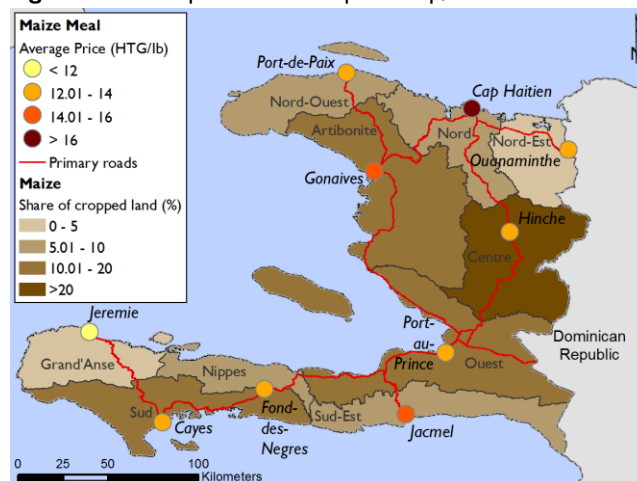
Maize cultivation is widespread across the country, occupying about 25 percent of the total cultivated area. Seventy-five percent of all agricultural producers cultivate maize, mostly in rainfed conditions and in association with other crops such as beans, peas, banana, and tubers. Seeds are usually produced from own harvest (Van Vliet et al. 2016). Ouest, Artibonite, Centre, and Sud Departments contribute to over 60 percent of total production (MARNDR 2017).

Generally, planting and harvesting of maize occur at different times over the course of the year (**Table 8**), varying by location and variety grown. Short-cycle varieties are typically grown in warm and/or irrigated areas, while long-cycle varieties are cultivated in cooler areas and in mountains. The spring season accounts for approximately 70 percent of annual production (MARNDR 2012b; CNSA 2013, 2014). The main varieties grown are Chicken Corn, Ti Bourik, Maquina, Comayagua, Ti Mayi, and Gros Mayi. Maize cultivation is part of a risk-reducing strategy for agricultural producers, who keep about 60 percent of the production for own consumption (Jean-Pierre, Kiremidijan, and Paul 2013).

**Table 8.** Seasonal calendar for maize

Activity	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Harvest												
Planting												

**Figure 29.** Maize production and price map, Haiti



Source: Authors’ calculations based on CNSA (2013), MARNDR (2017), and CNSA and FEWS NET (2017).

Yields are low, in the range of 0.5–3.0 MT/ha. The national average is estimated at 1.0 MT/ha, which is low compared to the average of 3.5 MT/ha observed in neighboring Dominican Republic (CNSA 2013). In the period 2012–2016, maize production averaged 174,256 MT (**Figure 30**). Production levels have been variable particularly due to the effects of climatic events. Maize production in 2009, considered as the reference year, totaled 353,785 MT (CNSA 2013).

Maize imports are in the form of maize meal and maize flour (to a lower extent). Imports are sourced from the Dominican Republic, which in the 2011–2015 period accounted for 63 percent of all formal imports. The United States and Brazil are the other two major trade partners, capturing 25 percent and 10 percent, respectively, of total formal imports. Other partners supply the remaining 2 percent (COMTRADE 2017). Formal imports averaged 59,528 MT/year during that period and registered an increasing trend up to 2014/15 (**Figure 31**). Increasing demand for maize for poultry production is deemed responsible for the increased demand for maize in the country (Van Vliet et al. 2016, FEWS NET 2017). No estimates exist on the size of informal imports made from the Dominican Republic via cross-border trade. The 2015 import ban included ground maize as one of the products for which imports by land are no longer allowed. This might have increased the amount of informal imports. Popular brands of imported ground maize are Alberto from the United States and Gradoro from the Dominican Republic.

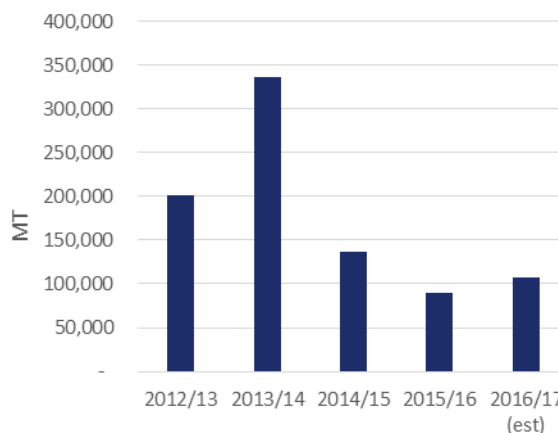
Maize production faces several constraints, namely: unfavorable climatic factors affecting production (erratic rains, drought); lack of access to irrigation; limited availability and access to production inputs (improved seeds, fertilizers); incidence of pests and diseases; use of traditional cropping practices; lack of access to financial capital for investment in production (inputs, payment for labor); and lack of organization of producers for planning harvest and timing (Jean-Pierre, Kiremidijan, and Paul 2013).

### 4.3. Structure of the marketing system

The widespread production of maize results in a large number of actors participating in the local maize marketing chain across the country, making it a competitive market with no evident barriers to entry (**Figure 33**). Producers sell at farm gate to local Madame Saras, who purchase small amounts of grain depending on their capacity to handle the produce. Given the large supply and lack of connections to other actors in the chain, producers have low bargaining power and are price takers instead. Madame Saras play a key role in the chain since they store, process, transport, and commercialize (to other traders and final consumers) the maize. On occasion, they also provide advances to producers (des Fontaines 2012; FEWS NET 2017).

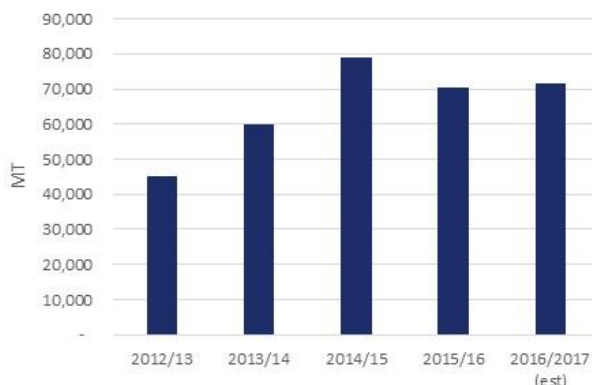
Local mills provide milling services to producers and local Madame Saras in exchange for a fee set at around 35–40 HTG per bucket (marmite). The extraction rate of grain to ground maize is about 2:1.4. These Madame Saras sell, in local and regional markets, to different actors such as retailers, consumers, and urban Madame Saras who aggregate larger quantities to be distributed in Port-au-Prince and other regional consumption markets (**Figure 38**). Shorter and smaller flows are directed toward local and regional markets in producing areas and other deficit areas in the country. Key markets for maize flows are Les Cayes, Fonds-des-Nègres, Belladère, Gonaïves, Hinche, Port-de-Paix, and Port-au-Prince (FEWS NET 2017). At the retail level, maize is sold predominantly by the “cup” or by marmite (2.7-kg can). Supermarkets repack the product(s) in plastic bags that hold about 2 lbs of product (**Figure 32**). At other levels of the chain, sales are made by marmite, 25-kg bag, or 50-kg bag (FEWS NET and CNSA 2017).

**Figure 30.** Production of maize in Haiti, MT, 2012–2016



Source: Authors' calculations based on CNSA (2013) and MARDNR (2017).

**Figure 31.** Maize imports in Haiti, MT, 2012–2016



Source: Authors' calculations based on COMTRADE data.

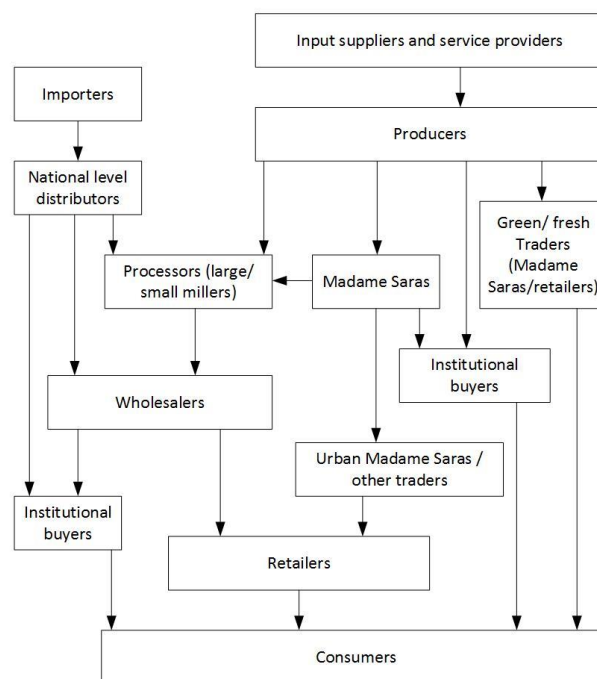
**Figure 32.** Marketing of maize

Source: FEWS NET (2017).

Producers and local Madam Saras also sell to the local Chambers of Agriculture, which in turn sell to other large-scale institutional buyers. Urban Madam Saras sell to retailers, supermarkets, and final consumers. In times of low local maize availability, the product (mostly imported maize products) flows in the opposite direction from Port-au-Prince, toward the smaller regional and local markets through the same market network (des Fontaines 2012; FEWS NET 2017).

Rice importers also import ground maize (and other products). Les Moulins d'Haïti and Haiti Broilers capture the broad majority of grain imports. STANCO accounts for about 50 percent of ground (meal) maize imports. Formally imported maize enters the country mostly through Port-au-Prince. Formal and informal imports from the Dominican Republic occur along the Dominican/Haitian border, but mostly through the Ouanaminthe, Belladère, Malpasse, and Anse à Pitres border crossings. Once in Haiti, imported maize joins the local maize flows. Dominican maize also enters Haiti by sea from the southern part of the border to Marigot, in Sud-Est Department.

Large- and medium-scale transformation (and packing) is done by a few companies (such as Les Moulins d'Haïti, Céréales d'Haïti, Compagnie Haïtienne de Promotion Agricole, and CETAI) that further distribute the product to wholesalers and retailers (Fintrac 2013; Jean-Pierre, Kiremidijan, and Paul 2013; FEWS NET 2017). Import tariffs for maize are 0 percent for maize seed and 20 percent for other maize product (grain for other uses, meal, flour) (WTO 2016). This higher level of tariffs compared to those for rice protects local maize producers. In support of domestic production, no fees are applied to the import of maize seeds. The import of ground maize/maize meal by land was prohibited with the 2015 ban (CFI 2016).

**Figure 33.** Maize marketing channels, Haiti

\* Institutional buyers buy both local and imported maize

Source: FEWS NET (2017).



Other actors support the chain in different aspects. The NGO ORE produces improved seeds that are mostly used in the southern part of Haiti. FAO has also supported the activities of the MARNDR for distributing improved seeds to producers. Producer organizations and cooperatives support their members in different aspects of production and commercialization, including access to credit and inputs. Transporters handle and transport products, commissioned by Madame Saras. Storage providers facilitate storage space to Madame Saras and local retailers in or near the markets. Institutional buyers, such as WFP, the school lunch program, and government agencies engage in large-scale purchases. A number of agricultural development projects funded by foreign governments (United States, Taiwan) have also supported activities in the maize sector (FEWS NET 2017).

#### 4.4. Performance of the marketing system

Prices are established based on information gathered from different sources and bargaining between trading partners. Generally, the price of maize varies by type of product (grain, meal, snacks), origin (local, imported), location, brand, quality, and amount purchased. In Croix des Bossales market in the broader Port-au-Prince area, the price of maize meal imported from the United States is about twice that of local maize meal (Figure 34).

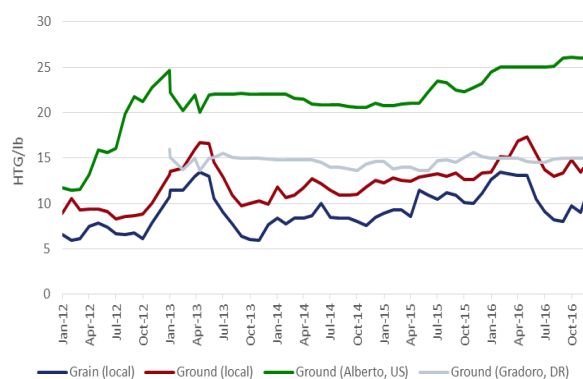
For local ground maize, notable price differences are observed between markets (Figure 35). For most of the time during the series, Cap-Haitien registered the highest prices and Jérémie the lowest. Based on field observations, consumers in Cap-Haitien display stronger preferences for local ground maize compared to consumers in Jérémie, who tend to prefer imported ground maize. This underlying difference impacts demand for local ground maize, and hence price. During the past months, local ground maize retail prices ranged between 10–20 HTG/lb.

In most markets, prices for imported ground maize are close to 20 HTG/lb (Figure 36). The lowest prices are observed in Cayes and Hinche, while the highest are most often experienced in Ouanaminthe. Overall, maize prices are highly variable.

At the local level, prices show seasonal variability. During periods of large supply, prices can range between 30–35 HTG/marmite (about 2.7 kg or 6 lb). In times of low supply, prices can increase up to 75–100 HTG/marmite. The costs of transporting maize are the same as for rice, and vary depending on the route and distance covered. They range between 10–75 HTG/25-kg bag (FEWS NET and CNSA 2017).

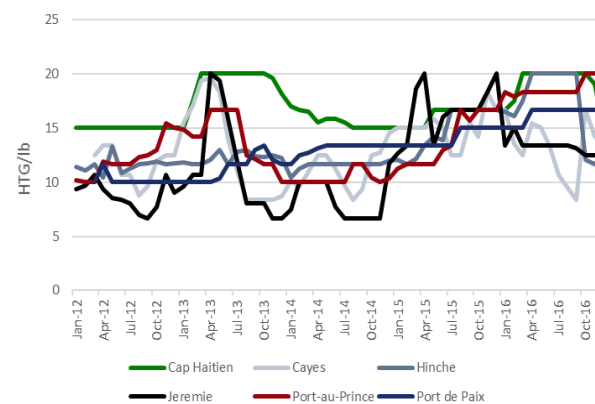
Figure 37 shows the seasonal variation of local ground maize retail prices in Port-au-Prince. Prices are lower toward the

**Figure 34.** Wholesale prices (HTG/lb) of local and imported ground maize in Croix des Bossales (Port-au-Prince), Haiti, 2012–2016



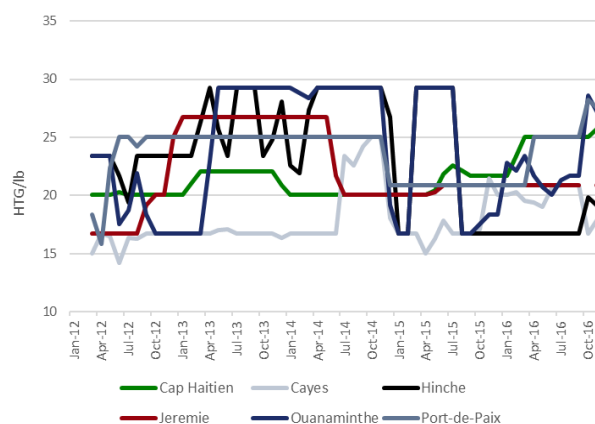
Source: Authors' calculations based on data from SIMA (2017), and CNSA and FEWS NET (2017).

**Figure 35.** Retail price of local ground maize (HTG/lb) in selected markets, 2012–2016, Haiti



Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

**Figure 36.** Retail price of imported ground maize (HTG/lb) in selected markets, 2012–2016, Haiti



Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

end of the year, coinciding with the harvesting season starting in October. However, Port-au-Prince receives maize supplies from all producing regions as harvesting initiates in the different locations.

Prices of local ground maize display moderate to strong co-movement (assessed via correlation analysis) in certain markets (**Table 9**). The markets in Cayes, Jérémie, Fond-des-Nègres, and Jacmel, located in the bottom half of the country, display stronger correlations with each other in comparison with markets located in other areas of the country, suggesting strong price co-movement (and market integration) across these markets. Among southern markets, only Jacmel and Jérémie show a moderate correlation with prices in Port-au-Prince, suggesting that prices in these markets have weaker co-movement with prices in Port-au-Prince. For these two markets, prices in Fond-des-Nègres are more relevant.

Cap-Haitien, Gonaïves, Hinche, and Ouanaminthe, located in the upper half of the country, have stronger correlations among themselves in comparison with markets in the southern part of the country. The prices in Gonaïves market register the strongest correlations with other markets, particularly with Ouanaminthe, Port-au-Prince, Port-de-Paix, and Hinche, indicating strong co-movement in prices across these markets.

Consistent with major trade flows, prices in Port-au-Prince co-move with prices in Gonaïves, Hinche, Jacmel, and Ouanaminthe. Weaker co-movement is observed with Cap-Haitien, Jérémie, and Port-de-Paix, which are more distant markets from Port-au-Prince.

**Figure 37.** Seasonal index for Croix des Bossales (Port-au-Prince) local ground maize retail price, Haiti, 2012–2016



Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

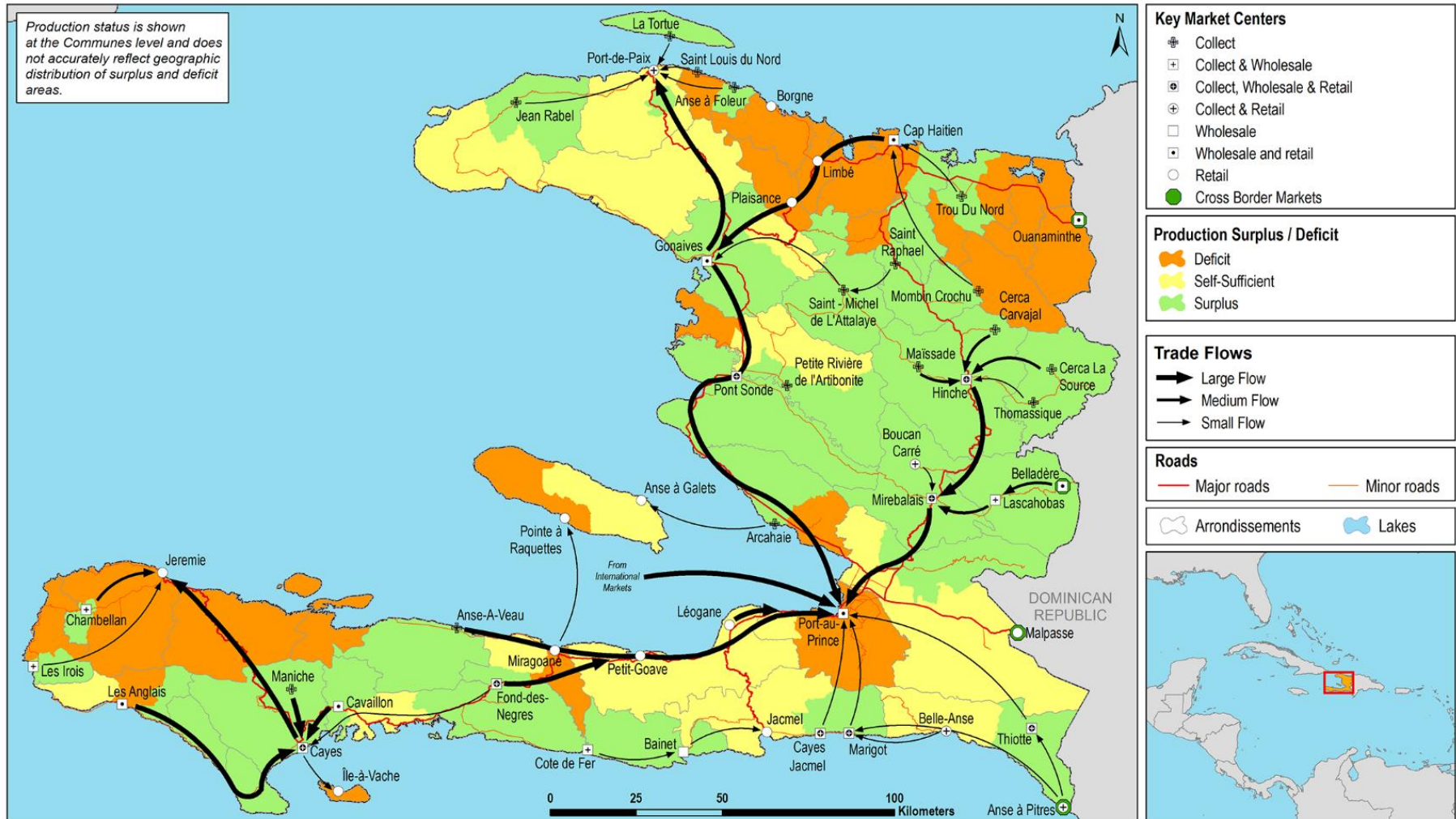
**Table 9.** Correlation coefficient for local ground maize in selected markets

Market	Cap-Haitien	Cayes	Fond-des-Nègres	Gonaïves	Hinche	Jacmel	Jérémie	Ouanaminthe	Port-au-Prince	Port-de-Paix
Cap-Haitien	1									
Cayes	0.042	1								
Fond-des-Nègres	0.051	0.887**	1							
Gonaïves	0.583**	0.363**	0.359**	1						
Hinche	0.494**	0.115	0.202	0.714**	1					
Jacmel	0.553**	0.537**	0.600**	0.558**	0.564**	1				
Jérémie	0.260*	0.669**	0.622**	0.570**	0.495**	0.560**	1			
Ouanaminthe	0.409**	0.287*	0.288*	0.887**	0.621**	0.430**	0.381**	1		
Port-au-Prince	0.573**	0.375**	0.404**	0.857**	0.655**	0.615**	0.542**	0.809**	1	
Port-de-Paix	0.344**	0.060	-0.018	0.698**	0.699**	0.234	0.365**	0.629**	0.546**	1

Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

Overall, the maize marketing system faces a number of challenges that impact product quality and distribution toward consumers. Some of these challenges are: poor quality of grains at harvest (not in optimal humidity level or at different maturation stages); poor quality of the milling process (for producing ground maize/maize meal); inefficient aggregation and distribution processes (too segmented); poor storage practices and facilities that reduce product shelf life; difficulty improving quality and distribution processes given the large number of actors with their own practices; limited access to adequate (hermetic) packaging options (to protect/maintain product quality); and the current system's incapacity to ensure regular supply in sufficient quantities and quality for accessing certain market possibilities (institutional buyers) (Jean-Pierre, Kiremidijan, and Paul 2013).

**Figure 38.** Maize (local) production and trade flow map, Haiti



Note: FEWS NET Production and Trade Flow Maps provide a summary of the geography of marketing systems that are relevant to food security outcomes during an average marketing year or season. The maps are produced by FEWS NET in collaboration with stakeholders from local government ministries, market information systems, NGOs, and private sector partners, using a mix of qualitative and quantitative data.

Source: FEWS NET (2017).

## 5. Sorghum

Sorghum is the third most important cereal produced in Haiti, with Artibonite and Centre Departments the largest producers in terms of area dedicated to its cultivation (**Figure 39**). Nippes and Sud Departments are becoming major producers due to their linkages to the processing industry. Beyond sorghum's use as food for human consumption, its use as an ingredient in the processing of "Malta H" (a nonalcoholic drink) has incentivized its production in recent years. At the small scale, sorghum is mostly commercialized through the Madame Saras' network. Large-scale transactions and processing are in the hands of a few corporate actors.

### 5.1. Consumption

Of all cereals, sorghum consumption is the lowest, at an annual consumption of 5 kg per person (CNSA 2013). Sorghum contributes to 2 percent of daily calorie availability (FAO 2016). Grains are processed into semolina and are also incorporated as an ingredient in drinks; "Malta H" is its most popular application. Grains or semoulin are boiled or grilled. Apart from food consumption, sorghum is used in the production of animal feed, fuel, and alcoholic drinks. As a staple, it is mostly consumed in sorghum-producing areas. Overall, it is less preferred than rice and maize as it is considered an inferior food (Levesque 2014; FEWS NET 2017).

### 5.2. Production

Eight percent of cultivated area at the national level is dedicated to sorghum production (Van Vliet et al. 2016), with Ouest, Artibonite, Centre, and Sud Departments contributing to over 80 percent of total production (MARNDR 2012b, 2017). Given its lower hydric needs relative to rice and maize, sorghum is cultivated in drier and/or marginal areas in the plains and mountains under a rainfed system. It is often grown by smallholders in association with pulses (mainly peas), maize, or other crops such as banana and watermelon and in rotation with vegetables (CNSA and WFP 2011; FEWS NET 2017), but some varieties are grown in monoculture (FEWS NET 2017).

Sorghum is produced in all seasons, but planting and harvesting times vary by region and variety used (**Table 10**). While about 40 percent of total output is produced in the spring season, year-to-year variations were observed in recent years (MARNDR 2012b; CNSA 2013, 2014).

**Table 10.** Seasonal calendar for sorghum

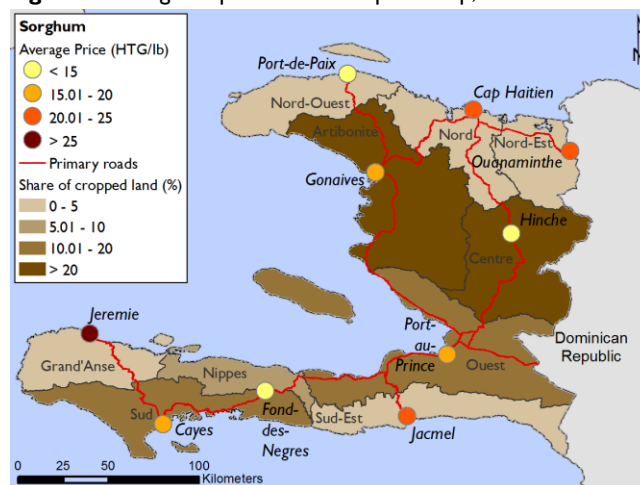
Activity	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Planting												
Harvest												

Source: CNSA (2013), Leclerc, Pressoir, and Braconnier (2014); FEWS NET (2017).

Sorghum is also referred as "pitimi" or "mil" (pearl millet). The sensitivity of sorghum to day-length led to the cultivation of photoperiod-insensitive varieties, which have shorter cycles. In recent years (2010–2014), efforts were made to cultivate multipurpose sweet sorghum, from which the grains, juice (after processing of the stems), and foliage can be utilized. Commonly photoperiod-insensitive varieties include M50009, RCV, Sureño (also known as Papésèk), and Soberano. As well, a number of traditional varieties (photoperiod-sensitive) such as Boutponyèt, Populaire, Dékabès, and Contretemps are cultivated (Leclerc, Pressoir, and Braconnier 2014; Levesque 2014).

Yields are low, between 0.50–1.50 MT/ha (1.00 MT/ha average). This performance is low compared to other producing areas in the LAC region such as the Dominican Republic (3.22 MT/ha) and Colombia (3.04 MT/ha) (CNSA 2013). Between 2012 and 2015, Haiti produced an average of 57,934 MT of sorghum per year. However, since 2014 total production has

**Figure 39.** Sorghum production and price map, Haiti



Source: Authors' calculations based on CNSA (2013), MARNDR (2017), and CNSA and FEWS NET (2017).



decreased considerably, maintaining a downward trend (**Figure 40**). Generally, Haiti is considered self-sufficient in sorghum for human consumption and no formal imports are documented.

The main constraints to sorghum production are adverse climatic factors (late rains, drought), incidence of pests and diseases, use of low-yielding varieties, and lack of use of production inputs (such as fertilizers) and of improved crop management techniques.

### 5.3. Structure of the marketing system

The structure of the sorghum (grain) marketing system is characterized by a large number of producers, and small-scale traders and retailers. Women are key players in small-scale transactions. Large-scale distribution and processing are in the hands of a few corporate actors, which have the power to influence markets in a variety of ways, for instance by setting fixed prices, favoring certain varieties, and establishing contracts and quality requirements for grains (**Figure 42**).

Depending on household needs, some sorghum is kept by producing households for own consumption, animal feed, or seed stock. This share is consumed as grain (and sorghum “pilé”, or ground sorghum) or milled into semoulin. The rest of the grains (once dried) are retailed in local markets or sold in small quantities to local Madame Saras who collect, aggregate, and process some of the grain. Madame Saras purchase sorghum in the local markets or at the farm gate. After processing, they sell it to other traders (urban Madame Saras or regional traders) who distribute the product to retailers and consumers across the country. Most sales occur at harvest time, but some producers hold stocks until the local supply decreases and/or prices reach an attractive point (Levesque 2014; FEWS NET 2017). At the retail level, sorghum is sold predominantly by the cup or marmite (2.7-kg can). At other levels of the chain, sales are done by marmite or larger-sized bags (25–50 kg) (**Figure 41**). (FEWS NET 2017).

Similar to other commodities, milling takes place at the local level through small mills, which provide the service in exchange for a fee. Estimates assess the grain-to-semoulin extraction rate in the range between 50–65 percent (Levesque 2014). The residues of the milling process are often used as animal feed. Elaboration of sorghum “pilé” (a sort of pounded grain) is a labor-intensive process that occurs mainly at the producer level, by household members. This processing increases the market value of the product, which is often regarded as of better quality and taste than milled sorghum (Levesque 2014).

**Figure 41.** Marketing of sorghum: sorghum in grain and ground sorghum



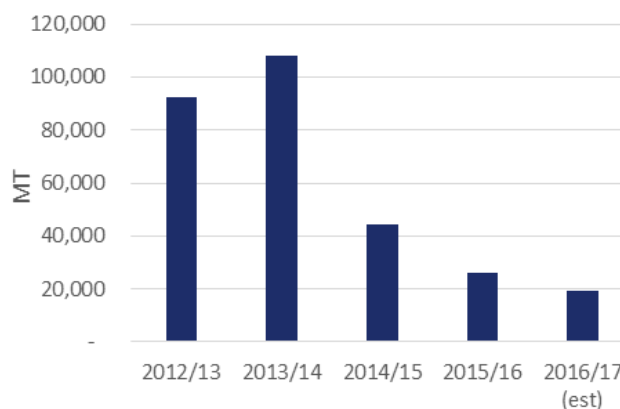
Cleaned grain



Ground sorghum (sorghum “pilé”)

Source: FEWS NET and CNSA (2017).

**Figure 40.** Production of sorghum in Haiti, MT, 2012–2016



Source: Authors' calculations based on CNSA and WFP (2011), CNSA (2013), and MARDNR (2017).

Larger-scale transactions are organized by producer associations, who collect the grains from members and sell to BRANA (Brasserie Nationale d'Haïti, S.A.) and other larger-scale food processors, such as SOTRAPAL (Society for the Transformation of Food-Processing Products) (RTI 2014; FEWS NET 2017). BRANA, a national subsidiary of Heineken, is increasingly using local sorghum (in replacement for imported malt) for elaboration of the popular “Malta H” drink. This marketing channel includes the participation of other actors who coordinate the collection and transport of the grains to BRANA’s facilities, and SMASH (the Smallholder Alliance for Sorghum in Haiti project), which establishes contractual relationships with BRANA and provides technical support to farmers in Sud, Nippes, Ouest, and Nord-Est Departments (RTI 2014; PAPHYRUS 2016).

Other actors relevant to the sorghum marketing chain are transporters, the broader agroindustry (animal feed – Haiti Broilers, SOTRAPAL), credit providers, intermediaries, input providers (including improved seeds), and research centers.

Key markets in sorghum trade flows are Cayes and Fonds-des-Nègres, which move the product toward the broader Port-au-Prince area; Hinche and Mirebalais in Centre Department, which aggregate and move local production toward Port-au-Prince; and Gonaïves and Saint Marc, which channel flows from the northern area toward Port-au-Prince (Figure 45).

#### 5.4. Performance of the marketing system

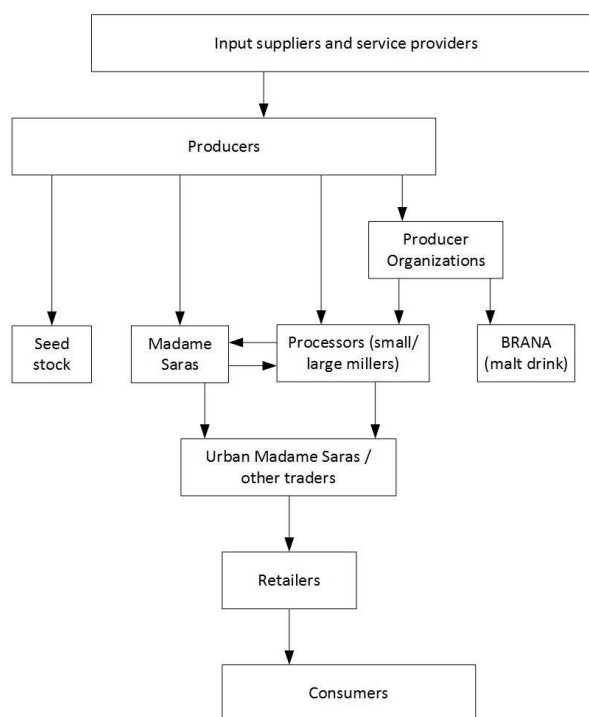
In the small-scale local sorghum trade, prices are established based on information gathered from different sources and bargaining between trading partners. Large-scale transactions related to BRANA establish a fixed price that serves as guarantee and incentive to producers for delivery of their product. Prices vary by type of grain, by whether the grain has been pre-processed (sorghum “pilé”), and by the amount purchased.

Retail prices behave similarly across key markets (Figure 43). The lowest price levels are observed in Fonds-des-Nègres and Hinche, which are key areas for sorghum production, collection, and aggregation. Higher prices occur in Cap-Haitien and Port-au-Prince, which are deficit areas.

Prices show marked seasonal variability. During periods of large supply, prices can be half (or less) than the price during the time of lowest sorghum availability. In Fonds-des-Nègres, a key market in sorghum trade flows, prices start decreasing in November with the start of the harvests, and reach their lowest between February and April (Figure 44). Prices gradually increase between May and November, corresponding to the growing period (FEWS NET 2017).

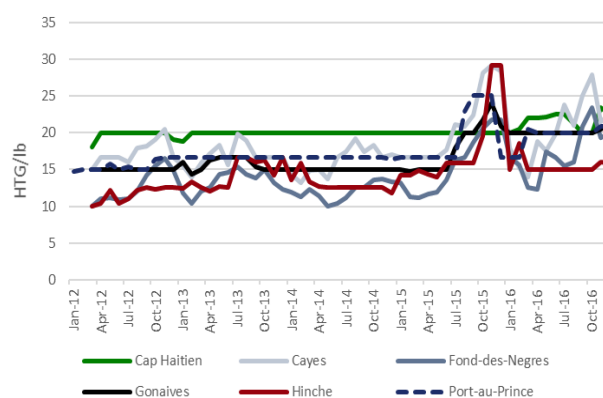
Prices of sorghum show varying degrees of co-movement across the different markets in the country (Table 11). Statistically significant correlations are moderate to strong (correlation coefficients between 0.50 and up to 0.87) in Gonaïves, Fonds-des-Nègres, Les Cayes, and most of the other markets analyzed. Prices in Port-au-Prince display moderate co-movement with Les Cayes, Fonds-des-Nègres, Hinche, and Jacmel, and strong co-movement with Gonaïves market. Prices in Cap-Haitien, Jérémie, and Ouanaminthe have rather weak co-movement with the rest of the markets.

Figure 42. Sorghum marketing channels, Haiti



Source: FEWS NET (2017).

Figure 43. Retail prices (HTG/lb) of sorghum in selected markets, Haiti, 2012–2016

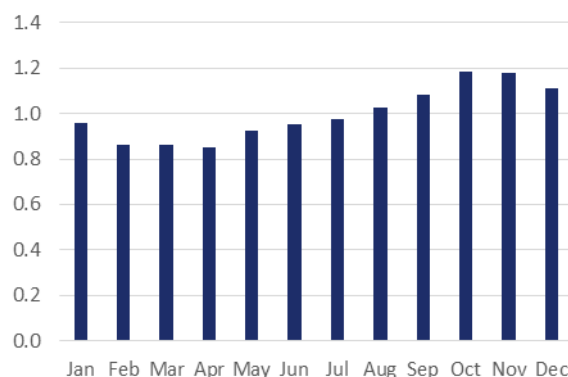


Source: Authors' calculations based on data from CNSA and FEWS NET (2017).



Several factors constrain the marketing system of sorghum in Haiti. Among the main ones stand: the seasonality of production; variable and/or poor quality of the grains at harvest; inefficient aggregation and distribution processes; poor storage practices; high levels of aflatoxins which make grains useless for human consumption; high transport costs; and the current system's incapacity to ensure a regular supply in sufficient quantity and quality with respect to the needs of the growing agroprocessing market for food and nonfood uses (RTI 2014; Levesque 2014; FEWS NET 2017).

**Figure 44.** Seasonal index Fonds-des-Nègres sorghum retail price, Haiti, 2012–2016



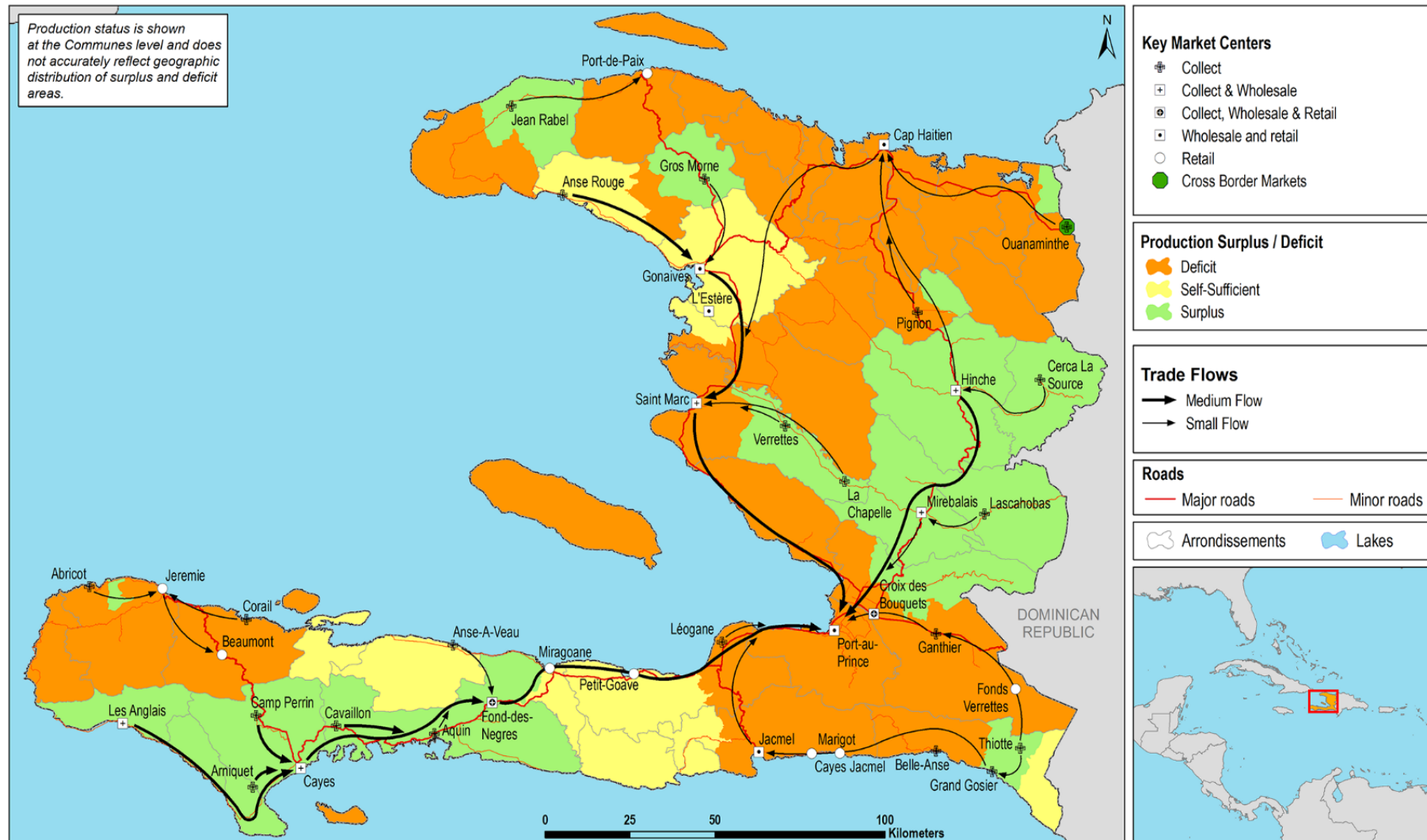
Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

**Table II.** Correlation coefficient for sorghum in selected markets

Market	Cap-Haitien	Cayes	Fonds-des-Nègres	Gonaïves	Hinche	Jacmel	Jérémie	Ouanaminthe	Port-au-Prince	Port-de-Paix
Cap-Haitien	1.000									
Cayes	0.219	1								
Fonds-des-Nègres	0.314*	0.874**	1							
Gonaïves	0.543**	0.732**	0.807**	1						
Hinche	0.171	0.649**	0.647**	0.661**	1					
Jacmel	0.447**	0.511**	0.668**	0.842**	0.609**	1				
Jérémie	0.062	0.319*	0.192	0.284*	0.074	0.274*	1			
Ouanaminthe	-0.134	-0.005	-0.027	-0.187	0.133	0.061	0.034	1		
Port-au-Prince	0.443**	0.656**	0.679**	0.822**	0.520**	0.610**	0.172	0.134	1	
Port-de-Paix	0.563**	0.501**	0.653**	0.661**	0.367**	0.568**	-0.081	-0.297	0.579**	1

Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

**Figure 45.** Sorghum production and trade flow map, Haiti



Note: FEWS NET Production and Trade Flow Maps provide a summary of the geography of marketing systems that are relevant to food security outcomes during an average marketing year or season. The maps are produced by FEWS NET in collaboration with stakeholders from local government ministries, market information systems, NGOs, and private sector partners, using a mix of qualitative and quantitative data.

Source: FEWS NET (2017).

## 6. Wheat (imported grains and flour)

Wheat-based products such as flour, pasta, bread, biscuits, and other bakery products are an important element of the Haitian diet. Bulgur wheat is also consumed, but to a much lower extent. Without domestic production of wheat, these products are sourced through imports. The United States is the main trading partner for wheat grain and bulgur wheat, and the Dominican Republic dominates transactions for wheat flour. Les Moulins d'Haïti is the main wheat processor in Haiti and captures a large proportion of the domestic flour market.

### 6.1. Consumption

Wheat is consumed in a variety of forms in Haiti. Wheat flour is consumed in soups and porridges accompanying beans and other side dishes. It is also an essential component of pasta, bakery products, and snacks, which are largely consumed across the country. Consumption of bulgur wheat is less widespread and is mostly associated with food aid (Fintrac 2013; FEWS NET 2017). Due to its relevance to the diet, wheat flour is a commodity included in the CNSA's food basket. Its annual consumption is estimated at 14 kg/person, on average. However, as with all commodities, it is recognized that regional consumption patterns and preferences shape its consumption (CNSA 2014). At the aggregate level, wheat (and its products) contributes to approximately 9 percent of daily calorie availability (FAO 2016).

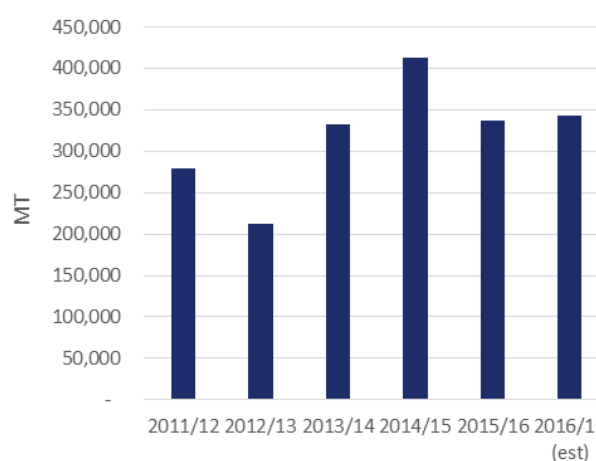
### 6.2. Production

The domestic supply of wheat grains, flour, and bulgur wheat is entirely sourced from imports. In the period 2011–2015, Haiti imported an average of 315,064 MT of wheat per year (**Figure 46**). By product, flour is the most important commodity, accounting for 50 percent of total formal imports (equivalent to 156,023 MT/year on average) (**Figure 47**). The Dominican Republic dominates this market, supplying 86 percent of all imports, followed by Turkey, with 10 percent of imports in that period.

While estimates of the size of informal wheat flour imports are not available, the value of those imports was estimated at USD 37.4 million in 2014. Wheat flour is considered to be the food-related commodity with the largest cross-border imports. Its formal imports were valued at USD 78.4 million in 2014, suggesting that about one-third of total wheat imports (by value) were informal that year (CFI 2016). The ban implemented in October 2015 prohibiting imports of wheat flour by land might have further incentivized informal imports. As **Figure 47** shows, formal imports decreased notably between 2014 and 2015.

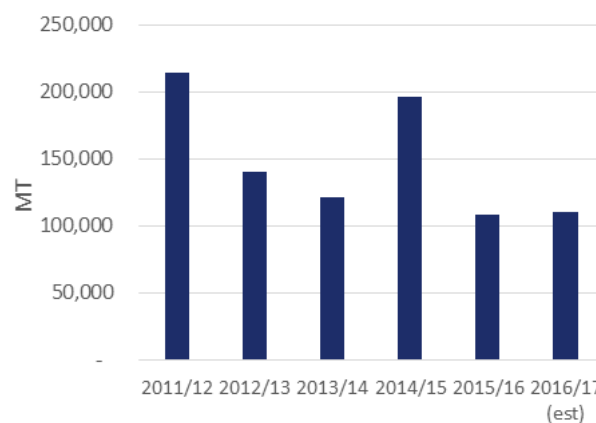
Grain imports represent 37 percent of all formal imports according to COMTRADE data. On average, Haiti imported 115,308 MT/per year in the period 2011–2015. The United States sourced 56 percent of these imports, followed by the Russian Federation (19 percent), Mexico and Latvia (10 percent each), and others. Formal imports of bulgur wheat are entirely sourced from the United States. Once in the country, grains (mostly Hard Red Winter and Dark Northern Spring wheat) are processed locally for the production of flour and a variety of products (pasta, breads, biscuits, etc.) (Fintrac 2013; FEWS NET 2017). Assuming that all wheat grains are processed into flour at an extraction rate of 0.7, total flour availability from formal imports (of grain or flour) averaged 236,738 MT/year in the 2011–2015 period.

**Figure 46.** Formal wheat (all products) imports, 2011–2016, Haiti



Source: Authors' calculations based on COMTRADE data.

**Figure 47.** Formal wheat flour imports, 2011–2016, Haiti



Source: Authors' calculations based on COMTRADE data.

### 6.3. Structure of the marketing system

On the supply side, the wheat marketing system is dominated by large-scale actors (**Figure 48**). The three main wheat-grain importers in Haiti are Les Moulins d'Haïti (LMH), M&R Lumber, and Les Céréales d'Haïti (LCH). LMH is by far the largest importer, capturing 89 percent of total grain availability in the country (Fintrac 2013). LMH and LCH are the largest processors; LMH holds most of the market share (over 70 percent). In 2016, it processed about 137,000 MT of flour (FEWS NET 2017), but it has an installed capacity of more than 280,000 MT/year (Fintrac 2013). Other importers are Bongu, La Perla, and Caribbean Milling (FEWS NET 2017) (**Figure 49**).

Other large-scale processors engage in the production of wheat-based products such as pasta and snacks. For instance, *Huileries Haïtiennes* markets spaghetti under the brand “Gourmet” (Huileries Haïtiennes S.A. 2017). Arlequin Foods produces a diversity of snacks (tapas, cheese puffs, etc.) under the “chee co” brand, and spaghetti and other pastas under the “Arlequin” and “Napoli” brands (Arlequin Food Products 2017).

A number of traders participate in wheat flour imports. At a larger scale, Antonio Handal & Co (Express Distribution Center, EDC) and Cristo SA (Deka Group, better known for the Bongu brand) are the main wheat flour importers licensed by the Quarantine Direction (DQCSPAP, *Direction de la Quarantine et du Contrôle Sanitaire des Produits Agricoles et de Pêche*). According to DQCSPAP information, Antonio Handal & Co imports from the Dominican Republic and Cristo SA/Bongu from Turkey (DQCSPAP 2016). EDC (under Antonio Handal/the Handal group), distributes food and nonfood products across Haiti. Carribex is another importer that also trades vegetable oil and maize (under the Ti-Malice brand).

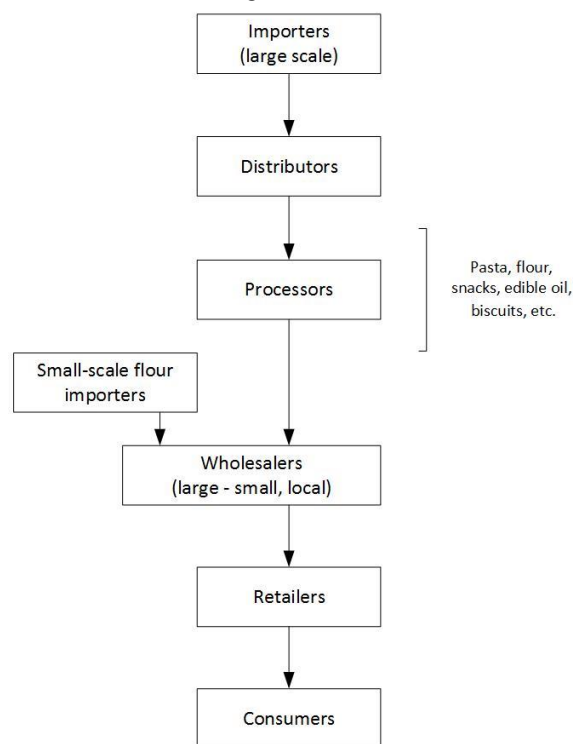
Smaller traders import flour in the bordering areas with the Dominican Republic. Local Haitian traders and itinerant Dominican traders coordinate formal and informal wheat flour imports to Haiti. Once in Haiti, the flour moves along with other commodities in the marketing system. In 2016, no tariffs were applied to the import of wheat grain, but for wheat flour these were in the order of 25 percent (WTO 2016).

Overall, importers engage local distributors for the delivery of the product to processors and wholesalers, who in turn sell to retailers and final consumers. The main processors and importers are located in Ouest Department, in or near Port-au-Prince. Wheat flour imported from the Dominican Republic is transported to markets directly by local wholesalers and larger retailers (FEWS NET 2017).

Transactions are usually on cash, but credit is often extended to trusted business partners. Wholesalers receive credit from importers and in turn provide credit to their traders and retailers (FEWS NET 2017).

A study from 2016 indicated that in the 2011–2012 period, the import of wheat flour and of wheat-based products such as bread and bakery products, pasta, and couscous was “highly concentrated,” based on results from the Herfindahl-Hirschman Index, a standard measure for assessing market concentration. Concentration in this sector is reinforced by family ties. The

**Figure 48.** Wheat marketing channel, Haiti



Source: FEWS NET (2017).

**Figure 49.** Wheat flour brands, Haiti



Source: FEWS NET and CNSA (2017).

risks of this concentration translate into the establishment of barriers to entry, engagement in anticompetitive business practices, prevention of the development of products, and high consumer prices (Pop 2016).

Compared to the situation in importing and processing activities, a larger number of actors participate in wholesaling and retailing wheat flour, making it a competitive market. These actors trade flour together with many other commodities. At the retail level, flour is sold in bags ranging from 5 kg to 25 kg. At other levels, flour is sold in bags of 25 kg and 50 kg (FEWS NET 2017).

#### 6.4. Performance of the marketing system

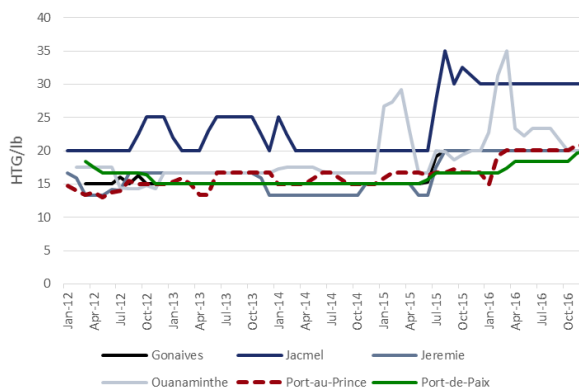
Generally, wheat flour prices tend to be stable in most markets across the country due to the stability of imports (**Figure 50** and **Figure 51**). From 10 markets monitored, only Jacmel and Ouanaminthe display particular variations with respect to the rest of the markets. Given the reliance of these markets on wheat flour from the Dominican Republic, these markets display different price dynamics. Further research on wheat flour market dynamics in these locations is needed. Price increases observed in late 2015 and early 2016 may reflect the impacts of the import ban (FEWS NET and CNSA 2017).

Across markets, price differentials occur based on perceived quality and transport costs. Prices also vary by the amount of product purchased and the existing business relationship between trading partners (FEWS NET 2017). In Port-au-Prince, wheat flour tends to be cheaper toward the end of the year, from October to December, relative to the rest of the year. The highest prices are observed in February–March and September (Figure 51). Prices in Ouanaminthe, the second most important cross-border market with the Dominican Republic, increased in late 2015, possibly due to the effects of the import ban on local flour supply.

Overall, retail wheat flour prices display moderate to very strong co-movement across the country, with correlation coefficients between 0.5 and 0.9 (Table 12). Weaker correlations are registered between Ouanaminthe and the rest of the country, highlighting the difference between this market and the rest (Figure 50).

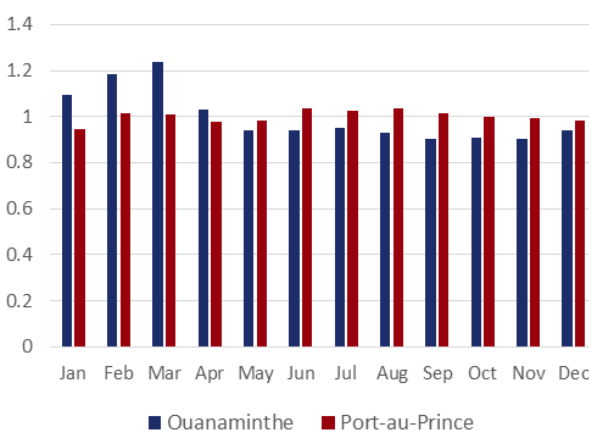
Quality control of imported grain and flour is predominantly done at customs. Evidence of Dominican flour containing high and toxic levels of potassium bromate has brought up concerns from local industry about quality control and fair competition (CFI 2016) and from the Haitian government about food safety and consumer protection. In response to this, the Ministry of Trade and Industry issued a note in July 2015 requiring wheat flour importers to obtain a Certificate of Free Sale prior to sale of products in Haitian territory (Ministère du Commerce et de l'Industrie n.d.). The note was signed by the Ministers of Commerce and Industry, Public Health and Population, Agriculture, Natural Resources, and Rural Development, and Economy and Finances.

**Figure 50.** Retail price of wheat flour (HTG/lb) in selected markets, 2012–2016, Haiti



Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

**Figure 51.** Seasonal index for Croix des Bossales (Port-au-Prince) and Ouanaminthe wheat flour retail prices, Haiti, 2012–2016



Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

**Table 12.** Correlation coefficient for wheat flour prices in selected markets

Market	Gonaïves	Jacmel	Jérémie	Ouanaminthe	Port-au-Prince	Port-de-Paix
<b>Gonaïves</b>	1					
<b>Jacmel</b>	0.906**	1				
<b>Jérémie</b>	0.876**	0.897**	1			
<b>Ouanaminthe</b>	0.529**	0.411**	0.448**	1		
<b>Port-au-Prince</b>	0.736**	0.690**	0.677**	0.564**	1	
<b>Port-de-Paix</b>	0.778**	0.640**	0.640**	0.330*	0.617**	1

Source: Authors' calculations based on data from CNSA and FEWS NET (2017).



## 7. Pulses (dry beans and peas)

Haitians consume a large variety of pulses, with black beans, red beans, pigeon peas, and groundnuts the ones most consumed. Pulses are produced in all regions (Figure 52), but imports are necessary to cover domestic demand. A large number of actors participate in the marketing chain for pulses, making this a competitive market. Pulses are also traded formally and informally with neighboring Dominican Republic.

### 7.1. Consumption

Annual consumption of pulses is estimated at 25 kg per person, on average. Pulses contribute to approximately 10 percent of daily calorie availability and stand among the largest sources of protein in the local diet (CNSA 2014; FAO 2016). Beans and peas are consumed daily as an accompaniment to other staples (rice, maize, sorghum, tubers) all across the country. In fact, the Haitian national dish is based on rice and beans (International Rescue Committee et al. 2010; FEWS NET 2017). Groundnuts are consumed as part of dishes or as a snack, or processed into peanut butter. The demand for pulses has increased at a rate of 7 percent per year since the early 2000s (Van Vliet et al. 2016).

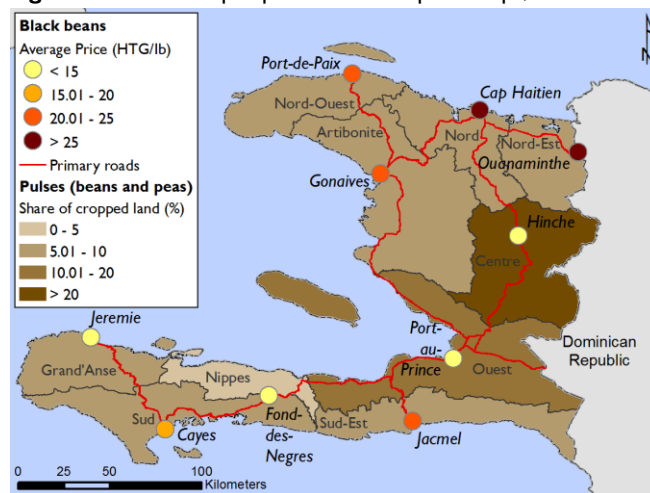
Among beans, black beans are the most consumed and are preferred over other types because of their perceived higher iron content. Red beans are the second type of beans most consumed. Mottled, pinto, yellow, and white beans are other types of beans consumed in Haiti. Peas are consumed both green and dry (CNSA and WFP 2011; Jean-Pierre, Kiremidijan, and Paul 2013). Nationally produced pulses are preferred over imported ones (International Rescue Committee et al. 2010; Fintrac 2013; FEWS NET 2017).

### 7.2. Production

Pulses occupy about one-third of cultivated area in Haiti and their production is spread all over the country, particularly in mountainous areas and in irrigated plains. Beans (black, red, white, yellow, and pinto), peas (pigeon pea, cowpeas, other), and groundnuts are the main pulses grown, with beans dominating production in terms of area under cultivation (International Rescue Committee et al. 2010; FEWS NET 2017; Van Vliet et al. 2016).

Beans and peas are grown in association with maize and in low-input production systems. While most production is rainfed, beans are also cultivated in irrigated fields in intercropping or rotation systems. The timing and frequency of harvests vary by location, with producers in mountainous areas harvesting up to three times a year and those in the plains only once a year (winter season) (Table 13). The spring season accounts for about one-half of total production (FAO and WFP 2010; CNSA and WFP 2011). Yields are on average 600 kg/ha for beans and 800 kg/ha for peas. These levels are low compared with yields in the Dominican Republic of 1.50-2.28 MT/ha for beans and 2.45 MT/ha for peas (CNSA 2013).

Figure 52. Bean and pea production and price maps, Haiti



Source: Authors' calculations based on CNSA (2013), MARDNR (2017), and CNSA and FEWS NET (2017).

Table 13. Seasonal calendar for beans and peas

Crop	Activity	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Beans	Planting												
	Harvest												
Peas	Planting												
	Harvest												

Note: The information displayed refers specifically to black beans and pigeon peas.

Source: FEWS NET (2017).

Artibonite, Centre, Ouest, and Grand'Anse Departments are the main bean producers, contributing to about 60 percent of total production (MARNDR 2017). Icta, Legeo, and Violet are commonly cultivated bean varieties (Van Vliet et al. 2016). Pea production is larger in Ouest, Nord-Ouest, Nord, and Artibonite Departments (over 60 percent of total production), but its production is also important in border areas with the Dominican Republic (CNSA and WFP 2011; MARNDR 2017). Groundnuts are grown principally in the drier areas of the country (CNSA and WFP 2011).

In the period 2012–2015, total production of pulses averaged 150,764 MT/year, but large year-to-year variations were observed during this period (Figure 53). In 2014 and 2015 total production decreased considerably with respect to previous years and with respect to 2009 (reference year), when total pulse production reached 268,858 MT (CNSA 2013). Overall, local production is insufficient to satisfy domestic demand; therefore, imports are needed to complement the domestic supply.

Bean and pea production is constrained by: the availability and affordability of quality seeds; lack of access to irrigation; traditional cropping techniques that include the low use of inputs (fertilizers and others); incidence of pests and diseases; and the adverse effect of climatic events such as droughts, storms, and hurricanes (Fintrac 2013; FEWS NET 2017; Van Vliet et al. 2016).

Pulses are predominantly imported as dry products. Between 2011 and 2015, 85 percent of total formal imports were sourced from two main partners, the Dominican Republic (46 percent) and the United States (40 percent). Formal imports were on average 23,575 MT/year (COMTRADE 2017). Years with lower national production registered higher import levels (Figure 54). The 2015 ban on imports by land did not affect this commodity. Informal imports from the Dominican Republic are also common, but remain difficult to quantify.

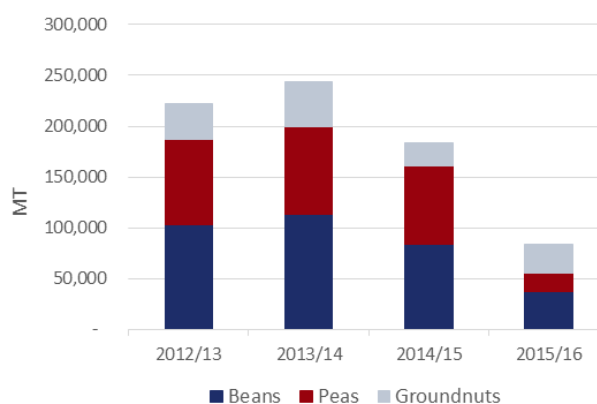
Besides imports, food assistance contributes to domestic supply. Generally, beans sourced through aid account for approximately 5–10 percent of total supply. This proportion is variable depending on needs (International Rescue Committee et al. 2010). The WFP, ACDI/VOCA, Oxfam, and many other smaller organizations (NGOs and faith-based groups) are the main providers of beans (imported and locally procured) in the framework of food assistance (ACDI/VOCA 2010).

### 7.3. Structure of the marketing system

The widespread production of beans and peas results in a large number of actors participating in the local pulses marketing chain across the country, making it a competitive market with no evident barriers to entry (Figure 55). Since beans and peas are produced mostly in association with maize, the marketing channels of these two commodities involve the same actors at the different stages of the chain.

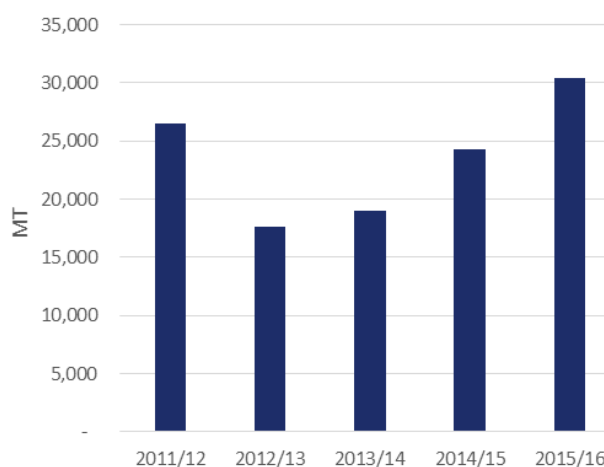
Producers sell at the farm gate to local Madame Saras, who purchase small amounts of product depending on their handling capacity. Given the widespread supply, producers have low bargaining power and are price takers instead. Madame Saras store, transport, and commercialize (to other traders in the region and final consumers) the beans/peas. Urban Madame Saras purchase the beans/peas in regional markets and transport them to urban markets where they sell to local retailers (including supermarkets) and/or final consumers (FEWS NET 2017). Less than 20 percent of farm output is used as seed and/or kept for own consumption (Fintrac 2013). Transactions typically occur on the spot and are cash-based.

**Figure 53.** Production of pulses in Haiti, MT, 2012–2015



Source: Authors' calculations based on CNSA (2013) and MARNDR (2017).

**Figure 54.** Pulses imports in Haiti, MT, 2011–2015



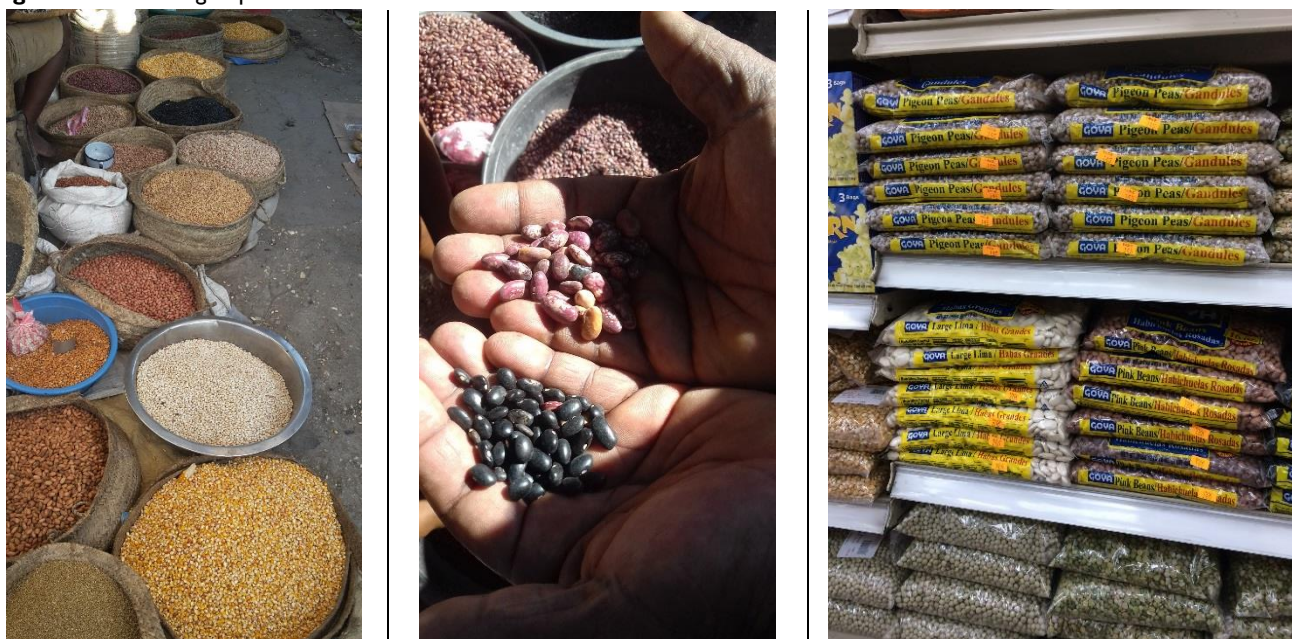
Source: Authors' calculations based on COMTRADE data.

Prices are established by negotiation between trading partners. Some farmers and other actors keep stocks for a short period of time with the objective of accessing higher prices.

Formal imports enter Haiti predominantly through Port-au-Prince. Smaller importers operate in Miragoâne, Saint Marc, and Cap-Haitien (Fintrac 2013; FEWS NET and CNSA 2017). Imported beans arriving in Port-au-Prince are sold by large commercial importers to large wholesalers (about 50), who in turn sell to medium-scale wholesalers, and institutional buyers. Medium-scale wholesalers sell to urban Madame Saras, supermarkets, hotels and restaurants, and local retailers. Urban Madame Saras also sell to local retailers who finally sell to consumers. Imports arriving in other ports have shorter marketing chains (Jean-Pierre, Kiremidjian, and Paul 2013; FEWS NET 2017). Commercial imports are in the hands of a smaller number of actors who trade many other commodities besides beans (such as maize and rice). Imports by religious and development agencies also take place, but to a lower extent (Fintrac 2013).

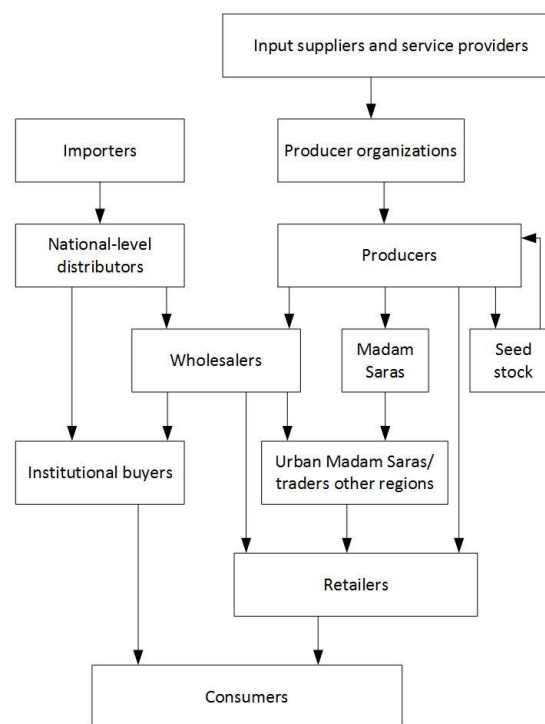
Imports from the Dominican Republic (both formal and informal) are done by regional (border) traders and Madame Saras who incorporate the products into the broader marketing system once they enter Haiti. While Malpasse is the main crossing point in formal cross-border trade, imports take place in different markets along the border. In addition, a small amount of informal exports to the Dominican Republic also takes place in these border areas (Fintrac 2013; FEWS NET 2017). Applied import tariffs during 2016 for dry beans ranged between 5.0–22.5 percent. For peas, the tariff was 5.0 percent, except for pigeon pea (15.0 percent). A single tariff of 40.0 percent was applied to imports of fresh beans and peas (WTO 2016). Imports take place throughout the year, but importers adjust their operations according to the availability and price of locally produced beans at any given point in time.

**Figure 56.** Marketing of pulses in Haiti



Source: FEWS NET (2017).

**Figure 55.** Bean and pea marketing channels, Haiti



Source: FEWS NET (2017).

Beans sales are made by the pot (or scoop) and marmite at the retail level, and in 25-kg or 50-kg bags at the wholesale level (Figure 56). In urban supermarkets, imported beans are sold in standard 1-lb packages. Local beans are packed in bags weighing up to 2 lbs. Generally, beans and peas are sold differentiated by type and not by brand.

Several other actors participate in the chain, for instance: input and service providers (including seeds), producer associations, development organizations with production-oriented projects, transporters, storage providers, and institutional buyers (such as the school feeding program, WFP, and others) (FEWS NET 2017).

#### 7.4. Performance of the marketing system

Black beans are less expensive than other types of beans (red, yellow, white, mottled, and pinto) and are more widely consumed (Figure 57). Higher-income groups are the main source of demand for the more expensive beans (Fintrac 2013). Consumers typically substitute between the different types of beans (including imported beans) and peas based on price level (ACDI/VOCA 2010; FEWS NET 2017).

Generally, prices of black beans tend to follow a similar pattern across markets. Price data for red beans show more variability in the same markets and slightly higher levels (Figure 58), as they are most often consumed for special celebrations (FEWS NET and CNSA 2017).

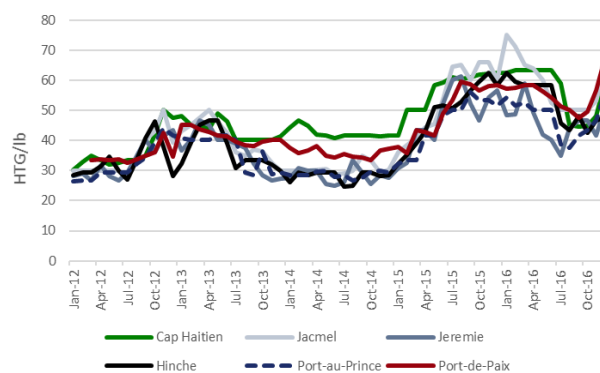
Bean prices vary over the year based on seasonality, scale, and geography of production. In Port-au-Prince, the lowest prices occur between July and September, coinciding with the end of the spring season harvest (Figure 59). Prices are lower again during February and March, coincident with the second harvest (FEWS NET et al. 2015; FEWS NET 2017).

Prices of black beans show strong co-movement across markets, indicating that the bean marketing system is well integrated. Strong statistically significant correlations (coefficients over 0.800) of price levels occur among all markets explored (Table 14). In addition, black beans prices are integrated to prices in the Dominican Republic, the main source of imported black beans in Haiti (Annex 3. Market Integration).

Compared to black beans, red bean prices display a lower level of co-movement. Moderate to strong statistically significant correlations are present among the markets analyzed (Table 15).

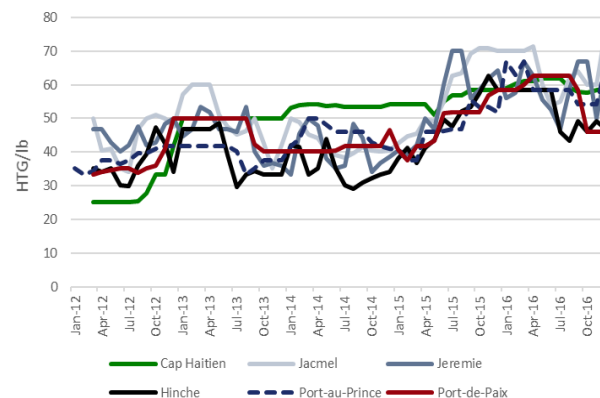
Similar to other commodities, the main constraints in the bean marketing system are: variability of domestic supply in quantity and quality; inefficient aggregation and distribution processes (too segmented); poor transport and road infrastructure; poor storage practices and inadequate facilities; difficulty improving quality and distribution processes given the large number of actors with their own practices; limited access to adequate packaging; lack of capital for key actors to

**Figure 57.** Retail price of black beans (HTG/lb) in selected markets, 2012–2016, Haiti



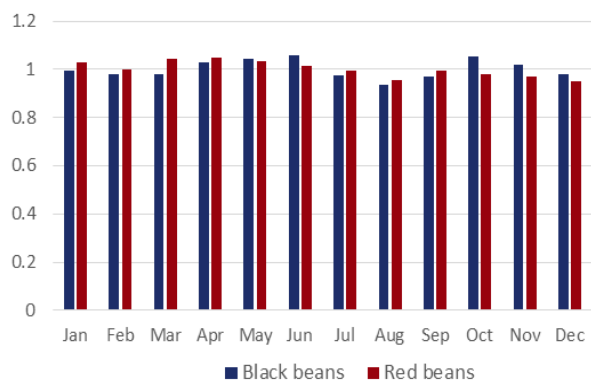
Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

**Figure 58.** Retail price of red beans (HTG/lb) in selected markets, 2012–2016, Haiti



Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

**Figure 59.** Seasonal index for Croix des Bossales (Port-au-Prince) local black and red beans retail price, Haiti, 2012–2016



Source: Authors' calculations based on data from CNSA and FEWS NET (2017).



expand and improve their operations; the large scale of unreported and undocumented trade; lack of transformation and value addition; and high tariffs on imports (ACDI/VOCA 2010; Jean-Pierre, Kiremidijan, and Paul 2013; FEWS NET 2017).

**Table I4.** Correlation coefficient for local black beans in selected markets

Market	Cap-Haitien	Cayes	Fond-des-Nègres	Gonaïves	Hinche	Jacmel	Jérémie	Ouanaminthe	Port-au-Prince	Port-de-Paix
Cap-Haitien	1									
Cayes	0.769**	1								
Fond-des-Nègres	0.830**	0.970**	1							
Gonaïves	0.883**	0.904**	0.931**	1						
Hinche	0.847**	0.821**	0.880**	0.935**	1					
Jacmel	0.873**	0.904**	0.932**	0.947**	0.941**	1				
Jérémie	0.769**	0.941**	0.943**	0.878**	0.838**	0.897**	1			
Ouanaminthe	0.891**	0.865**	0.914**	0.966**	0.961**	0.948**	0.859**	1		
Port-au-Prince	0.869**	0.915**	0.925**	0.962**	0.912**	0.952**	0.888**	0.934**	1	
Port-de-Paix	0.868**	0.837**	0.864**	0.900**	0.869**	0.928**	0.826**	0.878**	0.910**	1

Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

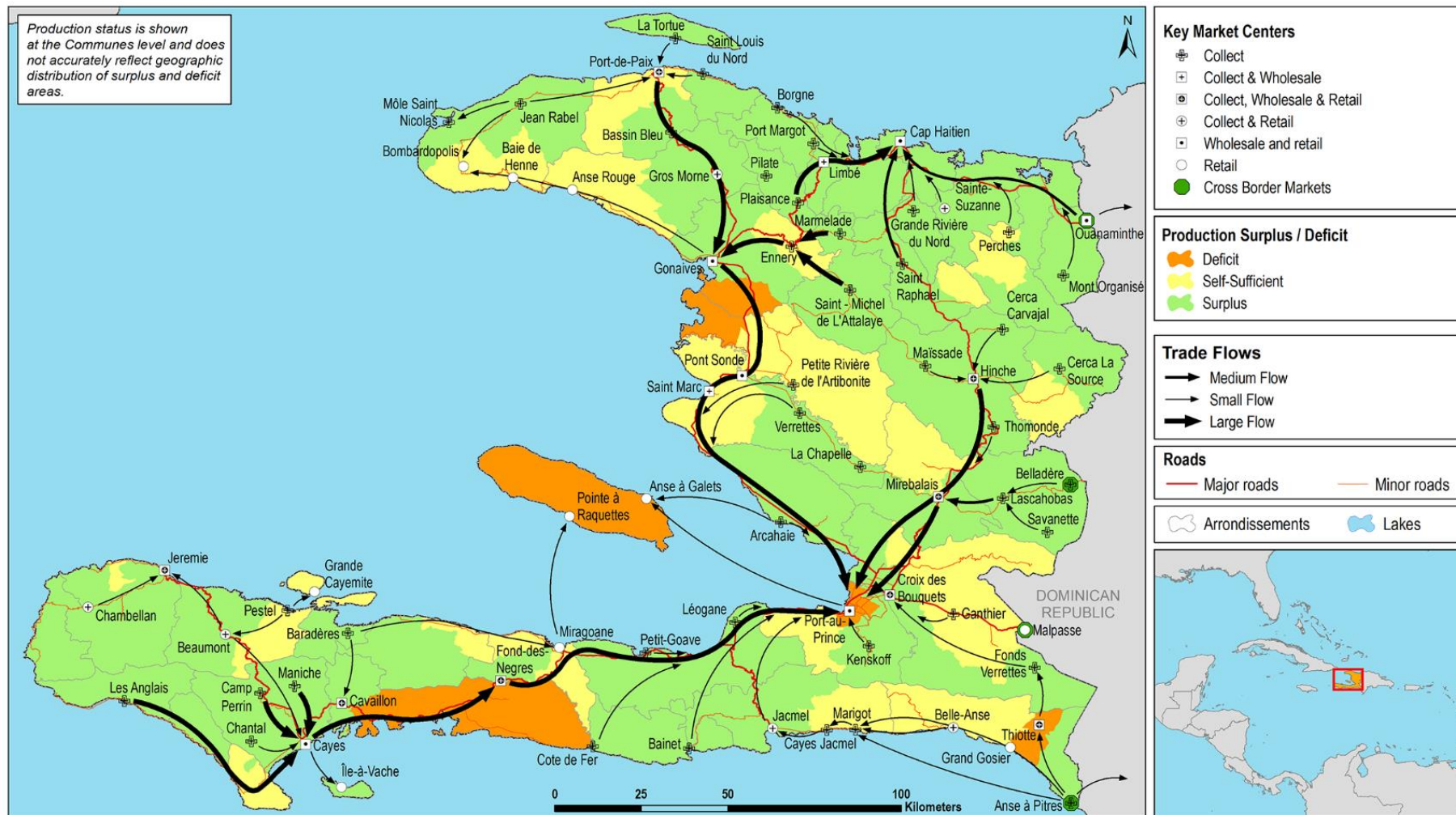
**Table I5.** Correlation coefficient for local red beans in selected markets

Market	Cap-Haitien	Cayes	Fond-des-Nègres	Gonai-ves	Hinche	Jacmel	Jérémie	Ouanaminthe	Port-au-Prince	Port-de-Paix
Cap-Haitien	1									
Cayes	0.538**	1								
Fond-des-Nègres	0.668**	0.842**	1							
Gonaïves	0.700**	0.782**	0.840**	1						
Hinche	0.504**	0.720**	0.808**	0.776**	1					
Jacmel	0.493**	0.833**	0.887**	0.780**	0.882**	1				
Jérémie	0.377**	0.831**	0.780**	0.678**	0.695**	0.818**	1			
Ouanaminthe	0.428**	0.582**	0.635**	0.803**	0.703**	0.625**	0.602**	1		
Port-au-Prince	0.644**	0.641**	0.758**	0.859**	0.721**	0.731**	0.638**	0.804**	1	
Port-de-Paix	0.695**	0.776**	0.837**	0.753**	0.741**	0.731**	0.664**	0.695**	0.720**	1

Source: Authors' calculations based on data from CNSA and FEWS NET (2017).



**Figure 60.** Pulses (beans and peas) production and trade flow map, Haiti



Note: FEWS NET Production and Trade Flow Maps provide a summary of the geography of marketing systems that are relevant to food security outcomes during an average marketing year or season. The maps are produced by FEWS NET in collaboration with stakeholders from local government ministries, market information systems, NGOs, and private sector partners, using a mix of qualitative and quantitative data.

Source: FEWS NET (2017).

## 8. Bananas (plantains)

Bananas, particularly plantains, are an important food and cash crop. Plantains are consumed in a variety of dishes and also represent an attractive source of income. Beyond their consumption fresh, bananas are processed into flour and chips. Given that production and harvesting take place all year long, actors in this chain (particularly traders) tend to specialize in this commodity. Madame Saras are the key actor in the chain as they act as intermediaries between producers and consumers.

### 8.1. Consumption

Annual consumption of bananas (including plantains) is estimated at 45 kg per person (CNSA 2013), but in banana-producing areas this amount can surpass 60 kg (Jean-Pierre, Kiremidijan, and Paul 2013). Bananas contribute to approximately 3 percent of daily calorie availability (FAO 2016). Plantains are the type of banana most widely consumed. Bananas are consumed mostly in their fresh state as fruit, while plantains are cooked and/or fried and served as a main staple or an accompaniment to other dishes. Bananas are also processed into flour and chips (“papita”), which are widely consumed as snacks. Banana snacks are typically (but not only) sold outside schools, hence their demand is associated with the school calendar (Jean-Pierre, Kiremidijan, and Paul 2013; CJ Consultants 2012).

### 8.2. Production

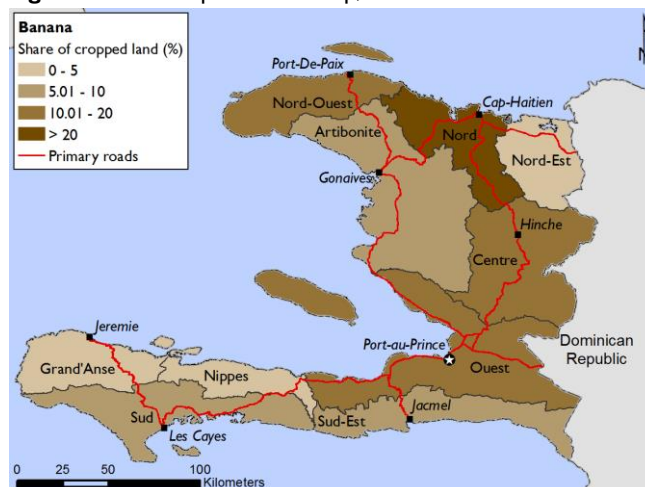
Bananas (including plantains) occupy about 6 percent of cultivated area (Van Vliet et al. 2016). They are produced both in rainfed and irrigated systems, with Nord, Ouest, Centre, Grand’Anse, and Nord-Ouest Departments contributing to over 70 percent of total production in the past years (CNSA 2013; MARNDR 2017) (**Figure 61**). Three types of banana are grown: banana plantain (or “miske”), the most important type of banana; banana “figue” (or sweet/dessert banana); and banana “poban,” used for flour production (Jean-Pierre, Kiremidijan, and Paul 2013).

Bananas are grown as monoculture in high-production areas such as Arcahaie, Léogane, Jean Rabel, Petit Goave, and Grand Riviere du Nord. In the humid mountainous areas they are part of agroforestry systems, grown in association with tubers, coffee, and diverse fruits (FAO and WFP 2010; CJ Consultants 2012). Planting and harvesting occur all along the year, but March to May is the main planting period. Several varieties of plantains are grown, most notably those known as “miske” (or “musquée”), “gosbotte,” “mateyen,” “kochon,” “barik,” etc. (CJ Consultants 2012). About 90 percent of production takes place on plots smaller than 1 ha (Jean-Pierre, Kiremidijan, and Paul 2013).

Yields of plantains vary according to production system and location of the production area, ranging from about 7 MT/ha in the drier areas up to 18 MT/ha in the irrigated plains (CJ Consultants 2012). Yields are on average 10 MT/ha (CNSA 2013). In the period 2011–2015, banana production was variable, ranging from 153,818 MT in 2015 up to 443,128 MT in 2013 (**Figure 62**). The average annual banana production over this period was 295,189 MT, or 112,386 MT in cereal equivalent terms.

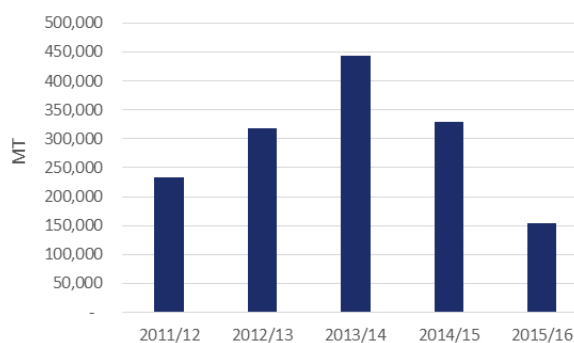
Overall, Haiti produces sufficient bananas to satisfy most of its food consumption requirements. Approximately 20,000 MT of bananas are imported every year, particularly from the Dominican Republic (FAO and WFP 2010). Formal exports are

**Figure 61.** Banana production map, Haiti



Source: Authors' calculations based on CNSA (2013), CNSA (2014), and MARNDR (2017).

**Figure 62.** Production of bananas in Haiti, MT, 2011–2015



Source: Authors' calculations based on FAO and WFP (2010), CNSA (2013), and MARNDR (2017).

practically nonexistent according to COMTRADE data, but informal imports toward other Caribbean islands have been documented (Jean-Pierre, Kiremidijan, and Paul 2013)

Among the most important constraints to banana production are the large water demands of this crop and its high sensitivity to pests and diseases, most notably “black sigatoka” fungal disease, which can cause total loss in infested plantations. Other factors affecting banana productivity are: limited access and affordability of production inputs; lack of access to financing opportunities; use of traditional cropping practices (in extensive/agroforestry systems) and limited access to technical assistance; limited access to irrigation and/or inadequate water management; and occurrence of unfavorable climatic factors (CJ Consultants 2012; Jean-Pierre, Kiremidijan, and Paul 2013; Van Vliet et al. 2016).

### 8.3. Structure of the marketing system

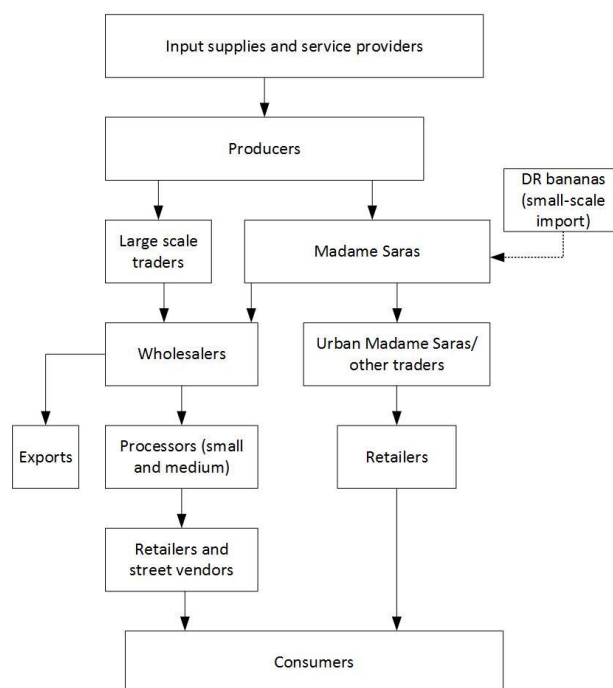
The main actors participating in the banana marketing chain are producers, traders (Madame Saras), retailers, and processors. Producers sell the product at the farm gate or in local markets to local Madame Saras and local consumers (Figure 63). Depending on their trading capacity and on the type of relationship established with producers, local Madame Saras buy smaller/larger loads (up to 12 bunches at a time) and are able support producers’ activities by providing credits/advances along the growing period and by guaranteeing the purchase of the production. Local Madame Saras sell to urban Madame Saras, who have a larger trading capacity (up to 60 bunches at a time) and bring the product to the main consumption markets in the broader Port-au-Prince area, Cap-Haitien, and Gonaives. Croix des Bossales market is the main trading point for bananas in the broader Port-au-Prince area and it serves as a source of supply for small-scale local traders, retailers, and large-scale buyers (hotels, restaurants, etc.). Larger-scale traders rent storage space to keep product in stock for up to eight days (CJ Consultants 2012; Jean-Pierre, Kiremidijan, and Paul 2013; FEWS NET 2017).

Local Madame Saras in Ouanaminthe (near the Dominican border) import Dominican bananas by the truckload and resell to other Madame Saras (mostly urban Madame Saras) who then incorporate the produce into the broader national flows. Dominican bananas are often considered of higher quality (based on their appearance) than Haitian bananas and are often used for the production of fried banana (“fritures”) and snacks (“papita”) (CJ Consultants 2012; Jean-Pierre, Kiremidijan, and Paul 2013).

Given the year-round supply of bananas, the Madame Saras participating in the marketing system tend to specialize in this commodity, and are the ones who typically set the prices in their transactions. Trade occurs between parties that have established a trust-based relationship that is maintained over time. Bananas are traded by the bunch (“regime”) along the chain (Table 16), except at the retail level, where consumers buy them by the “hand” or by the unit (Figure 64 and Figure 65) Prices are established based on the size and appearance of the product rather than on weight (Jean-Pierre, Kiremidijan, and Paul 2013; FEWS NET 2017).

Processing of banana is done at both the small-scale and semi-industrial level. Banana chips (“papita”) and “fritures” are produced by small-scale processors and sold by street merchants and small restaurants. Banana flour is used predominantly as infants’ food. Several brands of flour are sold in markets, small shops, and supermarkets (Jean-Pierre, Kiremidijan, and Paul 2013).

Figure 63. Banana marketing channels, Haiti



Source: FEWS NET (2017).

Table 16. Approximate weight of banana bunches

Type of regime	Approximate weight (lb)
Small	22 to 33
Medium	34 to 44
Large	45 to 66

Source: Jean-Pierre, Kiremidijan, and Paul (2013).



Other actors relevant for the functioning of the chain are the input providers, providers of financial resources (formal and informal), laborers who support harvesting activities, transporters, and storage providers (Jean-Pierre, Kiremidijan, and Paul 2013; FEWS NET 2017). Bananas are transported by regimes or in bags weighing between 200–400 lbs. A high level of losses occurs during transport as bananas become damaged due to improper or lack of adequate packing and handling. Bananas in regimes fetch higher prices than bananas in bags (CJ Consultants 2012).

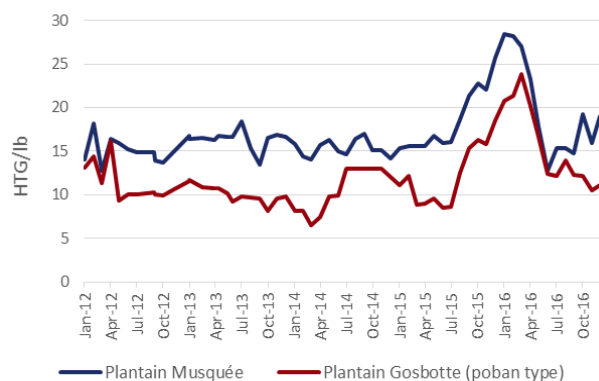
#### 8.4. Performance of the marketing system

Price determination occurs through bargaining among trading partners, based on subjective evaluation of the size, weight, origin, and visual appearance of the product. It is not common practice to weigh the product.

Plantain prices collected by the MARNDR are available at the wholesale level for the reference market of Croix des Bossales (Figure 66). Plantain musquée tends to be more expensive than plantains of the poban type (used for flour). Based on field observations, increased prices in early 2016 have been attributed to the residual effects of droughts prior to 2016.

While harvest tends to occur year round, prices in the broader Port-au-Prince area tend to be lower between June and August and increase in December/January (Figure 67). The lower prices faced in June–August are associated with a larger supply and lower demand during school holidays (CJ Consultants 2012).

**Figure 66.** Wholesale prices (HTG/lb) of bananas in Croix des Bossales (Port-au-Prince), Haiti, 2012–2016



Source: Authors' calculations based on data from SIMA (2017).

Several constraints hinder the marketing of bananas and plantains, namely: consumer preferences that favor varieties highly susceptible to black sigatoka; poor postharvest management (damages and losses); lack of suitable packing materials; perishability of the product (less than 10 days postharvest); limited value-addition activities; limited processing capacity due to simple and/or outdated equipment; lack of organization among market actors; lack of market information at the producer level; and limited availability of and access to financing schemes suited to the length of the production cycle (10 months or more) (CJ Consultants 2012; Jean-Pierre, Kiremidijan, and Paul 2013; FEWS NET 2017).

**Figure 64.** Banana trade, by bunch



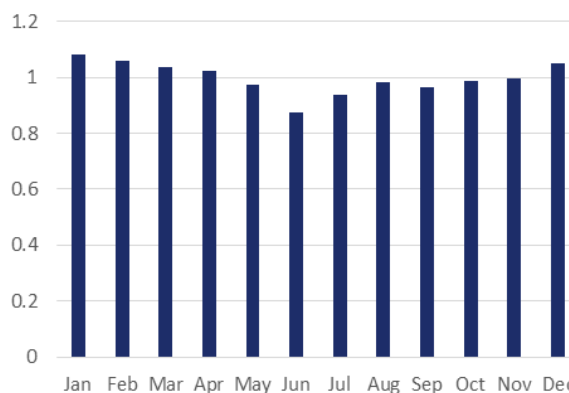
Source: FEWS NET (2017).

**Figure 65.** Banana retail, by hand/unit



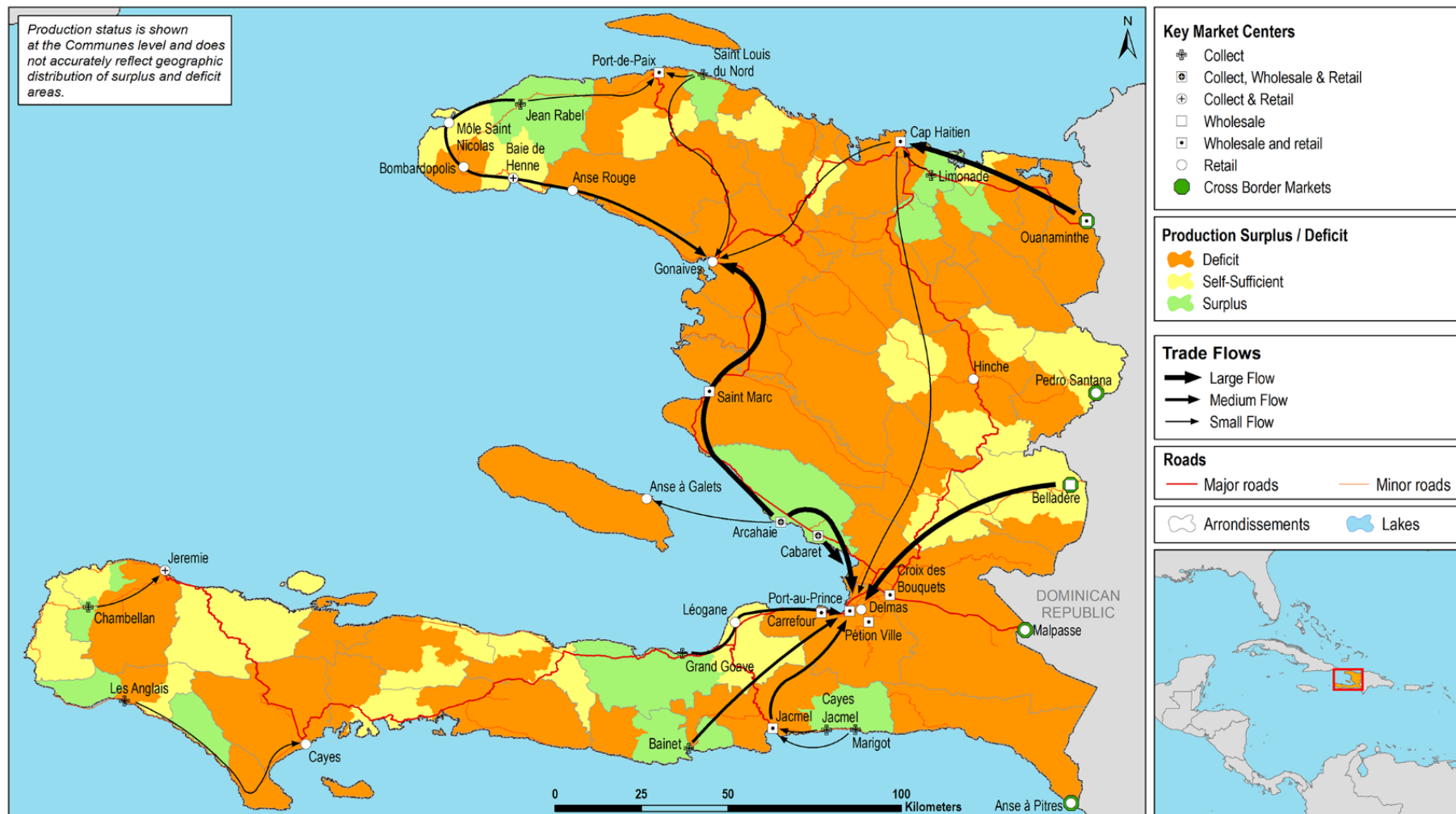
Source: FEWS NET (2017).

**Figure 67.** Seasonal index for plantain musquée wholesale price in Croix des Bossales (Port-au-Prince), Haiti, 2012–2016



Source: Authors' calculations based on data from SIMA (2017).

**Figure 68.** Banana (plantain) production and trade flow map, Haiti



Note: FEWS NET Production and Trade Flow Maps provide a summary of the geography of marketing systems that are relevant to food security outcomes during an average marketing year or season. The maps are produced by FEWS NET in collaboration with stakeholders from local government ministries, market information systems, NGOs, and private sector partners, using a mix of qualitative and quantitative data.

Source: FEWS NET (2017).



## 9. Roots and Tubers

Sweet potato, cassava (yuca), and yams are the main roots and tubers produced and consumed in Haiti. Sweet potato is by far the most produced and consumed. Other tubers grown are potato and taro. The main tubers are produced all over the country, but Grand'Anse, Nord, and Ouest Departments stand among the main producers (**Figure 69**). Domestic production is generally sufficient to cover domestic demand; nonetheless, a minimal amount of imports occurs every year. The tuber marketing system is competitive, characterized by a large number of actors participating along the marketing chain. Madame Saras are key actors in the chain as they act as intermediaries between producers and consumers.

### 9.1. Consumption

Annual average consumption for the main tubers (sweet potato, cassava, and yams) is estimated at 88 kg per person (approximately 25 kg in cereal equivalent) (CNSA and WFP 2011; CNSA 2013, 2014). Tubers contribute to approximately 12 percent of daily calorie availability (FAO 2016). They are consumed boiled accompanied by different sauces, fried, or cooked in soups and stews (FEWS NET 2017). Tubers are an important food security crop as they can be harvested practically all year long and can be used as a substitute for more expensive staples. Yams are usually eaten fresh, and cassava is predominantly processed into flour or cassava grates, from which bread, "cassava cookies/cake," and other products are elaborated.

### 9.2. Production

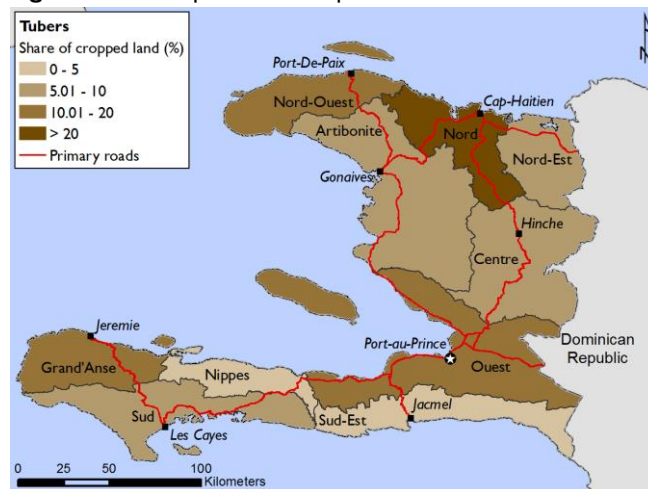
Tubers are grown all across Haiti and occupy about 13 percent of cultivated area. The environmental characteristics of the different departments enabled cultivation of these crops to different degrees, with sweet potato and yam production mainly concentrated in the humid mountains, and cassava production in the drier areas. Nord, Nord-Ouest, Nord-Est, Ouest, Sud-Est, and Grand'Anse Departments are the main producing areas (Ducasse 2002; FEWS NET 2017) (**Figure 69**). Tubers can be cultivated in monoculture (as in the case of sweet potatoes), in intercropping with maize and beans, or as part of agroforestry systems in association with fruit trees, coffee, and cocoa (Ducasse 2002; Vernier 2005).

The main types of yams cultivated are white yam and yellow yam, with white yam (varieties Guinée, Adigwé) more widespread in the southern production areas and yellow yam (varieties Soussou, Batwel, Bouba) in the north. As well, two types of cassava roots are cultivated: sweet and bitter cassava, with sweet cassava more widely produced (Ducasse 2002; Vernier 2005; MARNDR 2017).

Aggregate production of tubers was variable during the past years, with a marked downward trend (**Figure 70**). During 2012–2015, 789,183 MT were produced every year on average. This amount is 257,136 MT in cereal equivalent terms, based on a 0.3235 conversion factor as reported in the literature (Baquedano 2016).

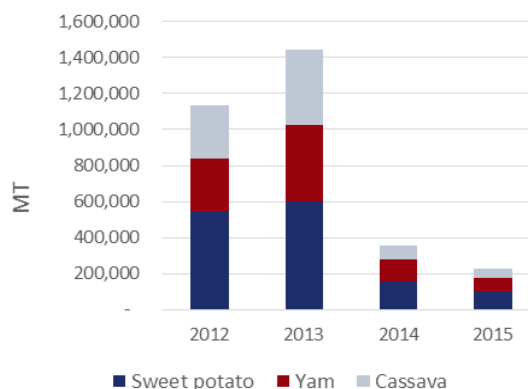
Tubers are produced in all seasons, although the spring season contributes to about 70 percent of total output (CNSA 2013, 2014). Planting occurs mostly between February and April, but the timing of harvest is variable depending on the crop, the variety grown, and whether multiple harvests are planned for (**Table 17**).

**Figure 69.** Tuber production map, Haiti



Source: Authors' calculations based on CNSA (2013), CNSA (2014), and MARNDR (2017).

**Figure 70.** Production of the main tubers in Haiti, MT, 2012–2015



Source: Authors' calculations based on CNSA (2013), CNSA (2014), and MARNDR (2017).

**Table 17.** Seasonal calendar for tubers

Crop	Activity	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Cassava	Planting												
	Harvest												
Yam	Planting												
	Harvest												
Potato	Planting												
	Harvest												

Source: FEWS NET (2017).

Yields are generally low compared to those reported in neighboring Dominican Republic (**Table 18**). Among all tubers, yams register the largest level of output per hectare. Productivity is constrained by: low soil fertility and/or soil degradation; the incidence of pests and diseases; lack of access to credit, research, and technical innovation, which prevents investment and modernization of the chain; lack of quality seeds and planting materials (cuttings); use of traditional cropping techniques; and lack of prioritization of these crops for development of technical improvements (Vernier 2005; FEWS NET 2017).

Local production is sufficient to cover the population's needs. However, a small amount of imports takes place, in the range of 5,000 MT/per year (**Figure 71**). According to COMTRADE data, potatoes represented close to 70 percent of total imports in the 2011–2015 period. Formal recorded exports were also minimal. According to COMTRADE data, 26 MT were exported, on average, every year between 2011 and 2015, with the Bahamas, Turks and Caicos Islands, Canada, and the United States as main trading partners. Previous studies documented small flows of informal exports of yellow yams toward the Bahamas and Turks and Caicos Islands (Vernier 2005).

### 9.3. Structure of the marketing system

The widespread production of tubers results in a large number of actors participating in the tuber marketing chain across the country, making it a competitive market with no evident barriers to entry (**Figure 72**). Producer households sell the roots directly to consumers in local markets, or sell at farm gate to local Madame Saras, who purchase small amounts of roots depending on their capacity to handle the produce. Generally, producers have low bargaining power and are price takers instead. The product undergoing transformation is processed into grates or flour. Local mills provide milling services in exchange for a fee (FEWS NET and CNSA 2017).

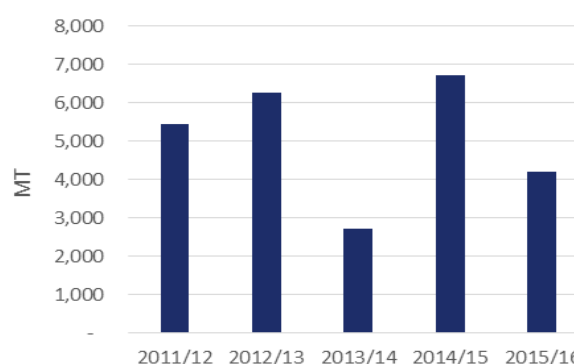
Local Madame Saras sell in local and regional markets to different actors such as retailers, consumers, and urban Madame Saras, who distribute larger quantities to Port-au-Prince and other regional consumption markets (**Figure 76**). Key markets for the flow of tubers are: Jérémie, Fonds-des-Nègres, Gonaïves, Pont Sondé, Cap-Haitien, Hinche, Jean Rabel, and Port-au-Prince (FEWS NET 2017).

Overall, the tuber marketing chain is similar to those of other locally produced commodities such as cereals or beans, but it does not necessarily involve the same actors. Observations from the field assessment suggest that traders who typically handle cereals and beans do not participate in the tuber marketing chain and vice versa. As well, tubers are often traded together with bananas.

**Table 18.** Average yield of tubers (MT/ha) in Haiti and Dominican Republic

Crop	Haiti	Dominican Republic
Sweet potato	10.2	17.86
Yam	12	14.6
Cassava	7	16.55

Source: CNSA (2013).

**Figure 71.** Tuber imports in Haiti, MT (cereal equivalent), 2011–2016

Source: Authors' calculations based on COMTRADE data.

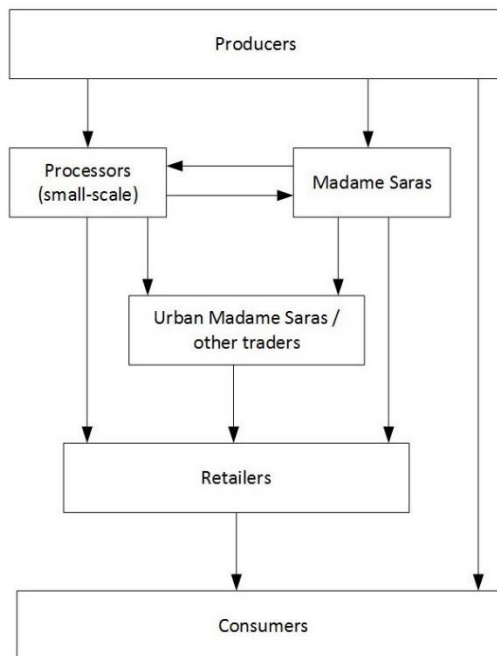
### 9.4. Performance of the marketing system

Price determination for tubers is considered not transparent and rather subjective, as it is not common practice to weigh the roots. Tubers are marketed by the bag, bucket, and basket (**Figure 74**). At the retail level, roots are most often sold “by the pile” and the amount and size of tubers comprising each pile are variable. Tubers and plantains are often traded together by the same retailer (**Figure 75**).

Prices collected by the MARNDR are available for the main tubers at the wholesale level (**Figure 73**). Among roots, yams tend to be more expensive and prices of white and yellow yam (not shown) have similar levels, where comparative data are available. Sweet potato registers the lowest wholesale price levels.

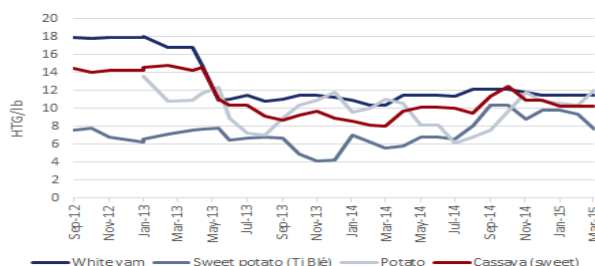
The tuber marketing system is constrained by the fresh-product bulkiness (limiting transport possibilities); perishability after harvest (high susceptibility to molding); difficulties with storage; lack of suitable packing options to reduce product damage and spoilage; low profitability levels; the undeveloped processing industry; and limited value addition. In addition, the chain is fragmented in a large number of actors with a low level of organization and information (FEWS NET 2017).

**Figure 72.** Tuber marketing channels, Haiti



Source: FEWS NET (2017).

**Figure 73.** Wholesale prices (HTG/lb) of roots and tubers in Croix des Bossales (Port-au-Prince), Haiti, 2012–2015



Note: Price data series were incomplete between January and August 2012 and after March 2015 for most commodities displayed. Source: Authors’ calculations based on data from SIMA (2017).

**Figure 74.** Trade of roots and tubers, by bucket



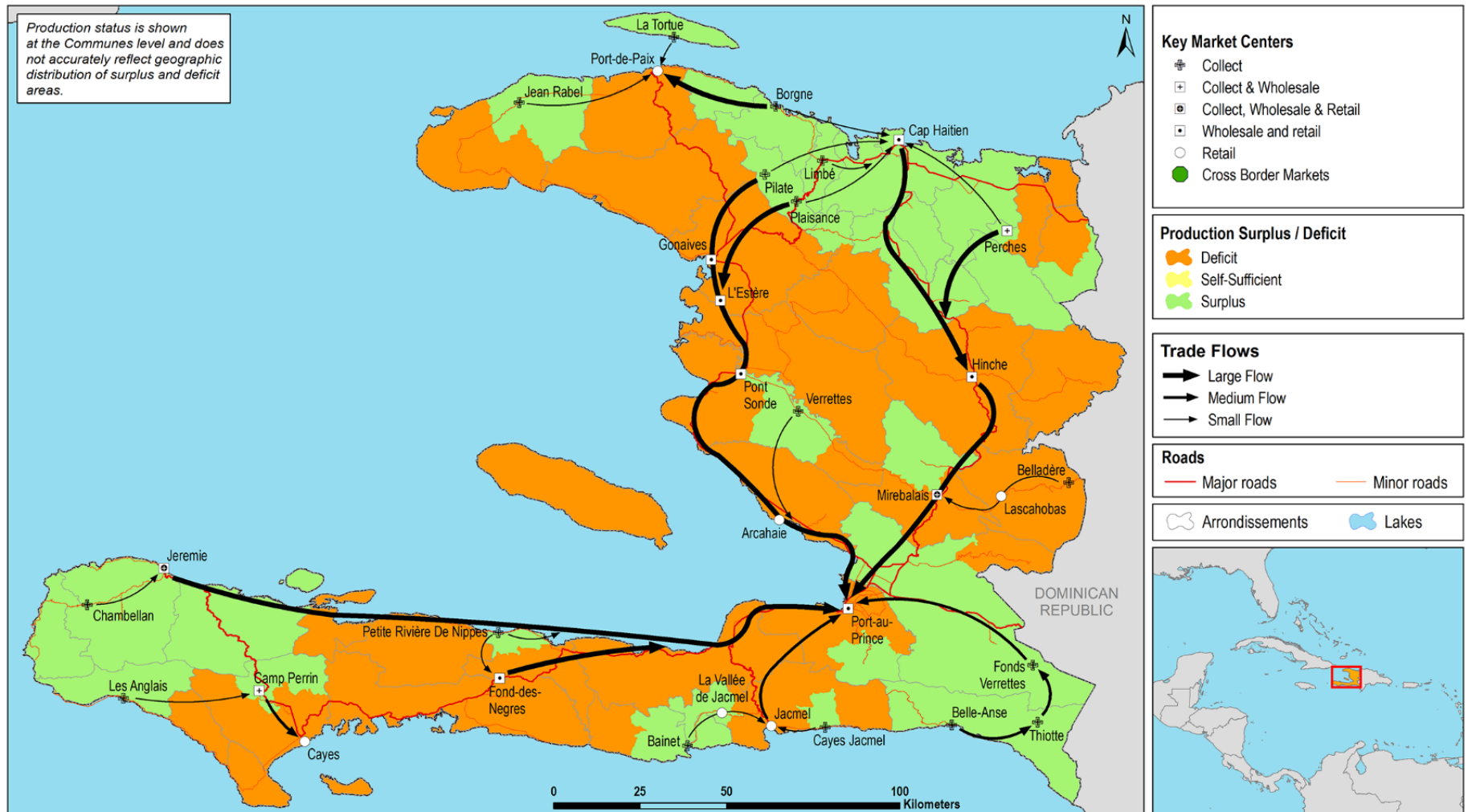
Source: FEWS NET and CNSA (2017).

**Figure 75.** Retail of roots and tubers, by pile



Source: FEWS NET and CNSA (2017).

**Figure 76.** Root and tuber production and trade flow map, Haiti



Note: FEWS NET Production and Trade Flow Maps provide a summary of the geography of marketing systems that are relevant to food security outcomes during an average marketing year or season. The maps are produced by FEWS NET in collaboration with stakeholders from local government ministries, market information systems, NGOs, and private sector partners, using a mix of qualitative and quantitative data.

Source: FEWS NET (2017).



## 10. Edible Oil

Edible oil is a key ingredient in the preparation of food at the household level and in the broader food processing sector. The production of cooking vegetable oil in Haiti is minimal; therefore, domestic requirements are supplied through formal and informal imports and food aid. Palm oil accounts for about 79 percent of total imports. Malaysia and Indonesia are the main trading partners for palm oil imports, and the Dominican Republic, the United States, and Argentina for soybean oil. Imported and local brands of cooking oil are generally available across the country.

### 10.1. Consumption

Edible oil is widely utilized in Haiti for the preparation of diverse dishes (including fried and deep-fried foods) and snacks, as well as for food manufacturing in the food processing industry. Due to its relevance to the diet, edible oil is a commodity included in the CNSA's food basket. Its annual consumption is estimated at 10 kg/person, on average, and contributes to about 12 percent of daily calorie availability (FAO 2016).

While palm oil is the most consumed oil, several brands offer different types (and mixes) of cooking oils (**Table 19**). Ti-Malice, Mazola, Bongu, and Gourmet are among the most popular brands (Fintrac 2013; FEWS NET and CNSA 2017).

### 10.2. Production

The domestic supply of edible oil is secured through imports, as domestic production is almost nonexistent. Imports are in the form of crude and refined oil, which are further processed, blended, and bottled under the name of local brands such as Ti-Malice or Gourmet. In the period 2011–2015, palm oil imports represented close to 80 percent of total formal oil imports. Soybean oil was second in importance, with 13 percent of total formal imports. During this period, Haiti imported 124,850 MT of edible oils annually (COMTRADE 2017) (**Figure 77**).

Malaysia and Indonesia are the main trading partners for palm oil imports, and the Dominican Republic, the United States, and Argentina for soybean oil (CFI 2016; Latino and Musumeci 2016; COMTRADE 2017). It is not possible to quantify the size of informal oil imports, but a 2016 study identified refined linseed oil imports as the fourth largest informal food import originating from the Dominican Republic, after wheat flour, sauces and seasonings, and tomato ketchup and other tomato sauces. By 2014, the estimated value of linseed oil imports was USD 13,217,876 (CFI 2016).

### 10.3. Structure of the marketing system

Formally imported oil enters predominantly through Port-au-Prince, but a small amount is imported through other customs stations, most notably the ones in Malpasse, Ouanaminthe, and Cap-Haitien (FEWS NET 2017). Importers such as Carribex, *Huileries Haïtiennes* S.A. (HUHSA), and Cristo S.A. import oil that upon arrival is processed (refined and/or blended), bottled, and marketed under local brands such as Ti-Malice (from Carribex), Gourmet (from HUHSA), and Bongu (from Cristo S.A.). HUHSA also carries other brands of imported oil such as Crisco and Goya (Huileries Haïtiennes S.A. 2017). These three companies/brands capture over 80 percent of the market and can influence prices (Fintrac 2013).

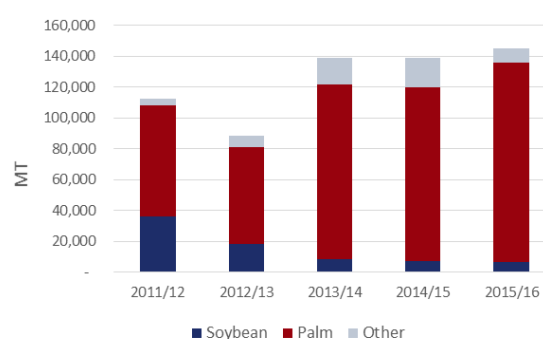
Branded cooking oil is marketed in a variety of presentations ranging from 18- to 20-liter canisters down to 1-gallon (3.8

**Table 19.** Examples of cooking oil brands consumed in Haiti

Brand	Oil type(s)
Ti-Malice (local)	Palm-soybean blend
Gourmet (local)t	Blend
Bongu (local)	Blend
Alberto	Blend
Mazola	Corn, canola, soy-canola blend
Crisol	Soybean
Crisco	Canola, blend, olive
Wesson	Canola, blend
HY TOP	Corn
Goya	Olive

Source: FEWS NET (2017).

**Figure 77.** Formal edible oil imports, 2011–2015, Haiti



Source: Authors' calculations based on COMTRADE data.



liters) containers and half-liter bottles (**Figure 78**). Unbranded oil (oil rebottled by the retailer prior to sale) can be contained in smaller-sized bottles (or half-full soda bottles).

According to DQCSPAP information, Cristo S.A. (also very active in wheat flour imports), Codigel, Caribbean Grain Company, S.A., and the *Société Haïtienne de Distribution* (carrying “Crisol” from the Dominican Republic) are among the largest oil importers in terms of the value of imports registered at customs in the past years (DQCSPAP 2016). Overall, oil imports are highly concentrated in a few actors. Similar to the case of wheat flour (see Chapter 6), this sector is highly concentrated, as evidenced by the Herfindahl-Hirschman Index, a situation reinforced by family links in the sector (Pop 2016). WFP imports oil as part of food aid.

Once the oil is in the country and/or has been processed, importers/processors send it to distributors located in major towns across the country who then sell to wholesalers, who in turn sell to retailers and these, to final consumers. At the wholesale and retail level, the vegetable oil marketing chain is competitive, with a large number of actors participating in trade activities, but prices are established by the larger traders. Depending on the quality of the business relationship between the different partners, some actors may offer credit to their clients (importers to wholesalers, wholesalers to retailers, retailers to consumers). Vegetable oil is often traded together with many other commodities (i.e., wheat, wheat flour) by the same actors. Vegetable oil flows go in the opposite direction as those of locally produced commodities, originating mainly in Port-au-Prince and moving toward the rest of the country (Fintrac 2013; FEWS NET 2017).

Two distinct tariffs exist for vegetable oil imports. In 2016, the applied import tariff was 15.0 percent for sunflower, coconut, and palm kernel oil, and 7.5 percent for other vegetable oils, including soybean, groundnut, and palm oil (WTO 2016). Cooking oil is among the 23 commodities banned from import by land (CFI 2016), but informal imports from the Dominican Republic still take place (FEWS NET 2017).

#### 10.4. Performance of the marketing system

Vegetable oil prices tend to be stable across the country due to the stability of imports (**Figure 79**). Across markets, Jérémie registers the highest retail price levels in the country. Prices in Port-au-Prince display lower variation and are among the lowest in the country.

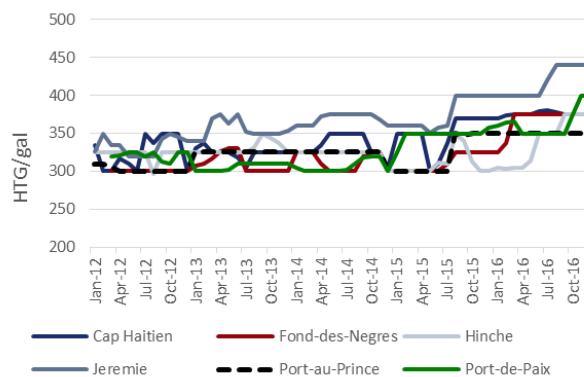
Across markets, price differentials occur based on perceived quality and transport costs. Prices also vary by the amount of product purchased and the business relationship existing between trading partners (FEWS NET 2017). Prices tend to remain stable over the course of the year (**Error! Reference source not found.**).

**Figure 78.** Marketing of edible oil in Haiti



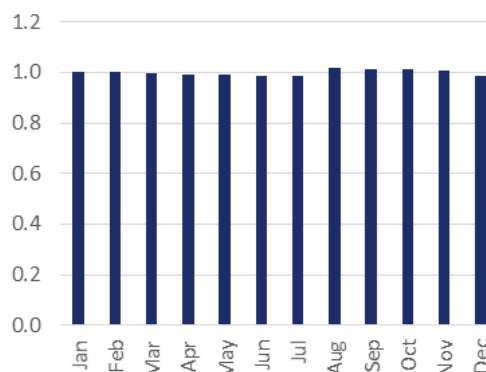
Source: FEWS NET and CNSA (2017).

**Figure 79.** Retail price of edible oil “Mazola” (HTG/gal) in selected markets, 2012–2016, Haiti



Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

**Figure 80.** Seasonal index for Croix des Bossales (Port-au-Prince) edible oil (Mazola) retail price, Haiti, 2012–2016



Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

Prices of cooking oil show a strong correlation between Port-au-Prince and other key markets in the country, indicating a fair degree of price co-movement across markets (**Table 20**). Weaker, but still significant, correlations are observed between other markets and Fonds-des-Nègres, Jérémie, and Cap-Haitien. Overall, prices in Hinche correlate weakly, or not at all, with prices in other markets, suggesting that other market dynamics might be present in this market.

**Table 20.** Correlation coefficient for edible oil prices in selected markets

Market	Cap-Haitien	Fonds-des-Nègres	Hinche	Jérémie	Port-au-Prince	Port-de-Paix
Cap-Haitien	1					
Fonds-des-Nègres	0.676**	1				
Hinche	0.229	0.474**	1			
Jérémie	0.765**	0.842**	0.455**	1		
Port-au-Prince	0.700**	0.782**	0.416**	0.843**	1	
Port-de-Paix	0.631**	0.618**	0.196	0.661**	0.448**	1

Source: Authors' calculations based on data from CNSA and FEWS NET (2017).

## 11. Areas of Future Investigation

The following four main lines of investigation could help provide a better basic knowledge of the workings of staple food markets in Haiti.

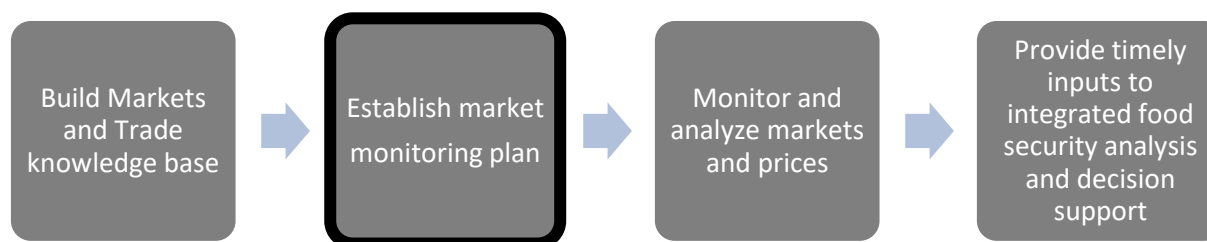
- Dietary habits are changing in Haiti as a result of, among others, urbanization, high food prices, and limited purchasing power. In addition, regional differences in staple food preferences are known anecdotally, but updated information on this aspect is missing. A subnational characterization of local/regional food preferences, as well as the contribution of different staples to local diets, would serve to update calculations related to domestic food demand, commodity balances, and the food sufficiency situation in the country. In addition, a detailed profile of the characteristics and components of local diets would allow identification of potential macro and micro nutrient imbalances and deficiencies, information that would in turn help design nutrition education and public health initiatives.
- Informal cross-border trade dynamics with the Dominican Republic are scarcely documented. The commercial linkages between the countries are broadly recognized and referred to by a diversity of stakeholders. However, attempts to characterize and quantify these dynamics in a systematic and plausible way have been very limited to date. Given the relevance of these commercial relationships for Haiti's food availability, it is important to understand the way trade between the countries takes place, both by land and by sea, as well as the special market dynamics observed in border areas.
- Given the relevance of Madame Saras to the functioning of the marketing chain of different staple and nonstaple foods, it is important to identify specific actions that could help strengthen their operations, for the benefit of consumers countrywide. Among the main challenges they face are access to finance, problems during transport (insecurity, vehicle breakdown), and lack of payment from their customers.
- Tubers and plantains are staple foods that are easily available at affordable prices, but their production (and presumably consumption) declined noticeably over the past years. In a context of high food prices and limited purchasing power, these two commodities may constitute good alternatives to other staples consumed. It is important to identify the factors that influence demand for these commodities.

## 12. Market Monitoring Plan

FEWS NET regularly monitors staple food and livestock market dynamics in both presence and remote monitoring countries. It is neither necessary nor possible for FEWS NET to effectively monitor all commodities markets all the time and/or outright. Thus, its markets and trade team focuses on the monitoring of selected indicators for a given marketing year.

These key indicators refer to market operations and major events liable to affect supply and demand dynamics and price levels and, thus, price variability on reference markets. FEWS NET also regularly monitors drivers of trade from surplus to deficit areas. Some of these indicators have upper thresholds, which are used together with other types of data to indicate/suggest at what point or threshold national or local food availability and/or access should start to raise concerns. The findings from this monitoring process are regularly presented in FEWS NET's Price Watch and Price Watch Annex. They are also used as basic inputs in integrated food security project analysis.

**Figure 8I.** FEWS NET's approach to market monitoring and analysis



Source: FEWS NET (2014).

A number of actors collect information about agricultural commodities and markets in Haiti (**Table 21**). At the national government level, the MARNDR, through the *Système d'Information sur les Marchés Agricoles* (SIMA), collects daily prices in 35 collection markets spread across the country, for different cereals, pulses, fruits and vegetables, roots and tubers, seasonings, etc., including local and imported products (SIMA/MARNDR 2017). The *Coordination Nationale de la Sécurité Alimentaire* (CNSA) regularly monitors the market conditions of a basic food basket composed of rice, wheat flour, maize, beans, sugar, and vegetable oil. According to CNSA estimations, these products account for 1,979 calories consumed per person per day (CNSA 2016).

FEWS NET monitors retail prices for a number of commodities in 10 markets across the country, in collaboration with CNSA. Other international actors, such as WFP, FAO, and USDA, also monitor agricultural markets in Haiti. More specifically, WFP monitors prices in 9 markets (one per department) for 10 commodities (black and red beans, maize meal, imported edible oil, pasta, local and imported rice, sorghum, white sugar, and imported wheat flour). USDA, through the Foreign Agricultural Service, monitors the evolution of crop production and climatic factors that can affect agricultural output (Foreign Agricultural Service/USDA 2017). FAO, through the Global Information and Early Warning System (GIEWS), collects price data for four commodities (different types of beans, local and imported maize meal, local and imported rice, and sorghum) in seven markets spread across the country (FAO/GIEWS 2017). NGOs such as CRS, CARE, ACF, OXFAM, Concern, and IHSI also monitor market activity in the framework of their operations in the country.

With respect to imports and exports, the General Customs Administration (under the Ministry of Economy and Finances), records import and export transactions occurring in the different entry/exit points (cross-border stations, airport, and ports) (Administration Générale des Douanes 2017).

The information gathered by the different institutions is published with varying frequencies on the different institutions' websites, as well as in a variety of reports that document the development of the commodity markets (including the evolution of the growing season) at a given point in time. These reports provide information to decision makers on factors affecting production and overall domestic food supply prospects. In addition, the National Survey of Agricultural Production ("*Enquête Nationale de la Production Agricole*," ENPA) takes place every year under MARNDR coordination. This survey's results offer valuable information for the programming of agriculture- and food security-related initiatives by both national and international development actors.

**Table 21.** Existing food/agricultural market monitoring systems in Haiti

Monitoring agency/organization	Monitoring indicators/data	Level	Frequency	Coverage
MARNDR	Food prices (wholesale)	35 markets	Daily	National through SIMA
	Volume of production	Department	Annual	National
CNSA	Food prices	10 markets	Weekly	National
	Area planted Volume of production	Department	Annual	National
	Trade flows (between surplus and deficit areas)	Markets	Monthly	National
CNSA in collaboration with FEWS NET	Food prices	10 markets	Weekly	National
WFP	Food prices	9 markets	Monthly	National (exc. Nippes)
FAO/GIEWS	Food prices	7 markets	Monthly	7 Departments
	Area planted Volume of production Climate	Department	Seasonal	National
USDA	Area planted Volume of production Climate	Department	Seasonal	National
General Customs Administration (Administration Generale des Douanes)	Imports and exports	Customs checkpoints and plant health inspection stations	Daily	National

Source: Authors' elaboration based on SIMA/MARNDR (2017); CNSA (2016); WFP (2017); FAO/GIEWS (2017); Foreign Agricultural Service/USDA (2017); Administration Générale des Douanes (2017).

Despite its many participants and different mechanisms, Haiti's market monitoring and data collection system suffers from a number of challenges related to inter-institutional coordination and collaboration, insufficient funding, timeliness of publications, duplication of effort in some areas of the country and lack of data in others, and methodological differences in data collection and analysis, all of which hinder comparative work. The generalized publication of price and production data using a web interface constrains the access to and use of information by those stakeholders (small farmers, small-scale traders, local authorities) who have limited access to electricity, computer, and internet services. **Table 22** presents relevant aspects that should be made part of monitoring initiatives for key staple food markets in Haiti.

**Table 22.** Aspects relevant for short- and/or long-term monitoring of key food staples markets

Category	Indicator
Macro/economic	Employment and migration
	Remittances (size, flow patterns, seasonal trends)
	Trade balance
	Exchange rate
	Inflation
	Global commodity prices, particularly United States and Vietnam for rice, Dominican Republic for maize and wheat flour, United States for wheat grain
	Fuel prices
	Patterns and size of government revenues from different sources
	Performance in other sectors, particularly apparel (main component of exports)
	Size of and allocation to agricultural spending in aspects relevant for the production of key staples
	Change in import tariffs/duties and preferential status for exports to the United States
	Political stability/instability



Category	Indicator
Domestic food supply	Levels of imports of key products (rice, wheat flour, edible oil)
	Spring season (area planted and total harvest)
	Other seasons (area planted and total harvest)
	Timeliness and sufficiency in the delivery of key production inputs by different stakeholders
	Changes in access to credit and financing options to small-scale producers
	Changes in land tenure system that can incentivize production and investment
	Changes in the patterns of demand from United States (main trading partner)
Environment	Changes in the conditions and coverage of the road network in major market routes
	Development of road and other infrastructure in more isolated locations
	Rainfall (volume and timing over the year) adequacy for sustaining rainfed agriculture in major production areas
	Climatologic events that may pose risks to domestic production (El Niño, drought, hurricanes/tropical storms, floods, etc.)
	Incidence of pests and diseases
Domestic food demand	Rate of urbanization
	Changes in dietary preferences and food consumption habits
	Changes in demand from the domestic agroindustry (particularly for sorghum, maize, wheat)

Source: Authors' elaboration.

## Annex 1. Participants in the Markets and Trade Workshop

**Table 23.** Participants in the markets and trade workshop

<b>Name</b>	<b>Affiliation (at the time of the workshop)</b>
Samuel Beausejour	WFP/VAM
Jean Robert Brutus	Ministère des Affaires Sociales et du Travail
Elizaire Pouagnel	CRS Monitoring, evaluation, and learning
Cèlestin Jean Ony	MARNDR, Statistics Department
Lacorne Cileus	Producer
Ketlene Durable	Retailer
Cameau A. Nozia	Nobigabel processing
Honoré de Bazac	Nobigabel processing
Yvette Marsan	Gerly Distribution
Michel Kenneth	Etoile du Nord SA
Jeliel Darius	Consultant
Boliscar Woodler	MARNDR
Jean Francois Jacob	Consultant
Kokou Amouzou	FAO
Jean Carrel Norceide	WFP/CNSA
Raynold Saint-Val	CNSA
Gerry Delphin	CNSA
Harmel Cazeau	CNSA

Source: FEWS NET (2017).

## Annex 2. Conversion Factors to Cereal Equivalent

**Table 24.** Conversion factors to maize equivalent

Commodity	MET Conversion Factor
Rice (paddy)	1.09
Maize	1
Sorghum	0.94
Wheat	0.93
Dry beans	1.02
Peanuts	1.54
Congo peas	1.02
Potatoes	0.21
Sweet potatoes	0.32
Cassava	0.39
Yams	0.28

Source: Reproduced from Baquedano (2016).

## Annex 3. Market Integration

### Introduction

As indicated in Chapter 1, food supply in Haiti is ensured through domestic production and imports from the world market. While Haiti can be considered as self-sufficient in staples such as maize, sorghum, tubers, and plantains, it is structurally deficit on rice and pulses. For rice, the main cereal consumed in the country, imports accounted for over 80 percent of total supply in the 2011–2016 period. About 81 percent of rice imports are sourced from the United States (Section 3.2). Port-au-Prince and Cap Haitien are the main ports of entry for rice imports (Section 3.3).

Despite the widespread production of beans/peas in the country, Haiti still requires imports to fill about half of the domestic requirements. Beans (dry) are the most consumed and produced pulses and black beans are the preferred type. Dominican Republic and the United States are the main trading partners, accounting for 46 percent and 40 percent, respectively of pulses imports in Haiti between 2011 and 2015 (Sections 7.1 and 7.2). Port-au-Prince is the main port of entry of imported beans. However, smaller importers operate in other locations (Cap Haitien, Miragoâne, Saint Marc) and along the Dominican Republic/Haitian border, where unquantified informal imports also take place (Section 7.3).

### Methodology and data

Market integration for imported rice and black beans was assessed using a single equation Generalized Error Correction Model (GECM) as described in Baquedano, Leifert, and Shapouri (2011). Readers should refer to this source for full technical details and explanations. The analysis follows previous analysis presented for Haiti in Baquedano (2016). Monthly price data from 2010 to 2017 was incorporated into the analysis. The price series used are presented in **Table 25**.

**Table 25.** Data used for market integration analyses

Commodity	Data series (monthly)
Rice	<ul style="list-style-type: none"> <li>Retail price in Port-au-Prince (HTG/MT)</li> <li>Retail price in Cap Haitien (HTG/MT)</li> <li>Export rice price in Gulf of Mexico, United States (USD/MT)</li> </ul>
Black beans	<ul style="list-style-type: none"> <li>Retail price in Port-au-Prince (HTG/MT)</li> <li>Retail price in Cap Haitien (HTG/MT)</li> <li>Wholesale price in Santo Domingo, Dominican Republic (DOP/MT)</li> <li>Export rice price in Michigan, United States (USD/MT)</li> </ul>

Note: All prices were standardized to the metric ton as unit of measurement, converted to real prices and expressed in natural logarithmic terms for the analysis. For the Dominican Republic, the data was available for the 2010-2016 period.

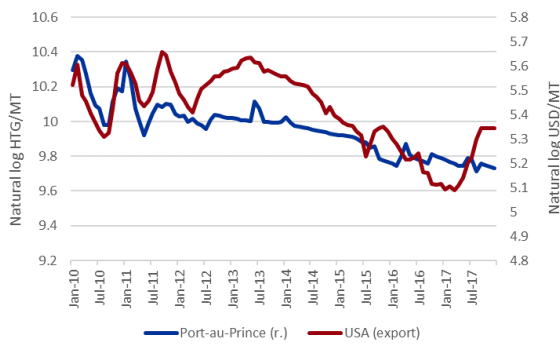
The GECM model builds from a basic price transmission model, which is expanded to accommodate differences in currencies between the trading partners and nonstationarity issues in the series. The model allows the identification of short- and long-run adjustments of the domestic prices to changes observed in the exchange rate and the world prices. Markets are integrated when their prices tend to move together in the long run, in spite of short run deviations that may occur.

### Results

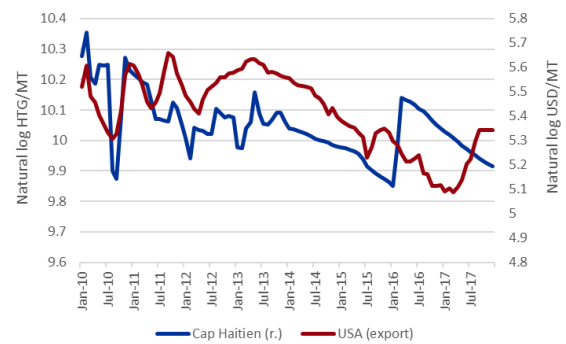
**Figure 82** to **Figure 84** show the domestic and world prices of rice and black beans, for Haiti and its main trade partners. Rice prices in Port-au-Prince and Cap Haitien follow the general trend observed in the United States' rice export prices. For black beans, prices in Port-au-Prince follow closely the trend observed in the Dominican Republic, however appear to counter the behavior of prices in the United States. In Cap Haitien, black bean prices follow less closely prices in Santo Domingo and do not show either a correspondence with Michigan prices. As shown in Section 7.4, prices in Cap Haitien differ slightly from prices in other markets in the country, suggesting different price dynamics in this market.

**Figure 82. Rice price in selected markets in Haiti and the United States, 2010 - 2017**

**Port-au-Prince vs Gulf of Mexico**



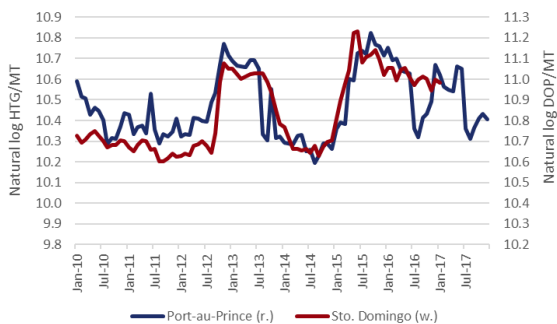
**Cap Haitien vs Gulf of Mexico**



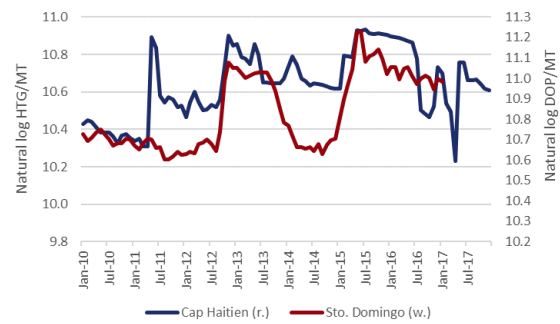
Source: Authors' calculations based on data from CNSA and FEWS NET (2017) and FAO (2017).

**Figure 83. Black beans price in selected markets in Haiti and the United States, 2010 - 2017**

**Port-au-Prince vs Santo Domingo**



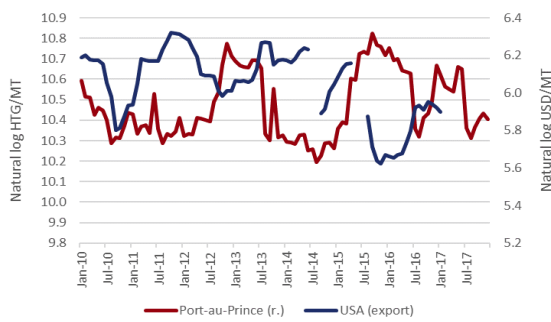
**Cap Haitien vs Santo Domingo**



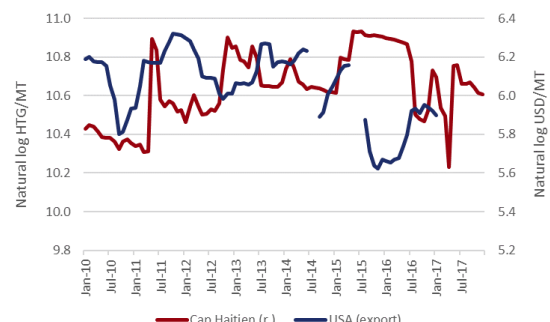
Source: Authors' calculations based on data from CNSA and FEWS NET (2017) and EAAPDEA (2017).

**Figure 84. Black beans price in selected markets in Haiti and the Dominican Republic, 2010 - 2017**

**Port-au-Prince vs Michigan**



**Cap Haitien vs Michigan**



Source: Authors' calculations based on data from CNSA and FEWS NET (2017) and USDA (2018).

Based on the previous results, only the Port-au-Prince/Gulf of Mexico rice price series and the Port-au-Prince/Santo Domingo black beans price series were maintained in further integration analyses.

Stationarity was assessed using the Augmented Dickey-Fuller general least squares (ADF-GLS) and the Philips-Perron tests. These tests provide information on whether the distribution of series analyzed depends, among others, on time (i.e., the series are nonstationary). The null hypothesis is that variables have a unit root (are nonstationary). Tests were carried out in the level variable, and with and without a linear trend. Overall, the null hypothesis could not be rejected.

Next, two GECM equations were estimated. Equation 1 assesses price transmission from world to domestic prices both expressed in local currency. The equation is built using Port-au-Prince retail prices and border prices (world prices expressed in local currency), and includes lagged terms of both variables. Equation 2 separates the effects of the exchange rate and explores transmission of world prices in foreign currency to domestic prices. The equation is built using Port-au-Prince retail prices, the exchange rate, the world prices expressed in their original (foreign) currency, and lagged terms of these variables.



The results indicate that prices between Port-au-Prince and the United States (rice) and the Dominican Republic (beans) are integrated. However, the speed of adjustment of Port-au-Prince prices to their long-term relationship with the border prices is faster for black beans than for rice. It takes about 2.5 months for black beans retail prices in Port-au-Prince to adjust halfway to their long-term equilibrium relationship with border prices, after a 1 percent change in border prices. For rice, it takes about 5 months for retail rice prices in Port-au-Prince to adjust halfway to their long-term equilibrium relationship with border prices after a 1 percent change on them.

With respect to intra-country dynamics, as Section 3.4 and Section 7.4 showed, rice and black beans prices display a similar behavior across markets (**Figure 25** and **Figure 57**, respectively).

## References

- ACDI/VOCA. 2010. "Emergency Market Mapping and Analysis: The Market for Beans in Sud-Est Department of Haiti." MicroREPORT 164. Sud-Est, Haiti: USAID.
- Administration Générale des Douanes. 2017. "Administration Générale Des Douanes (AGD)." 2017. <http://www.douane.gouv.ht/>.
- Arlequin Food Products. 2017. "Arlequin Food Products." Port-au-Prince, Haiti. <http://arlequinfood.com/products.html>.
- Banque de la République d'Haïti. 2017. "Indicateurs Macroéconomiques | Secteur Réel." 2017. [http://www.brh.net/secteur\\_reel.html](http://www.brh.net/secteur_reel.html).
- Baquedano, Felix. 2016. "FAO/GIEWS Food Availability and Market Assessment Mission to Haiti." Special Report.
- Baquedano, Felix, William Leifert, and Shahlá Shapouri. 2011. "World Market Integration for Export and Food Crops in Developing Countries: A Case Study for Mali and Nicaragua" 42: 610–30.
- Bayard, Budry. 2007. "La Filière Riz En Haiti. Diagnostic Global et Perspectives." Port-au-Prince, Haiti: Association Nationale Des Agro-Professionnels Haitiens (ANDAH).
- CFI. 2016. "Trade Flows Between Haiti and the Dominican Republic. Opportunities for Increasing Haitian Production." Port-au-Prince, Haiti: Centre de Facilitation des Investissements.
- CJ Consultants. 2012. "Haïti: Étude de La Filière Banane." Rapport de Consultation. Port-au-Prince, Haiti: IICA.
- CNSA. 2013. "Évaluation Prévisionnelle de La Performance Des Recoltes de La Campagne Agricole de Printemps 2013." Port-au-Prince, Haiti: MARNDR.
- . 2014. "Évaluation Prévisionnelle de La Performance Des Récoltes de La Campagne Agricole de Printemps 2014." Port-au-Prince, Haiti: MARNDR.
- . 2016. "Panier Alimentaire et Conditions de Sécurité Alimentaire." Bulletin # 15. Port-au-Prince, Haiti.
- CNSA, and FEWS NET. 2017. "Retail Prices in Haiti." Port-au-Prince, Haiti.
- CNSA, and WFP. 2011. "Enquête d'Évaluation de La Performance de La Campagne de Printemps 2011 et Analyse Des Marchés et de La Sécurité Alimentaire." Port-au-Prince, Haiti: Coordination Nationale de Sécurité Alimentaire.
- Cochrane, Nancy, Nathan Childs, and Stacey Rosen. 2016. "Haiti's U.S. Rice Imports." ERS USDA.
- COMTRADE. 2017. "UN COMTRADE Database."
- Des Fontaines, D. Halley. 2012. "Analyse de La Filière Maïs En Haïti et Appui Au Positionnement Des OP." Rapport Provisoire. Paris, France: IRAM / BID.
- DQCSPAP. 2016. "Liste d'Importateurs Registrées." Liste. Direction de la Quarantaine et du Contrôle Sanitaire des Produits Agricoles et de Pêche. [http://www.agriculturequarantaine.gouv.ht/css/php/menuhorizontal/base\\_de\\_donnees\\_internes/Permis\\_delivre\\_par\\_produit\\_simple.php?produit=Farine+de+Bl%C3%A9](http://www.agriculturequarantaine.gouv.ht/css/php/menuhorizontal/base_de_donnees_internes/Permis_delivre_par_produit_simple.php?produit=Farine+de+Bl%C3%A9).
- Ducasse, Joel. 2002. "Haïti: Suivi à La Table Ronde Sur Le Commerce - Phase Pilote Du Cadre Intégré. Le Secteur Des Mangues et Autres Fruits/Légumes." Projet GLO/02/GO3.
- EAAPDEA. 2017. "Wholesale Rice (5% Broken) and Black Bean Prices in Mercado Nuevo." Dominican Republic.
- FAO. 2015a. "State of Food Insecurity in the CARICOM Caribbean. Meeting the 2015 Hunger Targets: Taking Stock of Uneven Progress." Bridgetown, Barbados: FAO Subregional Office for the Caribbean.
- . 2015b. "Food and Nutrition Security in Haiti." Issue Brief 14. FAO Subregional Office for the Caribbean.
- . 2016. "Food Balance Sheet." FAOSTAT. <http://www.fao.org/faostat/en/#data/FBS>.
- . 2017. "International Prices: Rice." Rome, Italy.
- FAO, and WFP. 2010. "Mission FAO/PAM d'Évaluation de La Recolte et de La Sécurité Alimentaire En Haïti." Rapport Special. Rome: FAO, WFP.
- FAO/GIEWS. 2017. "FAO GIEWS Food Price Monitoring and Analysis Tool (FPMA)." 2017. <http://www.fao.org/giews/food-prices/tool/public/#/home>.
- FEWS NET. 2005. "Livelihood Profiles in Haiti." Washington, DC: USAID.
- . 2014. "Famine Early Warning Systems Network." FEWS NET. 2014. <http://www.fews.net>.
- . 2017. "Market Fundamentals Workshop Proceedings." Port-au-Prince, Haiti.
- FEWS NET, and CNSA. 2017. "Haiti Field Assessment." Haiti: FEWS NET.
- FEWS NET, Oxfam, GVC, and CNSA. 2015. "Haiti Rural Livelihood Profiles." USAID.
- Fintrac. 2013. "Haiti USAID-BEST Analysis." Washington, DC.
- Foreign Agricultural Service/USDA. 2017. "Haiti: Commodity Intelligence Report." January 27, 2017. <https://pecad.fas.usda.gov/highlights/2017/01/haiti/index.htm>.

- Gouvernement de la République d'Haïti. 2012. "Plan Stratégique de Développement d'Haïti. Pays Émergent En 2030." Port-au-Prince, Haiti.
- Government of Haiti. 2014. "Haiti, Facing Risks Together. Achievements in Disaster Risk Management Since 2010." Port-au-Prince, Haiti: UNDP Haiti.
- Guha-Sapir, D., R. Below, and Ph. Hoyois. 2016. "EM-DAT: The CRED/OFDA International Disaster Database." Brussels, Belgium: Université Catholique de Louvain. [www.emdat.be](http://www.emdat.be).
- Huileries Haïtiennes S.A. 2017. "Huileries Haïtiennes Products." Port-au-Prince, Haïti. <http://huilerieshaitiennes.com/house-brands/>.
- IHSI. 2015a. "Les Comptes Economiques En 2015." Port-au-Prince, Haïti: Institut Haïtien de Statistique et d'Informatique (IHSI).
- . 2015b. "Population Totale, de 18 Ans et Plus. Ménages et Densités Estimées En 2015." Port-au-Prince, Haïti: Institute Haitien de Statistique et d'Informatique.
- International Rescue Committee, American Red Cross, Haitian Red Cross, International Federation of the Red Cross, Save the Children, Mercy Corps, Oxfam GB, ACDI/VOCA, World Food Program, and FEWS NET. 2010. "The Market System for Beans in Haiti." EMMA Report. Port-au-Prince, Haiti.
- Jean-Pierre, Stephan, Helene Kiremidijan, and Junior Paul. 2013. "USAID/HAITI. Etude Initiale Des Cinq Filieres Prioritaires." Washington, DC: USAID.
- Johnson Williams, Vereda. 2011. "A Case Study of Desertification in Haiti." *Journal of Sustainable Development* 4 (3).
- Latino, Lucia, and Ilaria Musumeci. 2016. "Market Analysis. Haiti." Rome, Italy: WFP.
- Leclerc, Elise, Gael Pressoir, and Serge Braconnier. 2014. "L'Avenir Prometteur Du Sorgho Sucré En Haïti." *Field Actions Science Reports, FACTS Reports*, no. 9. <http://factsreports.revues.org/2801>.
- Levesque, Annaïg. 2014. "Le Sorgho Sucré. Une Plante Aux Multiples Valorisations Sources d'Innovation En Haïti." Mémoire de Fin d'Étude.
- Logistics Cluster Unit Haiti. 2012. "Logistics Capacity Assessment Haiti."
- MARNDR. 2012a. "Atlas Agricole d'Haïti." 2012. [http://agriculture.gouv.ht/statistiques\\_agricoles/Atlas/preface.html](http://agriculture.gouv.ht/statistiques_agricoles/Atlas/preface.html).
- . 2012b. "Synthese Nationale Des Resultats Du Recensement General de l'Agriculture (RGA) 2008/2009." Port-au-Prince, Haïti: MARNDR.
- . 2013a. "Programme Triennal de Relance Agricole 2013-2016." Port-au-Prince, Haïti: MARNDR.
- . 2013b. "Estado, Prioridades y Necesidad Para El Manejo Sostenible de Suelos En Haiti. Taller de Lanzamiento de La Alianza Mundial Por El Suelo: Hacia La Prevención y Restauración de Suelos Degradados En Centro América y El Caribe." Havana, Cuba, Octubre 30.
- . 2014. "Resultats Des Enquetes Nationales de La Production Agricole. Année 2014." Port-au-Prince, Haïti: Unite d'Etude et de Programmation.
- . 2015. "Situation de La Filière Riz 2014-2015." Port-au-Prince, Haïti: MARNDR.
- . 2017. "Agricultural Production Data 2014 - 2016."
- MIC, and PNUD Haiti. 2014. "Produits Typiques d'Haïti. Les Potentialites Economiques." Port-au-Prince, Haïti: Ministère du Commerce et de l'Industrie.
- Ministère du Commerce et de l'Industrie. n.d. "Interdiction de l'Importation de La Farine Dominicaine En Haïti." Micgouv. Accessed July 18, 2017. [http://www.mci.gouv.ht/index.php?option=com\\_content&view=article&id=324:farine&catid=1:nouveautes&Itemid=227&lang=en](http://www.mci.gouv.ht/index.php?option=com_content&view=article&id=324:farine&catid=1:nouveautes&Itemid=227&lang=en).
- MIT Media Lab Macro Connections. n.d. "OEC: The Observatory of Economic Complexity. Haiti." Accessed July 24, 2017. <http://atlas.media.mit.edu/en/>.
- Molnar, Joseph J., Kokoye Senakpon, Jolly Curtis, A. Shannon Dennis, and Huluka Gobena. 2015. "Agricultural Development in Northern Haiti: Mechanisms and Means for Moving Key Crops Forward in a Changing Climate." *Journal of Agriculture and Environmental Sciences* 4 (2): 25–41.
- NASA. 2014. "Shuttle Radar Topography Mission." <https://www2.jpl.nasa.gov/srtm/>.
- OCHA. 2017. "Haiti: Humanitarian Snapshot."
- OpenStreetMap. 2017. "OpenStreetMap." <https://www.openstreetmap.org/copyright>.
- Overseas Security Advisory Council (OSAC). 2016. "Haiti 2016 Crime and Safety Report." Washington, D.C.: US Department of State.
- PAPYRUS. 2016. "Smallholders Alliance for Sorghum in Haiti (SMASH). Project Description."
- Pop, Georgiana. 2016. "Haiti - Let's Talk Competition. A Brief Review of Market Conditions." Background paper. Washington, DC: The World Bank.

- RTI. 2014. "Value Chain Assessment. Annex 3. Agribusiness Sector Assessment. Local Enterprise and Value Chain Enhancement (LEVE) Project." USAID.
- Schwartz, Timothy. 2015. "Food Distribution, Production, and Consumption in Haiti. Part II." Research Report.
- SIMA. 2017. "Rapport Des Prix 2012 - 2016." Port-au-Prince, Haiti. Système d'Information sur les Marchés Agricoles, MARNDR.
- SIMA/MARNDR. 2017. "Rapports Prix Marchés | Unité de Statistique Agricole et Informatique." Ministère de l'Agriculture, Des Ressources Naturelles et Du Développement Rural. 2017. [http://agriculture.gouv.ht/statistiques\\_agricoles/?p=9527](http://agriculture.gouv.ht/statistiques_agricoles/?p=9527).
- Singh, Raju Jan, and Mary Barton-Dock. 2015. "Haiti: Towards a New Narrative. Systematic Country Diagnostic." 99448. Washington, D.C.: The World Bank.
- UNDP. 2015. "Human Development Report 2015. Work for Human Development. Haiti Briefing Note." Briefing note. New York, NY: United Nations Development Programme.
- USAID Haiti. 2016. "Education. Fact Sheet."
- . 2017. "Economic Growth & Agricultural Development. Fact Sheet."
- USDA. 2018. "Black Bean Export Prices."
- USGS. n.d. "Global Land Cover." The USGS Land Cover Institute (LCI). Accessed September 20, 2017. <https://landcover.usgs.gov/globallandcover.php>.
- USGS/EROS. 2016. "Haiti Historical Average Rainfall 2000 - 2014."
- Van Vliet, Geert, Gael Pressoir, Marzin Jacques, and Giordano Thierry. 2016. "Une Étude Exhaustive et Stratégique Du Secteur Agricole/Rural Haïtien et Des Investissements Publics Requis Pour Son Développement." Montpellier, France: CIRAD.
- Vernier, Philippe. 2005. "Appui Au Système National Semencier Pour La Production d'Igname. Haïti." Rapport de Mission. Montpellier, France: CIRAD.
- WFP. 2017. "UN WFP VAM: Monthly Price Data Analysis." 2017. <http://foodprices.vam.wfp.org/Analysis-Monthly-Price-DataADV.aspx>.
- WHO. 2015. "Haiti: WHO Statistical Profile." Geneva: World Health Organization.
- World Bank. 2014. "Financial Inclusion Data / Global Findex." 2014. <http://datatopics.worldbank.org/financialinclusion/>.
- . 2016. "World Bank Development Indicators." <http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>.
- . 2017. "World Bank Commodities Price Data (the Pink Sheet)." <http://www.worldbank.org/en/research/commodity-markets>.
- WTO. 2016. "WTO Integrated Database (IDB)." World Trade Organization. <http://tariffdata.wto.org/ReportersAndProducts.aspx>.