

OXFAM AMERICA
RESEARCH BACKGROUNDER

The Rice Value Chain in Haiti

Policy proposal

Carlos Furche

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Author information and acknowledgments

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EXECUTIVE SUMMARY

Once a special food consumed on Sunday, rice has become the main staple of the Haitian diet, especially among low-income people. Imported rice accounts for the vast bulk (83 percent) of consumption. Current imports total some 380,000 tons annually, at a cost of \$200 million a year. The irrigated Artibonite Valley region is, by far, the main rice production area in Haiti, accounting for up to 80 percent of national production.

In light of these figures, it is clear that any discussion of food security in Haiti must address the supply side of rice. A substantial increase in local production is needed to reduce dependence on external supplies, particularly given high and volatile international prices, and to improve the incomes of local producers, especially smallholder farmers.

The Haitian rice economy is directly linked to international markets. Most projections suggest that global prices will remain high and volatile for the foreseeable future. In addition, international rice markets remain distorted by high levels of subsidies in some producer countries, notably the United States. The latter country is the fifth-largest exporter globally, but accounts for the lion's share of Haiti's imports. Heavy dependence on imports leaves Haiti vulnerable to price spikes, which are leading to discontent similar to that experienced in 2008, when food price riots led to the collapse of the government of Prime Minister Jacques Edouard Alexis.

Macroeconomic factors have created a significant price advantage for imported rice in the Haitian market. In particular, Haiti reduced its tariff on foreign rice from 50 percent to 3 percent in 1995, and the local currency, the Haitian gourde, has appreciated vis-à-vis the US dollar. In addition, a small number of politically influential importers dominate the market.

It would, however, be a mistake to assume that mere changes in these macroeconomic factors alone could stimulate a rapid response in local production that would replace imports. An analysis of Haiti's rice value chain indicates a number of serious deficiencies:

- Limited irrigation infrastructure and poor maintenance of the existing infrastructure;
- Additional problems with regard to soil and water conservation;
- Limited government support for production, particularly with regard to research and extension, with inadequate financial and human resources provided to the Ministry of Agriculture's Artibonite Valley Development Agency (ODVA);

- Difficult access to credit for most producers;
- Insufficient use of improved seeds and fertilizers (whether mineral or organic), and low adoption of technologies for planting preparation and crop management, as well as water and soil management; and
- Production on a very small scale, with an average holding of less than one hectare (a hectare is equal to 2.47 acres), on land with precarious property rights, and a tendency to subdivision and fragmentation (owing to the absence of employment alternatives for the younger generations), making it difficult for farmers to adopt improved management technologies or to mechanize some productive processes.

As a result of these factors, yields have stagnated at the level of two tons per hectare (about half of the international average) for more than 20 years.

The inefficiencies at the level of primary production are reproduced in the subsequent links of the value chain. In particular, there is a great lack of infrastructure for drying and milling, which causes enormous post-harvest losses that are absorbed entirely by the producers themselves.

At the same time, Haiti lacks the tools and frameworks to manage trade appropriately. These would include price stabilization mechanisms and a regulatory framework to differentiate imported rice according to specific characteristics of quality and price.

As a result of these deficiencies and limitations, there is no magic policy bullet that in isolation would drastically improve rice production in Haiti. The depth and extent of the problems require the formulation of policies, adoption of policy tools, and resource allocation for the medium and long term. Better and more efficient coordination mechanisms between the production and processing levels are essential. Current international prices and the medium-term projections provide better conditions than in previous years for the formulation and implementation of a comprehensive policy for Haiti's rice sector.

The dogged persistence of a significant number of small-scale rice producers, who have resisted the adverse conditions resulting from the sharp tariff liberalization and unfavorable conditions of the international markets in earlier years, exhibits a resilience and adaptive capacity that should form the basis for the modernization process. The existence of long-standing producer organizations may also be the basis for brokering support services, improved technology, and installation of processing and management capabilities.

Based on this analysis, a proposed national policy for Haiti's rice sector focuses on four key areas:

- A program to strengthen infrastructure to improve irrigation and drainage systems;
- Policies to support primary production, with special priority given to dissemination and adoption of technological packages that have a high potential impact on production and productivity, with time-bound subsidies provided to small-scale farmers to facilitate their adoption of the package;
- Policies to improve coordination along the value chain; and
- Policies to address international price instability and short-term price fluctuations.

Econometric analysis examines the impacts of different policy options and instruments on both producers and consumers, particularly with regard to:

- Changes in yields and production at the farm level
- Changes in tariff levels and increments in import costs
- Changes in international prices

The analysis finds that Improvements in productivity, based on increased yields per hectare, are the best option by far, creating a greater and faster impact on producers' incomes. A set of policy tools is needed to create a rapid and significant increase in productivity.

These tools would need to be bolstered by adoption of a price stabilization system, inspired by or similar to the mechanism applied in numerous countries for rice and other agricultural commodities, in order to manage likely short-term price fluctuations. Price stabilization would involve ensuring that imported rice sells at a minimum entry price, with a variable tariff that rises when the price of imports falls below the minimum level. In light of social and political concerns, this kind of policy appears more feasible than a major increase in the tariff level. Moreover, an increased tariff does not have a high impact on either producer or consumer prices.

Adequate technical and financial assistance from donors will be essential to ensure the success of this policy proposal.

INTRODUCTION

Oxfam America has established a program to assist small farmers in Haiti's Artibonite Valley. This region is, by far, the main rice production area in the country, accounting for up to 80 percent of national production. Oxfam America commissioned this study to encourage discussion among public and private actors about a national policy for Haiti's rice sector.

The paper is based on a literature review and field research in Haiti (which took place in May 2012), including interviews with government officials, Haitian agricultural development professionals, experts on the agricultural sector, farmers and other actors in the rice value chain, and staff of nongovernmental organizations (NGOs) working in the Artibonite Valley. The author also carried out econometric modeling to support the policy proposal presented in the paper.

In the text, where no secondary source is cited, findings are based on the interviews that the author conducted during the course of the research.

The paper is organized as follows:

- Analysis of the international rice market, including trends and projections for production, consumption, trade, and prices, with a view to understanding how global market conditions should be taken into consideration when defining a national rice strategy in Haiti.
- Description of Haiti's rice value chain, including analysis of relevant macroeconomic factors, such as the tariff reduction implemented in the mid-1990s and the appreciation of the Haitian gourde in relation to the US dollar, in order to explain Haitian rice consumption, imports, and production.
- Presentation of key facts and figures characterizing the organization of the value chain, as well as the principal factors behind the stagnation of rice production during the past few decades.

On the basis of this discussion, the author then presents a proposed policy for Haiti's rice sector, with interventions in four key areas:

- A program to strengthen infrastructure to improve irrigation and drainage systems;
- Policies to support primary production, with special priority given to dissemination and adoption of technological packages that have a high potential impact on production and productivity, with time-bound subsidies provided to small-scale farmers to facilitate their adoption of the package;
- Policies to improve coordination along the value chain; and

- Policies to address international price instability and short-term price fluctuations.

The econometric analysis examines the impacts of different policy options and instruments on both producers and consumers, particularly with regard to changes in yields and production at the farm level, changes in tariff levels and increments in import costs, and changes in international prices.

This study concludes that improvements in productivity, as a result of increased yields per hectare, offer the best policy option, as they will create greater and faster impacts on producers' income. Given global market conditions, a price stabilization mechanism is a necessary tool to enhance the viability of the policies of technological modernization and increased productivity. Adequate technical and financial assistance from donors will be essential to ensure the success of this policy proposal.

INTERNATIONAL RICE MARKET

As a consequence of the high degree of openness of the Haitian economy, the economic performance of its main production chains, such as rice, is directly related to the tendencies and evolution of international markets.

Severe distortions impinge on global agricultural markets, mainly as a result of the subsidies and support that industrialized countries provide to their own farmers, as is the case in the United States and the European Union. Furthermore, some industrialized countries, notably Japan, apply high rates of tariff protection to sensitive products such as rice.¹

Of course, the evolution of the international rice market is not different from that of other agricultural commodities, particularly other cereals, for which there is a partial substitution effect with regard both to the use of land and to consumption, as seen with wheat and, to a lesser extent, corn.

International organizations and academic institutions agree that in the coming years, basic food prices will remain at higher levels than those seen during 1960–2006;² in addition, it is anticipated that short-term instability and volatility will persist in global agricultural markets, owing to a set of structural factors that will remain present for the foreseeable future. Among the factors affecting price levels and agricultural market volatility are the following:³

1. Steadily rising demand in emerging Asian, African, and Latin American countries, as a result of population growth, rapid urbanization, and increasing income levels that impact on aggregate food demand.
2. Climate change and its effects on agricultural production, as seen in the increased frequency of extreme climatic events, such as droughts or floods, which regularly affect agricultural production in various parts of the world.
3. The steady increase in biofuel production, causing the diversion of certain crops from food and feed uses into ethanol and biodiesel. Biofuel production

1. Government transfers to the US rice sector reached \$400 million in 2010; see Marc J. Cohen, "Diri Nasyonal ou Dirir Miami? Food, Agriculture, and US-Haiti Relations" (paper presented at the 2012 Convention of the International Studies Association, San Diego, CA, April 2012). Meanwhile, the tariff on imported rice in Japan can reach as high as 1,000 percent.

2. Eugenio Diaz-Bonilla and Juan Francisco Ron, "Food Security, Price Volatility and Trade: Some Reflections for Developing Countries," ICTSD Issue Paper 28 (Geneva: International Centre for Trade and Sustainable Development [ICTSD], 2010). The authors note that expected food production and trade continue to be affected by both long-term trends, which point to an increase in the price level or at least to the maintenance of current levels, and short-term cycles, which will likely show high volatility and instability arising from various structural factors, such as those discussed later in this report.

3. Shenggen Fan, "Overview: Major Food Policy Developments in 2011," in *2011 Global Food Policy Report*, ed. Shenggen Fan et al. (Washington, DC: International Food Policy Research Institute [IFPRI], 2012), pp. 1–10.

also affects the price of some agricultural commodities such as sugar and especially corn.⁴

4. Economic instability, especially in industrialized countries, that, among other things, leads to high exchange rate variability, especially for the US dollar and the euro, which directly impacts the nominal level of prices of agricultural and nonagricultural commodities.
5. An increase in speculative pressures in the futures markets for food commodities traded globally.
6. The persistence of agricultural policies in industrialized countries that favor subsidies and domestic support to producers; these policies have traditionally contributed substantially to market instability.

Moreover, a recent publication of the Organisation for Economic Co-operation and Development (OECD) and the Food and Agriculture Organization of the United Nations (FAO)⁵ adds that among the factors that will influence price levels is global food production growth of less than 2 percent annually, reflecting only modest increases in yields and productivity. This low level of growth will reduce stock levels for grains and other staple foods.

These general characteristics of global agricultural markets apply fully to the world rice market. Another peculiar feature of the international rice trade is its thinness: the volumes traded represent a very small proportion of world production, precisely because in many countries, rice is an essential part of the population's diet, and therefore its local production is considered an essential element of national food security strategies.

RICE PRODUCTION AND WORLD MARKETING: PROJECTIONS

According to the US Department of Agriculture (USDA), nearly 39 million tons of rice were traded in international markets in 2012; this is above the figure of 30 million tons annually, which held steady from 2005 to 2011.⁶

4. According to recent figures, nearly 40 percent of US corn production goes to produce biofuel, which explains the current price level and directly affects the price of other cereals. See Maximo Torrero, "Food Prices: Riding the Rollercoaster," in *2011 Global Food Policy Report*, ed. Shenggen Fan et al. (Washington, DC: IFPRI, 2012), pp. 15–24.

5. Organisation for Economic Co-operation and Development (OECD) and Food and Agriculture Organization of the United Nations (FAO), summary of *OECD-FAO Agricultural Outlook 2011–2020* (Paris: OECD Publishing/Rome: FAO, 2011).

6. US Department of Agriculture/Foreign Agriculture Service (USDA/FAS), *Grain: World Markets and Trade* (Washington, DC: USDA/FAS, 2012).

Meanwhile, global production in 2012–2013, according to the World Bank’s forecast, will reach 732 million tons of paddy (unmilled) rice,⁷ with a planted area of 165.1 million hectares, and an overall yield of 4.4 tons per hectare. FAO reports that no significant changes are expected in these numbers over the short term. These figures show that the volume of rice traded on international markets is less than 5 percent of world production, compared with 21 percent for wheat and 11 percent for coarse grains.⁸

The thinness of the global rice market no doubt contributes to price instability, because a small number of surplus-producing countries dominate. Still, as shown in Table 1, both the area planted and the global production of rice experienced a gradual increase over the past 10 years. In 2000, 399.4 million milled tons were produced, compared with 457.9 million milled tons in 2012, representing output growth of approximately 2 percent annually, which is consistent with stagnation of yields at four tons per hectare.

At the same time, the volume of rice traded in international markets rose at a faster rate than production, growing 5 percent annually, from 24 million tons to just over 32 million tons.

Another remarkable aspect of the world rice market is the significant decrease in stocks, which in 2000 accounted for 37 percent of annual consumption. By 2010, this figure had fallen to 21 percent. This decrease is consistent with the international rice market having expanded faster than production.

Moreover, an analysis of projections of world cereal production by OECD and FAO (see Figure 1) appears to confirm, in the case of rice, reduced growth rates, estimating global production of 528 million tons of milled rice in 2020, or a little more than 10 percent above current production of 477 million tons.

7. Reported in *FAO Rice Market Monitor* 15, no. 2 (April 2012).

8. FAO, *FAO Cereal Supply and Demand Brief*, October 4, 2012 (Rome: FAO).

Table 1. Global rice production and use, 2000-2012

Year	Area harvested (million hectares)	Yield (metric tons per hectare) ^a	Rough production (million metric tons)	Milled production (million metric tons)	Exports (million metric tons) ^{b,c}	Total use (million metric tons) ^{b,d}	Ending stocks (million metric tons) ^{b,e}	Stock/use ratio ^f
2000-01	152.4	3.9	594.3	399.4	24.4	395.8	146.7	37.1
2001-02	151.4	3.9	594.7	399.7	27.8	413.5	132.9	32.1
2002-03	146.9	3.8	563.5	378.5	27.5	408.4	102.9	25.2
2003-04	149.3	3.9	585.4	392.5	27.3	413.9	81.5	19.7
2004-05	151.8	3.9	597.0	401.2	29.0	408.7	74.0	18.1
2005-06	153.8	4.0	622.9	418.2	29.1	415.6	76.6	18.4
2006-07	154.6	4.1	626.2	420.0	31.9	421.5	75.1	17.8
2007-08	155.3	4.2	645.4	432.7	29.8	427.8	80.0	18.7
2008-09	157.9	4.2	669.2	447.5	29.3	436.0	91.5	21.0
2009-10	156.0	4.2	658.8	440.1	31.6	437.7	93.9	21.4
2010-11	158.1	4.3	676.6	451.6	31.0	448.4	97.0	21.6
2011-12 ^g	159.9	4.3	685.5	466.2	39.1	459.4	105.5	23.0

Source: USDA/FAS, *Grain: World Markets and Trade*, May 2012 and March 2013.

a. Yields are based on rough production.

b. Stocks, exports, and utilization are expressed on a milled basis.

c. Exports are reported on a calendar year basis. For example, for 2005/06, exports are reported for calendar year 2006. Trade data exclude intra-European Union trade.

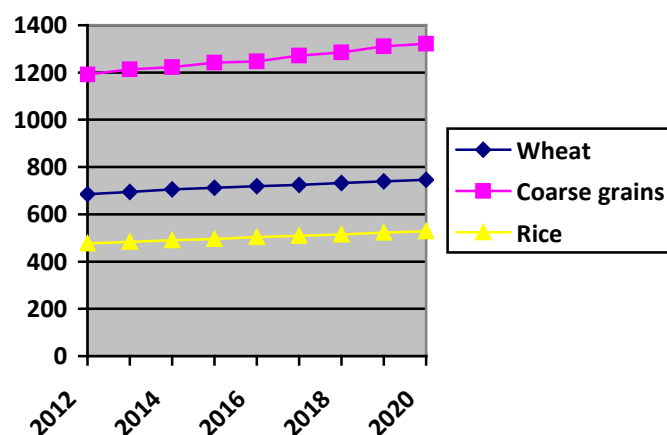
d. For countries for which stock data are not available, utilization estimates represent apparent utilization, i.e., they include annual stock level adjustments.

e. Stocks data are based on an aggregate of different market years, and should not be construed to represent world stock levels at a fixed point in time. Stocks data are not available for all countries.

f. Stocks-to-use represents the ratio of marketing year ending stocks to total utilization.

g. Area, yield, and rough production figures are estimates.

Figure 1. World cereal production forecast, 2012-2020 (millions of tons)



Source: OECD-FAO, *OECD-FAO Agricultural Outlook 2011-2020*.

INTERNATIONAL PRICES: TRENDS

As noted, the trends in rice prices are linked to the general characteristics of agricultural commodity markets, and have moved similarly to the prices of other grains such as wheat, oats, barley, and, to a lesser extent, corn.

The analysis of the developments in international rice prices shows a significant increase in 2008–2010, and later a fall, but without returning to the levels of the early 2000s (Table 2). As stated earlier, there is broad agreement that prices will remain high over the coming years, as a result of the structural factors that have exerted upward pressure.

It is also worth noting that there are no significant differences in rice prices in Thailand, the world's largest exporter, and in the United States, where rice costs 5 percent less but prices move in tandem with those of the main exporters. The United States is Haiti's key rice supplier, providing the overwhelming bulk of rice imports.

FAO has a price index differentiated by rice quality, which allows a more accurate analysis (Table 3). This index shows that the price of rice has more than doubled in the past 10 years, moving from an index of 100 in 2004 to 161 in 2007 and 250 in 2011. The big jump between 2007 and 2008 resulted in part from a vicious cycle: as prices started to rise, some surplus producers (such as India and Vietnam) initiated export embargoes, and major importers (e.g., the Philippines) made large panic purchases, with prices surging even higher as a

result.⁹ The index shows a fall in the prices for high-quality, aromatic, and japonica varieties; however, low-quality rice registered a 1.1 percent increase in prices, a decline from the 2008 peak, but still clearly above those of 2007 and earlier.

Table 2. International rice prices (US\$ per ton)

Year	Long grain (rough)	Long grain (milled)	Thai 5% (parboiled)	Thai 15% broken
2008	356	610	616	532
2009	316	506	544	472
2010	298	524	522	481
2011	338	559	588	574

Source: Author's calculations based on USDA/Economic Research Service (ERS), *Rice Outlook*, June 2012 (Washington, DC: USDA).

9. Derek Headey and Shenggen Fan, *Reflections on the Global Food Crisis: How Did It Happen? How Has It Hurt? And How Can We Prevent the Next One?* IFPRI Research Monograph 165 (Washington, DC: IFPRI, 2010).

Table 3. Rice price index, 2007-April 2012 (2002-2004=100)

Year	All	High quality Indica	Low quality Indica	Japonica	Aromatic
2007	161	156	159	168	157
2008	295	296	289	315	251
2009	253	229	197	341	232
2010	229	211	212	264	231
2011 (year)	251	237	250	274	227
April 2011	245	218	235	284	235
May	242	219	239	273	225
June	247	222	242	288	218
July	251	232	255	276	220
August	260	249	272	273	220
September	260	256	266	268	226
October	253	255	261	252	229
November	254	252	262	256	225
December	242	238	253	248	210
January 2012	235	221	238	252	215
February	229	223	239	230	214
March	235	229	242	242	214
April	234	227	242	244	204
Jan.-Apr. 2011	250	229	237	289	237
Jan.-Apr. 2012	233	225	240	242	212

% change Jan.-April 2011 to Jan.-Apr. 2012	-6.8	-2.0	1.1	-16.1	-10.7
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Source: FAO.

Note: The FAO Rice Price Index is based on 16 rice export quotations. "Quality" is defined by the percentage of broken kernels, with high (low) quality referring to rice with less (equal to or more) than 20 percent broken. The Sub-Index for Aromatic Rice follows movements in prices of basmati and fragrant rice.

MAIN RICE EXPORTERS

The main global rice exporters are located in Asia: Thailand, Vietnam, India, and Pakistan. Significant Western Hemisphere exporters include the United States, Argentina, Uruguay, and, more recently, Brazil.¹⁰

Nevertheless, rice exports are concentrated among a few countries. The top five exporters account for 80 percent of the total volume of milled rice in global trade, with Thailand alone shipping 32 percent. Vietnam accounts for 19.5 percent; Pakistan, 11.6 percent; the United States, 11.3 percent; and India, 8.9 percent (Table 4).¹¹ The United States is the largest exporter of paddy (unmilled rice), shipping 90 percent of the total, followed by Paraguay and Brazil, which account for 1 percent apiece.

Uruguay ranks seventh globally among rice exporters, with just over one million tons in annual shipments. Brazil has recently joined the group of countries that export more than one million tons yearly.¹² Yet, for Haiti, the main supplier by far is the United States, with small sales by Uruguay, Argentina, and, more recently, Brazil.

10. Importantly, recent reports indicate that Brazil for the first time exported more than one million tons of rice, which places it among the top eight exporters. Of that total, 66,000 tons were shipped to Haiti. See Oryza, "Brazil March–May 2012 Rice Exports Soar to Almost 557,000 Tons, Basis Paddy," *Oryza.com*, June 25, 2012, <http://oryza.com/Rice-News/15513.html><http://oryza.com/Rice-News/15513.html>.

11. Torrero, "Food Prices: Riding the Rollercoaster."

12. Oryza, "Brazil."

Table 4. Leading world rice exporters

Country	2008–10 exports (thousands of tons) ^a	Percentage of total global rice exports
Thailand	9.2	32.0
Vietnam	5.6	19.5
Pakistan	3.4	11.6
United States	3.2	11.3
India	2.6	8.9
All others	4.7	16.7
World	28.7	100.0

Source: Author's calculation, based on USDA/ERS, *Amber Waves*, December 2010 (Washington, DC: USDA).
Note: a. Average annual exports during the period.

INTERNATIONAL MARKET PROSPECTS AND SIGNIFICANCE FOR HAITI

This analysis of the international rice market offers some useful conclusions for formulating policies to develop Haiti's rice value chain:

1. There is a broad consensus that the prices of rice and other agricultural commodities will remain higher than in the early 2000s, probably at levels similar to current ones.
2. Nevertheless, numerous studies and analyses point to more-volatile global food prices, indicating a need for policy instruments that contribute to better risk management for prices and producers' incomes.
3. The projections of world rice production and trade show an evolution without major changes for the coming years, with moderate expansion of production and consumption and also increasing global trade, with rates comparable to those of recent years.

4. Projections are for Asian countries, especially Thailand, Vietnam, Pakistan, and India to remain the principal global suppliers of rice, with the United States and, increasingly, Brazil also having a significant presence. With respect to Haiti, given geographical proximity, lower transportation costs, and quality adapted to the preferences of its consumers, it appears that the United States will continue to be the main supplier, with a possible increase in the participation of Brazil and the neighboring Dominican Republic.

RICE VALUE CHAIN IN HAITI

PRODUCTION, CONSUMPTION, AND IMPORTS

According to recent figures, rice is the main food item imported by Haiti, and it is also the most important staple of the population’s diet. According to Haiti’s National Food Security Coordination Agency (CNSA),¹³ milled rice imports during 2010 reached 381,212 tons, while domestic milled rice production in 2011 was 77,551 tons. Total rice consumption in Haiti reaches a little less than 458,000 tons annually, with 83 percent imported, and just 17 percent produced domestically. As Table 5 indicates, Haiti’s import dependence shows a clear upward trend in recent years, owing to the stagnation of domestic production for more than two decades, with volumes of around 70,000 tons.¹⁴ It is clear that Haiti’s abrupt tariff reduction in the mid-1990s and its lack of public policies to support small-scale producers have contributed to this stagnation.

Table 5. Haitian rice imports, 2001–2010 (thousands of tons)^a

2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
305	345	269	328	300	292	320	300	399	381

Source: CNSA, based on USDA data.

a. Includes commercial imports and food aid.

Although there are imports of other cereals, mainly wheat and corn, rice purchases exhibit higher growth (Table 6).¹⁵

13. Information provided by Gary Pierre Mathieu, CNSA coordinator, during an interview in Port-au-Prince on May 24, 2012. CNSA is an agency of the Haitian Ministry of Agriculture, Natural Resources, and Rural Development (MARNDR).

14. Carlos G. Suarez and Nicolas Rubio, "Haiti: Rice Production and Trade Update," *USDA/FAS Global Agricultural Information Network (GAIN) Report*, November 2010, http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Rice%20Production%20and%20Trade%20Update_Santo%20Domingo_Haiti_11-9-2010.pdf.

15. Ibid. It is estimated that there was an increase in domestic production in 2010 resulting from the positive impact of fertilizer subsidies and better irrigation. This would bring local production to between 80,000 and 90,000 tons in 2011.

Table 6. Main Haitian food imports (2009)

Rank	Commodity	Quantity (tons)	Value (thousands of dollars)	Unit value (\$/ton)
1	Milled rice	297,935	174,961	587
2	Wheat	239,592	59,251	247
3	Palm oil	52,021	46,165	887
4	Soybean oil	45,025	44,000	977
5	Raw centrifugal sugar	95,776	42,137	440
6	Whole evaporated milk	23,638	33,108	1,401
7	Chicken meat	31,102	29,379	945
8	Miscellaneous prepared foods	2,308	23,502	10,183
9	Refined sugar	39,515	18,693	473
10	Prepared foods, flour, malt extract	21,116	14,116	668
11	Dry beans	23,304	13,953	599
12	Garlic	15,501	11,891	767
13	Macaroni	14,798	11,304`	764
14	Vegetable oil (type not specified)	7,828	10,000	1,277
15	Confectionary sugar	6,145	9,606	1,563
16	Husked rice	31,845	9,500	298
17	Corn flour	20,485	9,250	452
18	Tomato paste	7,962	8,676	1,090
19	Wheat flour	22,437	8,300	370
20	Whole dried milk	1,567	7,165	4,572

Source: FAO FAOSTAT database, <http://faostat.fao.org/?lang=en>.

The impact of imports on domestic production is compounded by the rapid increase in domestic consumption, reflecting both population growth and changes in consumption patterns, which have favored the consumption of rice as the cheapest source of carbohydrates.¹⁶

In recent years, the United States has accounted for most of Haiti's rice imports, with annual volumes of 300,000 tons.¹⁷ In 2010–2011, Haiti was the second-largest market for US rice exports (Table 7), purchasing 12 percent of the total; Haiti will likely remain one of the main importers in the near future.

Table 7. Top 10 markets for US long-grain milled rice exports

Rank	Country 2010-11	Exports 2010-11	Country 2009-10	Exports 2009-10	Country 2008-09	Exports 2008-09
1	Mexico	863.7	Mexico	843.9	Mexico	705.6
2	Haiti	310.0	Japan	361.4	Japan	335.6
3	Japan	305.1	Haiti	327.2	Haiti	275.9
4	Canada	227.6	Turkey	281.3	Venezuela	226.8
5	Turkey	200.7	Venezuela	243.7	Canada	217.8
6	Venezuela	147.3	Canada	227.5	Saudi Arabia	138.4
7	Honduras	135.7	Iraq	135.1	Costa Rica	126.9
8	Nicaragua	119.9	Honduras	125.4	Iraq	121.0
9	Saudi Arabia	117.5	Saudi Arabia	123.7	Honduras	115.1
10	Iraq	114.0	Nicaragua	113.0	Nicaragua	108.9
Total for top 10		2,541.5		2,782.2		2,372.0
Total exports		4,018.6		4,072.0		3,460.5

Source: Suarez and Rubio, "Haiti: Rice Production and Trade Update." USDA.

16. Ibid.

17. The United States provides approximately 85 percent of Haitian rice imports; see *ibid.*

HAITI RICE IMPORT OLIGOPOLY

With foreign rice accounting for more than 80 percent of the rice that Haitians consume, rice importing is a big and lucrative business in the country. Although approximately 20 import firms are active in six Haitian ports, six large importers that operate in Port-au-Prince play a dominant role, and have substantial power to set the price of imported rice. In 2010, these six companies handled 70 percent of Haiti's rice imports. Three of the six are considered to enjoy virtual control of the market.¹⁸

One of the big six importers is Tchako S.A., whose brand is among the most popular in Haiti.¹⁹ The company is an active wholesaler as well as an importer.²⁰ Tchako is affiliated with Riceland Foods, a cooperative based in Arkansas. Between 1995 and 2010, Riceland received more than \$500 million in US government agricultural support, and was the leading recipient of all US farm payments. During the period, the US government paid more than \$14 billion in total support to US rice farmers.²¹

The importers sell rice to 10 major wholesalers. Although these actors do not have the same concentrated market power as the importers, they do have the largest marketing margins within the rice chain, suggesting a considerable propensity to engage in speculation. While they frequently depend on the importers for credit, large wholesalers hold substantial rice stocks, and therefore have a substantial impact on retail prices.²²

In Port-au-Prince, the large wholesalers sell rice to some 200 secondary wholesalers and retailers, who in turn sell to a national network of 10,000 retailers, many of whom are women. Because the big wholesalers buy rice in US dollars and sell in Haitian gourdes, they face exchange rate risks and contribute significantly to price volatility.²³

Figure 2 shows the marketing chains for both domestic and imported rice.

18. Fintrac (for USAID Office of Food for Peace), *Haiti: Market Analysis* (Washington, DC: US Agency for International Development [USAID], 2010), pp. 66, 69, 127.

19. Suarez and Rubio, "Haiti: Rice Production and Trade Update."

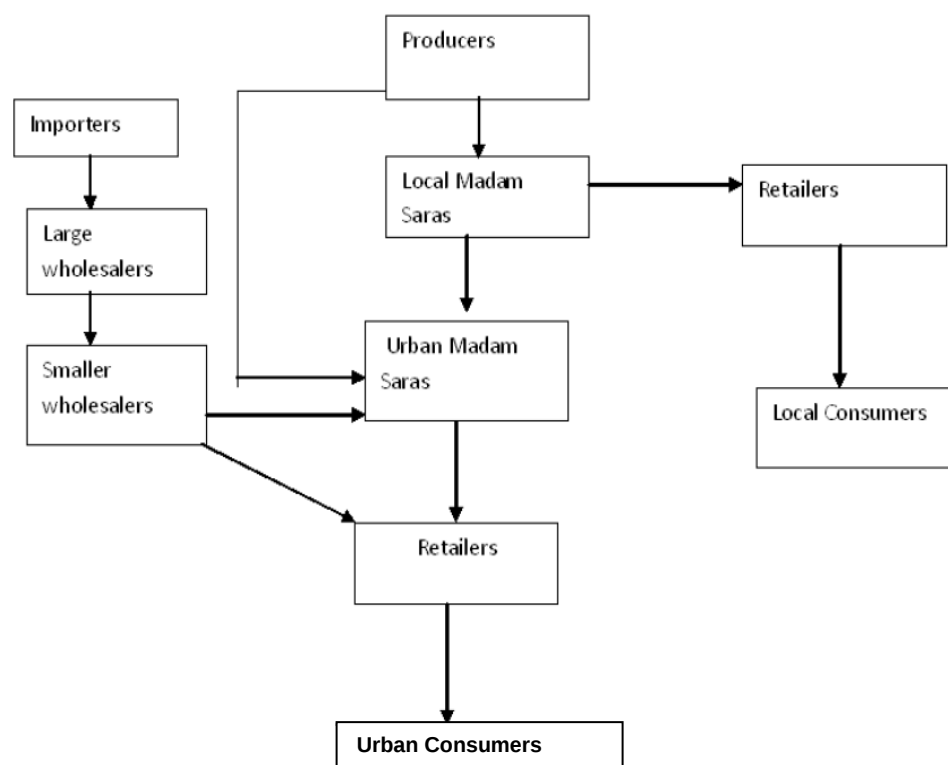
20. Fintrac, *Haiti: Market Analysis*, p. 128.

21. According to the Environmental Working Group (EWG) farm subsidy database, <http://farm.ewg.org/>.

22. Fintrac, *Haiti: Market Analysis*, p. 66.

23. Ibid.

Figure 2. Marketing channel of imported and local rice in Haiti



Source: Fintrac.

MACROECONOMIC FACTORS

The rapid growth of domestic rice consumption has displaced other traditional staples of the local diet, such as corn, sorghum, cassava, and yams; the stagnation of domestic rice production has meant this increased consumption has been supplied by imports.

In addition to the microlevel factors behind the stagnation of domestic rice production explored below, such as deficiencies in irrigation systems, poor infrastructure, and inadequate basic services such as credit support, research, and technology transfer, at least two macroeconomic factors have significantly contributed to the current situation: low tariffs and exchange rate fluctuations.

□

Low levels of tariff protection

In 1995, under pressure from the donor community, the Haitian government adopted a set of economic reforms, including the reduction of tariffs on a significant group of agricultural products, among them rice, for which the tariff

protection fell sharply from 50 percent to 3 percent.²⁴ Haiti has a three-tier tariff structure: fully open without payment of duties; very low protection with a tariff of 3 percent; and moderate protection, with a tariff of 15 percent.

Table 8 confirms that since 2009, rice has the lowest level of tariff protection of Haiti’s main cereal imports. Furthermore, it is interesting to note that recently the government increased tariffs on sorghum, wheat, and wheat flour, but left the duty on the latter at a very low level, probably owing to the potential impact, as in the case of rice, on the price for consumers.

Table 8. Haitian import tariffs on selected cereals (percentage)

Product	1995	1995–2009	2009–2011
Rice	50	3	3
Corn	50	15	15
Sorghum	No data	0	15
Wheat	No data	0	4
Wheat flour	50	0	3.5

Source: CNSA, May 2012.

Regardless, it is clear Haiti’s protection levels remain much lower than those of other countries in the region. In fact, in the Dominican Republic (which shares the island of Hispaniola with Haiti), the tariff on rice imports is 20 percent, while Haiti’s fellow members of the Caribbean Community (CARICOM) impose a levy of 25 percent on rice imports from non-CARICOM countries.²⁵ Other countries in Latin America with higher levels of agricultural development than Haiti, such as Colombia, Peru, and Ecuador have placed rice in the so-called Andean Price Band System (Sistema Andino de Franjas de Precios), which establishes a price

24. See Marc Cohen, “Planting Now: Agricultural Challenges and Opportunities for Haiti’s Reconstruction,” Briefing Paper No. 140 (Oxford, UK: Oxfam International, 2010) for background on the factors that led to the tariff reduction.

25. Cohen, “Planting Now”; David C. Wilcock and Franco Jean-Pierre, “Haiti Rice Value Chain Assessment: Rapid Diagnosis and Implications for Program Design,” Oxfam America Research Backgrounder (Washington, DC: Oxfam America, 2012), <http://www.oxfamamerica.org/publications/haiti-rice-value-chain-research>; USDA/FAS, “Jamaica,” *Grain Trade Policy*, August 23, 2004, <http://www.fas.usda.gov/grain/policy/southAmerica/JamaicaPolicy.pdf>.

stabilization mechanism against distortions and instability in the prices of products classified as sensitive.²⁶

Exchange rate changes

Another key factor favoring rice imports over local production is the level and evolution of the exchange rate between the Haitian gourde and the US dollar. According to figures published by the UN Economic Commission on Latin America and the Caribbean (ECLAC),²⁷ the real exchange rate (which takes inflation into account) has appreciated significantly in recent years, and the Haitian economy has lost external competitiveness, which has accentuated the reduction in the alternative costs of imports of some agricultural commodities, especially rice (see Table 9).

This evolution of the exchange rate occurred in the context of the economic crisis aggravated by the 2010 earthquake, and is partly explained by the evolution of the US dollar in international markets, and by two other endogenous factors to the Haitian economy: the steady flow of remittances from the Haitian diaspora, estimated at between \$1.5 billion and \$2 billion yearly,²⁸ representing the main source of Haiti's foreign exchange, and the flow of international aid, estimated to have reached \$3.8 billion between June 2010 and June 2011.²⁹

Thus, despite the Haitian trade deficit that reached \$3.2 billion in 2010,³⁰ it seems unlikely that in the medium term there will be a more favorable evolution of the exchange rate for the tradable sectors.

26. Under the World Trade Organization's (WTO's) rules, Haiti can impose a tariff on rice as high as the old level of 50 percent (its "bound tariff"). The Haitian government received an exemption from the Caribbean Community (CARICOM) Common External Tariff on rice when it joined the community. As for the Andean price stabilization mechanism, even under its recent free trade agreement with the United States, Colombia will be able to keep the mechanism in place for more than 15 years.

27. UN Economic Commission for Latin America and the Caribbean (ECLAC), *Haiti: Evolution économique en 2010 et perspectives pour 2011* (Mexico City: ECLAC, 2011).

28. The World Bank estimated the value of remittances for 2010 at \$1.571 billion; see World Bank, *Migration and Remittances Factbook* (Washington, DC: World Bank, 2011).

29. ECLAC, *Haiti: Evolution économique*.

30. Ibid.

**Table 9. Inflation and exchange rates in Haiti
(index: 2006 = 100)**

Year	Inflation	US\$ vs. Haitian gourde (nominal)	US\$ vs. Haitian gourde (controlling for inflation)
2006	100	100	100
2008	125	93	80
2010	135	98	77
2011 (June)	148	97	72

Source: Author's calculations, based on ECLAC, *Haiti: Evolution économique*.

Trade liberalization and increased imports

There is no doubt that the combination of the appreciation of the gourde vis-à-vis the dollar and the sharp decline in tariffs significantly affected Haitian rice production, exposing Haitian farmers to international competition for which they were not prepared. This situation is compounded by international agricultural trade distortions.

The figures on consumption trends, domestic production, and increased imports show that imports soared after the tariff fell from 50 percent to 3 percent. The recent increase in international prices seems to have improved the relative situation of domestic producers; however, this uptick in prices may not have been enough to offset the negative effects of the exchange rate and low tariffs.

Despite these important macroeconomic effects, Haiti's rice value chain also clearly suffers from a set of deficiencies in primary production, processing, and marketing, which were present prior to trade liberalization. Therefore, it would be a mistake to assume that the mere change in any of the macro factors, in this case, the tariff protection level, could stimulate a rapid domestic production response that would replace imports competitively.

It is possible, as will be discussed later in this report, that the fragmentation of production and subsequent links in the chain, namely processing and marketing, and in contrast, the high concentration of importers, make it difficult to effectively transfer the higher alternative costs of importing derived from a possible rise in tariffs, to the rice producers. Another factor to consider is the potential impact of increased tariffs on consumer prices, which according to Haitian government

officials interviewed, is seen as a potential source of social conflicts and political instability.³¹

Considering the local context and the possible evolution of prices in the international market, the challenge lies in part in implementing policies to increase production and productivity at the primary level. It is also necessary to remedy deficiencies in the processing and marketing stages, and moreover to ensure stable conditions in terms of import costs, so as to provide a stable medium-term horizon for local actors of the value chain. These measures will allow them to carry forward investments to raise the competitiveness of the chain as a whole.

Stability in the medium term is also a prerequisite for the deployment of public policies that require time for implementation, such as in the case of investments in basic infrastructure, irrigation, and drainage.

INTERNATIONAL TRADE DISTORTIONS: THE US FARM BILL

The persistence of significant distortions in international agricultural markets, owing to the domestic support policies and export subsidies of the industrialized countries, is well known. The virtual stagnation of the Doha Round of world trade negotiations does not permit optimism about a short-term modification.

Regarding the rice value chain in Haiti, there are no doubts about the impact of US agriculture policy on the situation of local producers, as noted in various studies and documents,³² because the United States is Haiti's main rice supplier.

Even though the international price of rice is derived from several factors—such as the production level in the main Asian-producing countries; rising production costs, especially for energy, fertilizers, and petroleum products; and even the evolution of the exchange rates for the US dollar and euro—there are considerable expectations about the next US Farm Bill, which will be in force for five years. The US Congress did not approve new agricultural legislation in 2012, but it is on the congressional agenda for 2013.

In fact, in recent years, direct payments to US rice producers have averaged around \$400 million annually,³³ or almost 20 times the total value of paddy rice

31. Local authorities interviewed, including the current minister of trade and industry and a former prime minister, expressed reluctance to raise tariff rates that may increase the price of dietary staples, especially for the low-income Haitian population. In addition, the prime minister at the time of the April 2008 price spike, Jacques Edouard Alexis, had to resign in the middle of street riots that were on the verge of overtaking the National Palace; United Nations troops had to defend the palace. It took several months for President Préval to gain parliamentary approval of a new prime minister.

32. Wilcock and Jean-Pierre, "Haiti Rice Value Chain Assessment," and Cohen, "Planting Now."

produced in Haiti, and nearly 10 times annual US aid to Haitian agriculture. It should be noted that the United States is one of the biggest donors to Haitian agriculture, and its program includes assistance to rice farmers.³⁴

The more than \$14 billion in subsidies and domestic support provided to US rice producers between 1995 and 2011 included nearly \$1 billion in highly trade-distorting countercyclical and loan-deficiency payments. The \$385 million in support that US rice farmers received in 2011 was mainly direct payments, which are not based on current production and prices and are therefore considered less trade distorting.³⁵

Current congressional debates have centered on the gradual decoupling of direct payments to farmers from their level of production, with subsidies provided to promote the intensive use of risk management tools. However, it is too early to evaluate the impact of this new policy on production and exports of commodities such as rice. Moreover, US irrigated-rice producers have argued that they face lower risks than rainfed farmers. They see a shift toward subsidized insurance as reducing their government support levels, and so have resisted the change in policy.³⁶ Regardless, it seems reasonable to assume that any policy change will not completely eliminate market distortions, which will continue to affect poor countries like Haiti.

Increased US aid to help modernize the rice value chain in Haiti, augment Haitian production, strengthen food security, and promote higher incomes and a better quality of life for small rice producers can mitigate the negative impacts of US domestic agriculture policy.

33. Environmental Working Group farm subsidy database.

34. Tonny Joseph, "Planting Now, Second Edition: Revitalizing Agriculture for Reconstruction and Development in Haiti," Oxfam Briefing Paper No. 162 (Oxford, UK: Oxfam International, 2012).

35. Cohen, "Planting Now," and Environmental Working Group farm subsidy database.

36. Information on Farm Bill "state of play" provided by Oxfam America Senior Agriculture Policy Advisor Eric Muñoz.

ORGANIZATION OF THE VALUE CHAIN

The agricultural sector generates approximately 23 percent of Haiti's gross domestic product, and accounts for 60 percent of employment.³⁷ Furthermore, in terms of production value, annual rice revenues reach a total of \$22.4 million, which places the crop at number 11 among the most important in the country. This production value is very similar to that of corn and potatoes, but it ranks well below tropical crops such as mango and guava, which occupy the top two spots in this ordering.³⁸

In any case, the rice value chain's relevance is not only due to its importance as a source of revenues for Haitian farmers, but also because it forms the basis of the Haitian diet, and at the same time is the main import for the food basket.

Recent studies analyze in detail the rice value chain in detail, illustrate its main weaknesses, and suggest ways to address these deficiencies.³⁹

RICE PRODUCTION: MAIN ISSUES

Some rice is likely grown in all 10 of Haiti's departments (provinces), but according to the CNSA, at least two-thirds of the crop is produced in the Artibonite Valley.⁴⁰ This valley has 35,000 hectares under irrigation and another 18,000 hectares that produce during the rainy season only.⁴¹

Two other key producing areas are the Maribahoux Plain in the North-East Department and the Torbeck Perimeter near Les Cayes in the South Department (see Figure 3). The Maribahoux Plain has about 10,000 improved hectares. Much of the investment in this zone comes from the Dominican Republic, which in most years also purchases most of the output. In 2010–2011, the Dominican Republic closed its border to Haitian rice, with negative effects on Maribahoux. The Torbeck Perimeter has 2,000–3,000 irrigated hectares. Although this area

37. ECLAC, *Haïti: Évolution économique*, and Feed the Future Initiative, *Haiti: FY 2011–2015 Multi-Year Strategy* (Washington, DC: USAID, 2011), http://www.feedthefuture.gov/sites/default/files/country/strategies/files/HaitiFeedtheFutureMultiYearStrategy_Public_FINAL.pdf.

38. FAO data cited in Wilcock and Jean-Pierre, "Haiti Rice Value Chain Assessment," Table 2.

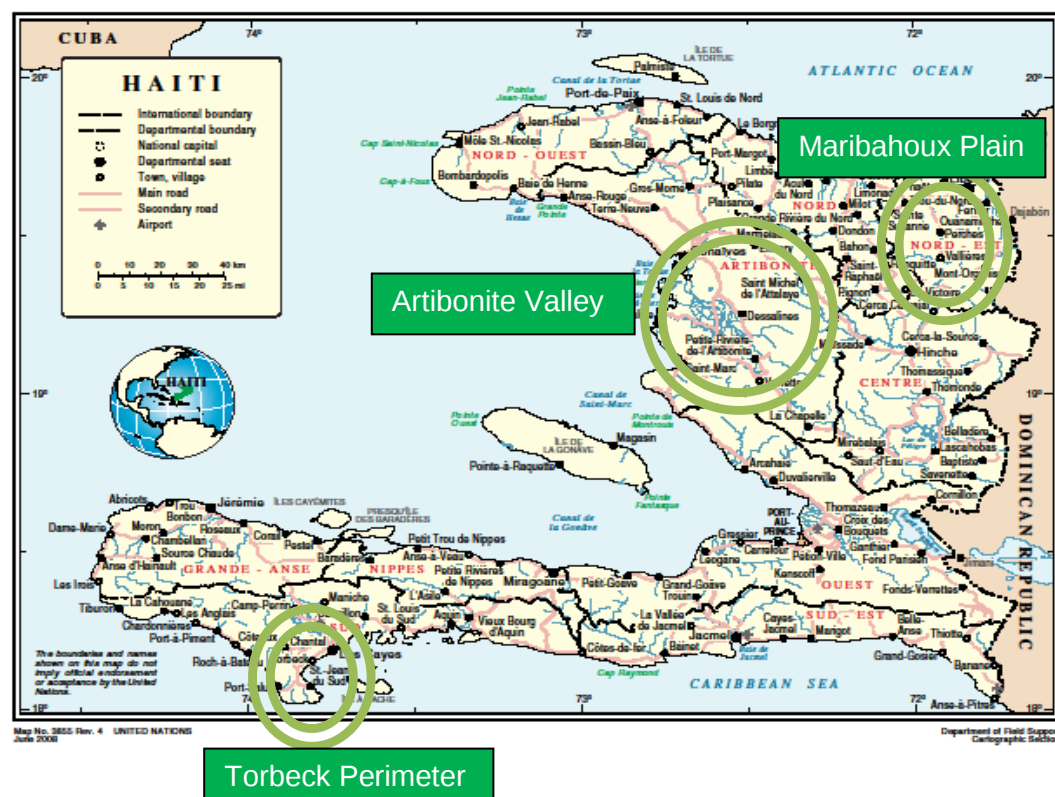
39. Ibid.

40. Ibid.; the authors have estimated that production in the Artibonite Valley accounts for at least 75 percent of total national production. Additional information from Mathieu interview.

41. Wilcock and Jean-Pierre, "Haiti Rice Value Chain Assessment."

only has a small area planted to rice, the infrastructure is reportedly in good condition.⁴²

Figure 3. Map of Haiti with major rice-growing areas



It is estimated that the Artibonite irrigation system's full capacity during the rainy season is actually only around 30,000 hectares. The infrastructure was built 50 years ago, and has not received significant investment in maintenance and repair, so it has serious deficiencies, especially at the level of secondary and tertiary distribution channels.⁴³ The inadequacies of the water management system are also evident in poor drainage systems. Although a number of NGOs and donors are currently supporting development activities in the Artibonite Valley, Haiti lacks a comprehensive national policy aimed at increasing rice productivity and promoting rice production. Such a policy must necessarily focus on the improvement of the existing infrastructure.

42. Ibid.

43. Ibid.

National rice production has remained essentially steady since the 1980s, at around 70,000 tons; however, according to CNSA, in the 2010–2011 season, national production increased to just over 77,000 tons.⁴⁴

The stagnation in the volume of rice production stems from low levels of productivity, which have remained virtually unchanged for 20 years. Indeed, yields per hectare have remained around two tons during that time, without significant incorporation of genetic improvements, better land management, or soil and cultivation management technologies.

Several factors make it especially difficult for farmers to adopt improved management technologies or to mechanize some productive processes. Production takes place at a very small scale, with an average holding of less than one hectare;⁴⁵ most land has precarious property rights; and there is a tendency toward subdivision and fragmentation of the already small parcels owing to the absence of employment alternatives for the younger generations. These factors also impede the search for economies of scale at the processing and marketing stages.⁴⁶

The inefficiencies at the level of primary production are reproduced in the subsequent links in the chain. Certainly, there is a great lack of infrastructure for drying and milling, which causes enormous post-harvest losses that are absorbed entirely by the producers themselves.

In addition, supply chains are also fragmented, with small producers selling their reduced volumes to small traders, who act directly as processors if they have milling installations, or who in turn deliver the rice to one of the numerous mills in the region, which in general are also very inefficient.

The main public agency present in the Artibonite Valley is the Artibonite Valley Development Agency, better known as ODVA,⁴⁷ which was initially conceived as a development agency to provide technical assistance, promote the adoption of new technologies, support the development of cooperatives and producer organizations, and provide basic services to support productive development in the valley.

Research for this paper indicates that ODVA operates with a great shortage of personnel (it has only 50 percent of the technicians that it requires to provide technical services to the valley's producers) and that it does not have sufficient

44. Owing to insufficient information, it is impossible to know if this production figure represents a one-time increase or the beginning of a new trend.

45. Wilcock and Jean-Pierre, "Haiti Rice Value Chain Assessment."

46. Some technical specialists estimate that 160,000 people work in the rice value chain. See Association Nationale des Agro-Professionnels Haïtiens (ANDAH), "Une politique nationale rizicole" (unpublished, 2008); provided to author by Roosevelt Saint-Dic of ANDAH.

47. ODVA operates under the supervision of MARNDR.

financial resources to develop investments in infrastructure improvement, particularly irrigation systems.⁴⁸ Oxfam America staff report that critics complain that ODVA also suffers from corruption, mismanagement, and politicization.

The Taiwan Technical Mission in the Republic of Haiti has a significant presence in the Artibonite Valley, and has focused on the adaptation and dissemination of seeds that have improved genetic qualities and higher yields per hectare.⁴⁹

In addition, long-standing work from some NGOs, among the most important being Oxfam Great Britain, Intermón, and Oxfam America, focuses primarily on supporting the development of small producers' organizations to strengthen their production and commercial management skills as well as their ability to engage in policy advocacy vis-à-vis government officials and agencies.

The participation of women in the rice value chain

According to FAO, women account for 43 percent of the value of agricultural production globally.⁵⁰ However, at the national and local level, the figure varies considerably, depending on the crops and on various socioeconomic factors.

In this regard, Haiti looks similar to many other low-income countries: a huge number of women head households, with the close involvement of the whole family group in farm production and the implementation of diversified survival strategies, which merge farm and off-farm incomes and employ the family labor force in multiple activities.

Women account for the majority of economically active Haitians.⁵¹ Although hard statistics on their participation in the rice value chain are difficult to obtain, it is clear from even casual observation of rice production in Haiti that they play a major role in all the on-farm activities that follow soil preparation and seeding, including water management and harvesting.⁵² Their role is decisive beyond the farm, in both wholesale and retail trade and also in the management of small mills and drying infrastructure.

Oxfam's 2011 study of gender roles in the Artibonite Valley found that women are engaged all along the rice value chain, in addition to bearing a hugely disproportionate burden of household and family responsibilities. Despite their double or even triple workday, they frequently face pay discrimination.⁵³

48. Interview with the director of ODVA, Artibonite Valley, May 30, 2012.

49. The most rapidly diffused variety is TCS 10.

50. State of Food and Agriculture Team and Cheryl Doss, "The Role of Women in Agriculture," ESA Working Paper No. 11-02 (Rome: FAO, 2011).

51. Bureau International du Travail (BIT), *La promotion du travail décent dans la reconstruction et le développement d'Haiti après le tremblement de terre de 2010* (Geneva: International Labor Organization [ILO], 2010).

52. During field work in the Artibonite Valley, the extent of women's participation in agriculture and marketing was evident.

53. "Enquête sur les rapports sociaux de sexe au niveau des organisations et réseau partenaire d'Oxfam America dans l'Artibonite" (unpublished manuscript, January 2011).

Additional research on women's participation in the rice value chain is critical to developing supportive policies. Even with the limited information currently available, however, it seems clear that gender-sensitive training programs, technical assistance, and technology transfer are essential to ensure that women are able to participate as equals with men in the various activities of the value chain.

Environmental conditions

A program to increase domestic rice production and productivity in Haiti must also pay close attention to the potential impact on the ecosystem. The cultivation of rice without crop rotation and with severe limitations on soil and water management (as a consequence of the poor condition of the irrigation and drainage infrastructure) can have severely negative effects on the natural resource base on which rice cultivation depends. The dissemination of better land management practices and the identification of crop rotation alternatives must be part of any technological package promoted and most likely subsidized by public policies.

Promotion of the system of rice intensification (SRI) would efficiently encourage a "natural resources conservation culture." This approach to rice cultivation obtains higher yields through labor- and knowledge-intensive use of compost for fertilizer, with reduced use of both seed and water.⁵⁴ Closely related approaches would include identification of better practices for land preparation and economically feasible crop rotations to avoid the soil degradation risk associated with intensive monocropping.

At the same time, efforts to ensure that farmers have access to high-yield seeds and mineral fertilizers through judicious use of subsidies must also ensure that farmers know how to apply fertilizer correctly, at the right time, and in a manner adapted to the requirements of local soil and crops.

MAIN FACTORS OF RICE PRODUCTION STAGNATION

As noted, Haitian rice production has remained virtually stagnant for more than 20 years, while in the same period the consumption of rice increased several times. This combination of events has led the country from a situation of self-sufficiency to substantial reliance on imports to meet domestic demand.

54. For more information on SRI and its piloting in Haiti, see "Haiti," *SRI-Rice Online*, <http://sri.ciifad.cornell.edu/countries/haiti/index.html>.

Production stagnation is the consequence of various causes; the most important of these follow:⁵⁵

Primary production

1. Deficiencies of the irrigation and drainage infrastructure. In the case of the Artibonite Valley this infrastructure is affected by age and lack of upgrading and maintenance, as well as lack of investment in fully extending the network of secondary and tertiary channels.
2. Lack of research to adopt and create rice varieties with higher yield and good commercial value.
3. Insufficient use of certified seed⁵⁶ by farmers and their organizations.
4. Low levels of fertilizer use (whether mineral or organic) and lack of detailed soil analyses to allow better identification of the most appropriate formulas for the soil conditions and requirements of rice production in the valley.
5. Low adoption of technologies for planting preparation and crop management, as well as water and soil management.

Processing and transformation

1. Lack of appropriate infrastructure for drying paddy (unmilled) rice.
2. Fragmentation of installed milling capacity, with proliferation of small traders and processors.
3. Lack of adequate facilities for small-scale farmers and their organizations to collect and manage stocks.
4. Separation between farmers and processors.
5. Inefficient marketing channels owing to lack of economies of scale and absence of adequate commercial information.

55. This list of factors is derived from interviews in Port-au-Prince with policymakers and technical specialists, as well as a literature review. See in particular Wilcock and Jean-Pierre, "Haiti Rice Value Chain Assessment"; ANDAH, "Une politique nationale rizicole"; and Cohen, "Planting Now."

56. Seed is certified by government agencies or other designated certification bodies on the basis of national regulatory standards for quality, purity, and health. These standards vary considerably from country to country, but typically include the absence of seed-borne diseases and seeds from other crops and weeds, and also cover moisture content, level of germination, and seed vigor and viability. For more detail, see Organisation for Economic Co-operation and Development, *OECD Seed Schemes: A Synthesis of International Regulatory Aspects that Affect Seed Trade*, Paris: OECD, 2012, <http://www.oecd.org/tad/code/internationalregulatoryaspectsseedtrade.pdf>.

Institutional level

1. Insufficient institutional capacity and resources from MARNDR and ODVA to deliver support services for production that responds to the needs of Artibonite Valley farmers.⁵⁷
2. Insufficient availability of technical assistance and technology transfer.
3. Lack of technical capacity to support the economic and commercial management of the valley's small farms.
4. Absence of channels and credit resources in line with programs that aim at modernizing production and increasing productivity.

International trade

1. Wide and deep tariff liberalization, without any adjustment period provided to help the local industry remain competitive.
2. Lack of tools to adequately manage international market instability and volatility.
3. Lack of a regulatory framework to differentiate imported rice according to specific characteristics of quality and price.
4. No regulations or phytosanitary (plant health) controls for imported paddy rice.
5. Insufficient border controls to limit access⁵⁸ of low-quality and cheap rice.

Based on this set of deficiencies and limitations, we can draw conclusions that provide the rationale for proposing public policies to increase smallholder rice producers' productivity and incomes (see this report's next section):

- There is no single policy measure that in isolation would address the deficiencies affecting the rice value chain in Haiti.
- The depth and extent of the problems require the formulation of policies, the adoption of policy tools, and the allocation of resources for the medium and long term.
- Better and more efficient coordination mechanisms between the production and processing levels are needed to address the severe disarticulation and fragmentation of the rice value chain.

57. See Joseph, "Planting Now, Second Edition," for details on underinvestment in agriculture in Haiti.

58. This issue of border controls is especially important with regard to the border with the Dominican Republic.

- Current international prices and the medium-term projections provide better conditions than in previous years for the formulation and implementation of a comprehensive policy for Haiti's rice sector.
- The dogged persistence of a significant number of small-scale rice producers, who have resisted the adverse conditions resulting from the sharp tariff liberalization and unfavorable conditions of the international markets in earlier years, exhibits a resilience and adaptive capacity that should form the basis for the modernization process of the rice value chain.
- The existence of long-standing producer organizations may also be the basis for brokering support services and installation of processing and management capabilities.
- The development of specific technical experience and local expertise can realistically justify programs that aim at rapidly increasing productivity and yields per hectare.

POLICY PROPOSAL

Based on the preceding discussion, we propose that the Haitian government formulate and implement a national policy for the rice chain that is associated with specific targets in order to periodically assess progress and compliance with goals. The targets specified below are intended to allow Haiti to make substantial but realistic gains in national rice production, within a time frame that should be feasible to achieve.

RICE POLICY OBJECTIVES

1. Double, over a maximum period of eight years, yields per hectare, moving from the current two tons to the global average of four tons.⁵⁹
2. Increase the irrigated surface over a five-year period by 15 percent, in order to achieve at least 35,000 irrigated hectares in the Artibonite Valley.⁶⁰
3. Achieve, over an eight-year period, a level of 50 percent self-sufficiency in rice production in Haiti. This objective includes increasing the annual production of milled rice equivalent from 80,000 to 250,000 tons.
4. Double small rice producers' incomes over a five-year period.
5. Promote better environmental practices, especially in soil and water management.

STRENGTHENING BASIC INFRASTRUCTURE

1. Define a medium-term investment program to improve irrigation and drainage infrastructure, especially at the secondary and tertiary levels. Of course, this objective forms the basis for other efforts to increase productivity and production, because rice depends on water availability and good management at the primary production unit level.

59. Several studies suggest that this goal is possible and realistic, even in a shorter period of time; see ANDAH, "Une politique nationale rizicole," and Wilcock and Jean-Pierre, "Haiti Rice Value Chain Assessment." Similarly, the minister of agriculture said in an interview that the objective of the ministry is to double national rice production over 10 years.

60. It is possible that this goal can be modified to incorporate other geographic areas that have good potential to develop irrigation and drainage infrastructure.

2. Establish an investment program through producer organizations in the valley to develop rice drying and storage facilities. This program could have an important impact in reducing post-harvest losses and could improve marketing channels in favor of producers.

POLICIES AT THE LEVEL OF PRIMARY PRODUCTION

1. Identify rice varieties with improved agronomic and commercial properties in the Artibonite Valley; increase the capacity for certified seed production and promote its adoption among the small-scale producers.⁶¹
2. Increase the use of appropriate quantities of fertilizers and technical formulation in accordance with the characteristics of the soils of the various zones and microzones of the valley.⁶²
3. Promote the adoption of specific technological packages (integrating seeds, fertilizers, and soil and water management) through direct subsidies to smallholder farmers, defined on a temporary basis and subject to periodic evaluation of effectiveness and impact.⁶³
4. Disseminate promising experiences such as pilot use of SRI, to raise paddy yields while reducing costs and promoting better soil and water management.⁶⁴
5. Improve the coverage of public support services, especially technical assistance and technology transfer. This support should involve not only an increase in resources for the recruitment of more professionals and technicians, but also a review of the methods and content used for technological modernization.

61. At least two varieties are in widespread use: TCS 10 and Sheila. Some works, such as ANDAH, "Une politique nationale agricole," recommend investigating the creation of new varieties to include the best features of both. Other international experience suggests that partial or total subsidization of quality seeds can be an efficient mechanism to promote technological change among small-scale farmers.

62. Farmer organizations offer an important vehicle for promoting technological change. In addition, the government has offered fertilizer subsidies to farmers at various times. In this regard, if government or aid resources are used for subsidies, it would be desirable to subsidize a comprehensive technology package, including seeds, fertilizers, and soil and water management.

63. At the moment, some fertilizer subsidies are in place. International experience indicates that subsidizing technological innovation using a direct mechanism to reach the farmers can have positive results. The amount and detailed ways to apply the subsidies (targeting to poorer farmers, time limits on subsidy provision) should be defined by MARNDR.

64. SRI has been successfully promoted among small producers in some Asian countries, and it has started to be disseminated in Haiti by USAID and Oxfam cooperation programs, also with promising results.

6. Ensure access to appropriate credit and financing mechanisms for small-scale producers, in terms of deadlines, payment conditions, interest rates, and so on.

POLICIES TO IMPROVE THE COORDINATION OF THE RICE VALUE CHAIN

1. Promote the installation of drying and milling infrastructure according to current production and increases planned for the coming years. Presently, drying and milling facilities are among the main deficiencies in the chain, and several analyses stress the need to address them.
2. Increase milling capacity, both from a technological point of view and in terms of scale. This increase would provide the following benefits:
 - A better conversion factor from paddy to milled rice; it currently does not reach 60 percent.⁶⁵
 - Improved product standardization, facilitating marketing.
 - Decreased losses in the milling process; these currently are as high as 45 percent.⁶⁶
 - A liaison mechanism between the demands and needs of the market and producers, delivering appropriate signals with respect to prices, quality, and commercial properties more accepted by consumers.
 - An efficient mechanism for providing and channeling services to producers, especially with regard to technical assistance and economic management.
 - The possibility for developing supplier programs, in the form of guaranteed contracts with producers.⁶⁷
 - Establishment of management centers, specialized in supporting small-scale producers in the economic management of the production process.⁶⁸

65. Wilcock and Jean-Pierre, "Haiti Rice Value Chain Assessment."

66. Ibid.

67. International experience engaging small-scale farmers in agricultural modernization via "contract farming" is extensive. This approach requires the establishment of specific programs that formally link small farmers and agro-industry under formal modalities. See, for example, Bharat Ramaswami, Pratap Singh, and P.K. Joshi, "Efficiency and Distribution in Contract Farming: The Case of Indian Poultry Growers," Markets, Trade, and Institutions Division Discussion Paper No. 91 (Washington, DC: IFPRI, 2006).

3. Conduct in-depth evaluations of various formulas for the installation of new milling capabilities. Possible options include the following:
 - Establishment of public-private joint ventures, for example between ODVA and investors interested in this field and interested in settling in the Artibonite Valley.⁶⁹
 - Provision of modern drying and milling facilities, facilitated with favorable and soft loans or grants to cooperatives and producer organizations in the Artibonite Valley.
 - Direct public investment, by a specialized agency capable of economic and commercial management, to establish drying and milling facilities.⁷⁰
4. Make the necessary significant investments to install drying capabilities.⁷¹ This undertaking will require not only adequate financing, but especially two basic conditions:
 - Stability in the alternative import costs, so as to reduce the risk of any sharp decreases in international prices that could affect the balance of local suppliers versus imported suppliers.
 - Adoption of a national rice policy to deliver credible signals about the priority given to increasing production and local productivity.

POLICIES TO ADDRESS INTERNATIONAL MARKET INSTABILITY

Price stabilization policies

The Haitian government's tariff reduction in the mid-1990s created a rapid and abrupt change in the conditions of domestic production. Numerous studies and assumptions point to this tariff reduction as one of the fundamental causes of rice production stagnation in Haiti—and of the country's growing dependence on imports.

68. There is a total absence of systematic information on production costs, prices of inputs and the final product, and overall economic management and the commercial production process.

69. In this regard, a major importer of rice, Kenneth Michel, executive director of Haiti International Traders, expressed interest and willingness to invest in local drying and milling capacity.

70. The latter option is highly recommended to support a state or parastatal purchasing agency that can influence and regulate the domestic market for rice.

71. Interview with Michel. He suggested that an estimated investment of \$6 million would be necessary for the infrastructure to process 60,000 tons of paddy rice.

Notwithstanding the importance of tariffs, their modification does not seem to be in any way sufficient to change the competitiveness of rice in Haiti, owing to the numerous and clear problems at the primary and intermediate levels of the value chain.

In addition, high social and political sensitivity to the possibility of an increase in rice prices for consumers is evident, because rice is the main staple food. This sensitivity makes it very unlikely that the government would endorse significant modifications to the current tariff level in the near future.⁷²

However, there is also recognition that the current levels of liberalization increase the risks arising from volatile international markets and act as a clear disincentive to investments in support of higher production and productivity and modernization of the various links of the value chain.

Based on these elements, we propose the establishment of a price stabilization mechanism that can maintain prices at an acceptable range for producers and consumers and that is predictable over the medium term for the different actors in the value chain. Haiti can learn from the experience of other countries in price stabilization. The most commonly used mechanisms follow:

1. **Establishment of price bands.** A price range based on fixed tariffs sets the **alternative cost to import.**⁷³ The establishment of this system—which has a floor and ceiling price for imports, based on international prices,⁷⁴ and which takes into account the relevant product markets—requires an efficient and systematically updated system of information on prices and markets.

Given the current low rice tariff, which would make irrelevant the possibility of tariff reductions if the international price reached very high levels, this option does not seem advisable for Haiti.

2. **Determination of minimum entry prices.** This mechanism is also widely used, with different variations, in several countries. It is through precisely

72. This point was emphasized in several interviews with Haitian officials, including the minister of trade and industry and a former prime minister, as well as with donor representatives.

73. This mechanism is, with some variations, the mechanism that operated in Chile for a long period of time for some sensitive products like wheat, sugar, and oilseeds; it still operates for wheat imports. It is also the mechanism used by member countries of the Andean Community (Bolivia, Peru, Ecuador, and Colombia), which seek to protect their most sensitive agricultural subsectors, including rice. The Dominican Republic uses a similar mechanism for rice and other products.

74. When prices fall below the price set, it triggers a compensatory mechanism by way of additional tariffs up to the floor previously defined, thereby protecting the producer's situation. By contrast, when international prices exceed the established ceiling, the mechanism reduces the ad valorem tariff to keep prices below the ceiling, thus protecting the interests of consumers.

such a mechanism that the European Union seeks to stabilize agriculture producer prices.⁷⁵

Similar to the price bands, determination of minimum entry prices aims to establish a minimum price for imports. When the cost, insurance, and freight (CIF) price of imports does not reach a minimum price, the mechanism increases the tariff rate to reach the **minimum price of admission**. Given the institutional and market conditions that exist in Haiti, having minimum entry prices seems to be the mechanism that best suits the country's needs.

Operation of the price stabilization mechanism

Identification of relevant markets in question

Since nearly 80 percent of Haiti's rice imports come from the United States and imports from other countries such as Uruguay, Argentina, or Brazil enter at prices below that of US rice, it is proposed that the price of US long-grain rice becomes the market price of reference.

Determination of the price level to operate the mechanism

Several opinions expressed in Haiti indicate that the international price (free on board, or FOB) of \$550 per ton determines a final import price of around \$712 per ton (see Table 10). This price includes insurance, freight, taxes, and financial costs, putting the alternative import cost at \$1,000 per ton.⁷⁶

If it is deemed that this level is appropriate for the actors in the rice chain (especially when producers reach better levels of productivity), the mechanism should operate by compensating, via tariffs, for imports that do not reach the CIF price of admission (the **entry price**).

Adjustment frequency

Considering the volatility of international prices, it seems reasonable that the price of admission be periodically reviewed, and that tariffs be determined based on this review. Therefore we propose conducting a review every six months, at predetermined dates.

To establish the minimum entry-level price, we propose the creation of a technical committee, having representatives from MARNDR, the Ministry of

75. Although the special plight of Haiti suggests the existence of a considerable scope for trade policy, it should be recalled that Haiti's WTO-bound tariff of 50 percent and its exemption from the CARICOM Common External Tariff on rice mean that adoption of a mechanism of this nature is unlikely to be challenged in either the WTO or CARICOM.

76. Interviews with CNSA and observations in the market in Port-au-Prince confirm this figure as the final price.

Trade and Industry, producer organizations, importers, and professionals who know the rice sector.

Table 10. Price of imported rice in Haiti⁷⁷

Element	Current price (US\$ per ton)
FOB price	550
Insurance (2% of FOB)	11
Sea freight	40
CIF price	601
CIF + tariff (3% of CIF)	619
Stamp tax (5% of CIF + tariff)	31
Value-added tax (10% of CIF+ tariff)	62
Final price	712

Source: Author's estimates.

The proposed mechanism would operate based on a standard application formula:

EP = CIF + LD + X.⁷⁸

In addition to the relative simplicity of its operation, this mechanism would not significantly alter the current level of prices already assumed by Haitian

77. According to information collected during the research, the Customs Service of Haiti charges the following fees on the free on board (FOB) price of admission declared by the importer: 3 percent duty, 10 percent value-added tax, and 5 percent tax verification, for a total of 18 percent. The FOB price in the table is the 2011–2012 FOB price per ton in Bangkok for milled rice with 5 percent broken kernels; see USDA Economic Research Service (ERS), *Rice Yearbook 2012*. Oxfam is grateful to Teo Babun, executive director of AmericasRelief Team, for assistance in determining freight rates for bulk shipments of rice from US Gulf ports to Haiti: \$40 per ton.

78. EP = Entry price;; LD = Local or domestic import duties; X = Additional duties to reach the entry price.

consumers. Furthermore, the periodic review will help with the collection of data on international markets.

This mechanism ultimately should act as a safeguard against a possible sharp fall in international prices, which would further undermine the situation of Haitian producers. At the same time, its adoption should give credibility to national rice policy, ensuring a stable and predictable medium-term horizon for investors and other actors of the value chain.

Tariff level equalization

A complementary option to be analyzed is the adoption of a common tariff level for food grains. As Table 8 indicates, the tariff for imported rice is 3 percent, but that for wheat flour is 3.5 percent; wheat, 4 percent; and corn and sorghum, 15 percent. Considering that these products, especially rice, wheat, and corn, exhibit some substitution effects among consumers, it would be reasonable to equalize tariffs, for example at 10 percent.

It is probable that the Haitian government would look more favorably on this kind of measure (as compared with sharper tariff escalation), given the effects on consumers. At the same time, such a measure would send a strong signal to farmers—and, in general, participants in food production value chains—that a coherent and long-term policy is being adopted.⁷⁹

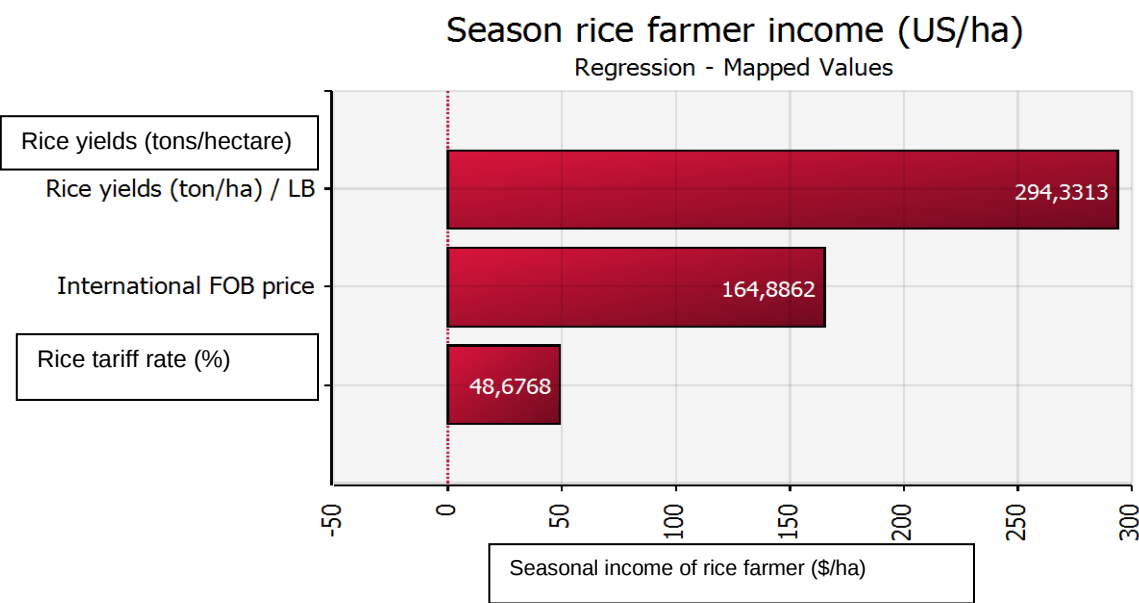
MODELING RESULTS

In support of this policy proposal, we examined the relationships among Haitian rice yields, tariff rates, international rice prices, domestic producer and consumer prices, and farm incomes in a variety of scenarios (this analysis is reported in detail in Appendix 2). We used Monte Carlo simulation to determine the impacts of yields, tariffs, and import prices on Haitian rice producers' income per hectare and on the Haitian consumer price of rice, and then used tornado analysis to rank the impacts. The Monte Carlo simulation considered yields ranging between 1.75 and 3.5 tons per hectare, tariffs between 3 percent and 15 percent, and CIF prices between \$440 and \$660 per ton, examining 10,000 scenarios drawn randomly from these ranges (further details are reported in Appendix 2). Figures 4 and 5 show the results of the tornado analysis. As Figure 4 indicates, yield is the most important variable in improving producer incomes, followed by an increase in international prices. In Figure 5, variations in international rice prices have a bigger impact on consumer prices than changes in the tariff on imports.

79. A more detailed analysis must consider the impact on consumers and also the possible positive impact on government revenues, considering that rice is the most important food import in terms of total value.

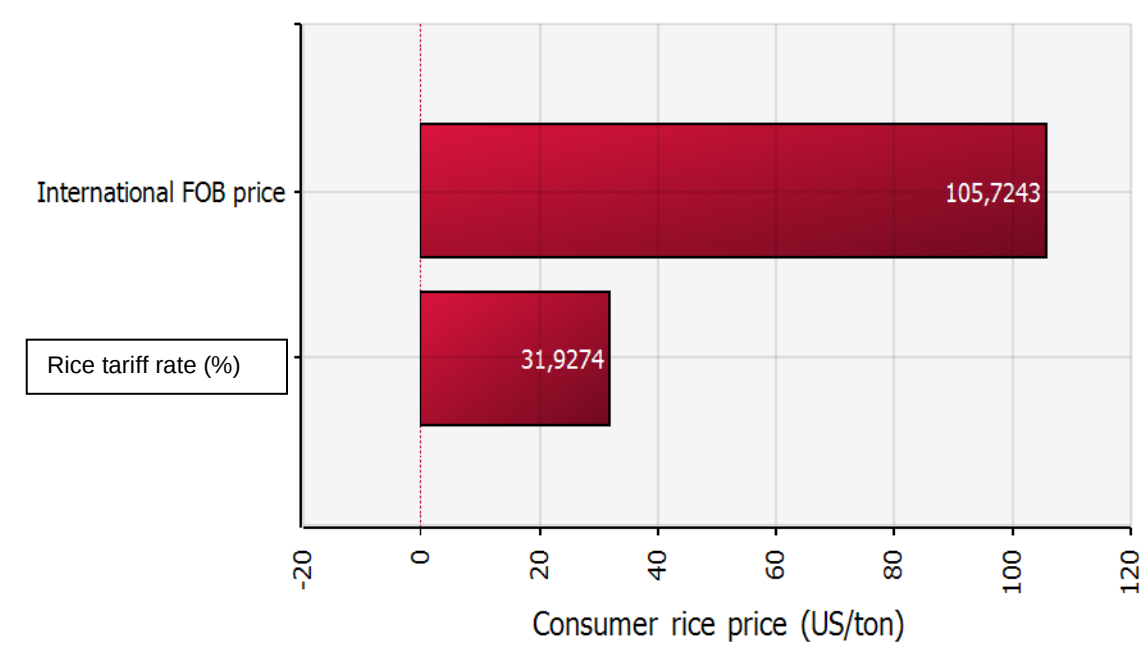
Decreasing price variations could also have a significant impact on producers' incomes.

Figure 4. Seasonal rice farmer income in Haiti (US\$ per hectare), mapped regression values



Source: Author's calculations.

Figure 5. Consumer rice price in Haiti (US\$ per ton), mapped regression values



Source: Author's calculations.

CONCLUSIONS

International price volatility will continue to be a risk for agricultural commodities for the near-term future, so the econometric modeling results discussed in the preceding section bolster the proposal that Haiti adopt some kind of price stabilization mechanism, as such a mechanism would benefit both consumers and producers. Regardless of the particular impact of any given policy measure, however, it will be crucial for Haiti to adopt an integrated set of public policies to increase productivity and to provide a more stable and regulated framework for rice imports:

1. Improvements in productivity, resulting in increased yields per hectare, are the best option by far, creating a greater and faster impact on producers' income. Certainly, the greatest impact is obtained with the largest proportional increase in yields; however, even assuming more modest increases of 30 percent, the impact remains relevant.⁸⁰

Fast and significant increases in productivity will require use of a set of policy actions, among which the most important follow:

- **Infrastructure.** Develop an investment program aimed at improving irrigation and drainage infrastructure to allow more efficient water resource management appropriate to the needs of the different stages of cultivation.
- **Technology.** Promote adoption of a technology package that provides a high impact on productivity. Without prejudice to a more detailed definition of the components of this technology package, to be carried out by specialists in the rice cultivation, it is clear that this package must include improved genetic resources (seeds), micro- and macronutrient availability (fertilizers), and soil and water management.
- **Subsidies.** Consider subsidies to promote the technological innovation package to accelerate the adoption process and obtain a rapid impact on producers' incomes.⁸¹
- **Resources.** Allocate resources to promote a technology package of this nature based on the number of farmers to be assisted and the size of the

80. For a more accurate analysis, there must be better information on production costs. However, available information allows this solid conclusion, which is consistent with other works cited in this document. See Wilcock and Jean-Pierre, "Haiti Rice Value Chain Assessment," and ANDAH, "Une politique nationale rizicole."

81. It is important to consider a technological innovation package, instead of piecemeal initiatives for fertilizer, seeds, or soil and water management.

subsidy to be considered. The establishment of a subsidy is a necessary condition for the success of this policy.

- **Build ODVA's capacity.** Strengthen the capabilities of ODVA, increasing the resources available for extension and technology transfer in such a way that the processes of technological upgrading and increased productivity are expedited.
 - **Farmers' organizations.** Promote and support farmers' organizations, collecting and expanding existing experiences, to ensure sustainable gains in productivity.⁸²
2. Increases in the tariff rate to 10 percent or 15 percent show a less significant impact on producers' income than productivity gains.⁸³ Although any increase in rates does not show a dramatic modification of the price to be paid by consumers, the cost-benefit, economic, and probably political and social analysis does not make it advisable to undertake such measures.⁸⁴

However, the reality of the international markets, which are affected by distortions arising from subsidies applied by industrialized countries, and short-term volatility in the price level will require stabilization instruments that allow a predictable medium-term price horizon.

Therefore, the adoption of a price stabilization mechanism, as proposed in this document, is a necessary tool to enhance the viability of the policies of technological modernization and increased productivity.

3. Adequate technical and financial assistance from donors will be essential to ensure the success of this policy proposal.

82. Experience with "productive blocs," which allow producer groups to coordinate planting periods, seeds, rice varietal selection, crop management, harvesting, and commercialization, has been positive.

83. This impact is seen to be even less significant in the case of bringing the rates up to 15 percent, assuming an unlikely scenario in which the total increase in the alternative cost of importing is transferred to the price received by the producer.

84. The evaluation of adopting a common import tariff for grains such as corn, wheat, and rice could be a complementary option to the implementation of a stabilization mechanism.

APPENDIX 1: LIST OF PERSONS INTERVIEWED

PORT-AU-PRINCE

1. Pedro Duran, United Nations specialist, adviser in the Office of the Prime Minister of the Republic of Haiti
2. Roosevelt Saint-Dic, agricultural economist, member of the National Association of Haitian Agronomists
3. Pierre Gary Mathieu, national coordinator of the National Food Security Coordination Agency (CNSA), Ministry of Agriculture, Natural Resources, and Rural Development, Republic of Haiti
4. Gilles Damais, senior specialist in natural resources and agricultural development, Inter-American Development Bank, Haiti Office
5. Thomas Jacques, minister, Ministry of Agriculture, Natural Resources, and Rural Development, Republic of Haiti
6. Rosny Smarth, agronomist, former prime minister of the Republic of Haiti
7. Mariano Fernández, special representative of the secretary-general of the United Nations and head of the UN Stabilization Mission in Haiti (MINUSTAH)
8. Kenneth Michel, executive director, Haiti International Traders
9. Wilson Laleau, minister, Ministry of Commerce and Industry, Republic of Haiti
10. Chenet Saint Vil, head of relations with the Caribbean Community (CARICOM), Ministry of Planning and International Cooperation, Republic of Haiti
11. Visit to public market

ARTIBONITE VALLEY

1. Visit to local public market
2. Interview with rice mill owner and small traders

3. Serge Milius, director general of the Artibonite Valley Development Agency (ODVA), Ministry of Agriculture, Natural Resources, and Rural Development
4. Technical supervisor for rice research in the Artibonite Valley, Ministry of Agriculture, Natural Resources, and Rural Development
5. Technical assistant of rice producers' organizations, Artibonite Valley Development Agency (ODVA), Ministry of Agriculture, Natural Resources, and Rural Development
6. Technical assistant to rice producers' organizations, Oxfam
7. Farmers and representatives of rice growers' organizations

APPENDIX 2: ANALYSIS OF PRODUCER REVENUES AND CONSUMER PRICES

To support the policy proposal that this paper presents, we undertook some econometric modeling and sensitivity analysis. Specifically, we examined the impact of yield increases (an indicator of productivity), international rice prices, and various tariff rates for rice imports on Haitian rice farmers' incomes and the prices Haitian consumers pay for rice.

YIELD CHANGE SCENARIOS

We considered two rice yields: a low of 1.75 tons per hectare, somewhat below the current Haitian average, and a high of 2.5 tons per hectare, above the average. For both these baseline yields, we considered three different yield increase scenarios: 30 percent, 50 percent, and 100 percent. For each scenario, we simulated gross income per hectare, based on the FOB world market price for rice, \$550 per ton (see Table 10), with the results summarized in Table 11.⁸⁵ Figure 6 displays this variation in producer earnings per season for the different yield change scenarios in graphical form.

TARIFF RATE CHANGE SCENARIOS

Next, we considered three tariff rate scenarios for rice: the current Haitian tariff of 3 percent, a 10 percent levy, and 15 percent. Table 12 shows the producer and consumer prices for each of the three tariff rates; changes in tariffs change both producer and consumer prices by the same proportion. The same results are displayed graphically in Figure 7.

Table 13 presents producer income simulations for the two rice yield levels, taking the tariff scenarios into consideration.⁸⁶

85. We assumed that the relationship between yield and income remains constant in every scenario. Because data on production costs is lacking, we do not estimate net income.

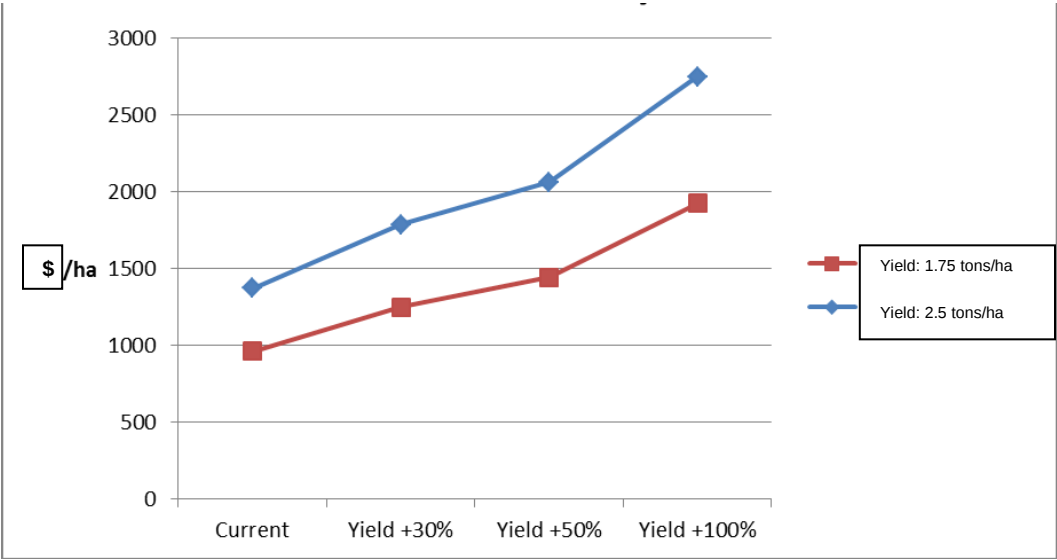
86. We assumed no correlation between yield and consumer prices. The model is based on the alternative import price.

Table 11. Yield (tons per hectare) producer income (\$ per season) scenarios

	Baseline yield	Baseline + 30%	Baseline + 50%	Baseline + 100%
Yields	2.5	3.3	3.8	5.0
Income	1,375	1,788	2,063	2,750
Yields	1.75	2.3	2.6	3.5
Income	963	1,251	1,444	1,925

Source: Author's calculations.

Figure 6. Income for three scenarios of yield increase



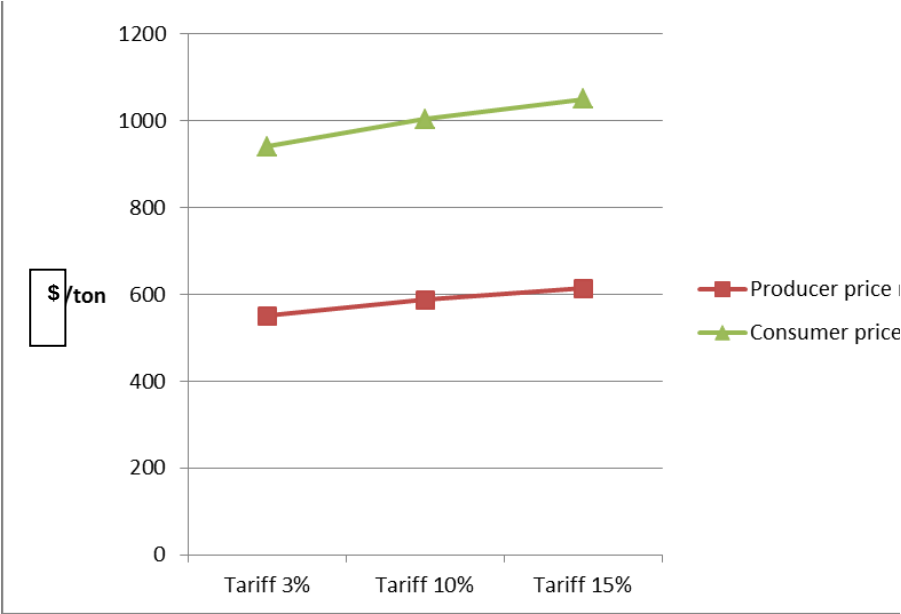
Source: Author's calculations.

Table 12. Tariff rate scenarios, producer prices, and consumer prices for rice in Haiti

Tariff rate scenario	3%	10%	15%
Producer price (\$/ton)	550	587	614
Consumer price (\$/ton)	940	1,004	1,050

Source: Author's estimates.

Figure 7. Rice price in Haiti under three tariff scenarios



Source: Author's calculations.

Table 13. Farmer seasonal income (dollars) for various yield and tariff scenarios

Rice yield (tons/hectare)	3% tariff	10% tariff	15% tariff
1.75	963	1,028	1,075
2.5	1,375	1,468	1,535

Source: Author's calculations.

INTERNATIONAL PRICE CHANGE SCENARIOS

We also examined the impact of international price changes on consumer and producer prices by considering four hypothetical situations: increases of 10 percent and 20 percent, and similar declines. The five scenarios of tariff rate change and the final simulated producer and consumer prices can be seen in Table 14.

Table 14. Producer and consumer prices (\$ per ton) of rice for four international price scenarios

	Current level	FOB + 10%	FOB + 20%	FOB – 15%	FOB – 20%
Producer price	550	601	653	473	447
Consumer price	940	1,028	1,115	808	765

Source: Author's calculations.

Figure 8 shows the change in the producer price of rice for the five modeled scenarios.

Figure 8. Haitian producer prices of rice in five international price scenarios



Source: Author's calculations.

Table 15 and Figure 9 both show the impact of the five international rice price scenarios on producer income for two different yield rates.

Table 15. Haitian rice farmer incomes (\$ per season) in two yield (tons per hectare) and five international price (\$) scenarios

Yield	Current income	FOB + 10% income	FOB + 20% income	FOB – 15% income	FOB – 20% income
1.75	963	1,052	1,142	828	783
2.5	1,375	1,503	1,632	1,182	1,118

Source: Author's calculations.

Figure 9. Haitian rice farmer incomes in two yield and five international price scenarios



Source: Author's calculations.

SENSITIVITY ANALYSIS

Monte Carlo methods use random numbers and probability to solve problems. Monte Carlo *simulation* involves repeated evaluations of a model of the relationship between inputs (in this case, yield, international prices, and tariff rates) and outputs (farm income and consumer prices) using sets of random numbers for the inputs.⁸⁷ We used this technique⁸⁸ to analyze 10,000 different scenarios, generating random values for the input variables using the following ranges: yields of 1.75 to 3.5 tons per hectare; tariffs between 3 percent and 15 percent; and CIF prices between \$440 and \$660 per ton. The results of the analysis are reported in Figures 4 and 5, presented earlier in this report. Those figures are tornado charts that use mapped values of regression.

The mapped values are a transformation of the beta coefficient of the regression to real magnitude values. The coefficient of this analysis indicates the amount of change in the output variable given a change of one standard deviation in the

87. J.W. Wittwer, "Monte Carlo Simulation Basics," *Vertex42.com*, June 1, 2004, <http://vertex42.com/ExcelArticles/mc/MonteCarloSimulation.html>.

88. We used the @risk program for the Monte Carlo simulations.

input variable (assuming all other variables remain constant). The values in the X axis of Figures 4 and 5 quantify the change in the output variable due to +1 standard deviation change in each input variable. The figures show the values of the coefficients of each variable ranked according to their greatest impact on the output variable, that is, the sensitivity of the output variable to input variables.

The elasticity of income-yield in Figure 4 is 1, so there is a proportional increase in income related to an increase in crop yield. Income elasticity with respect to international price is 0.91; it is more inelastic than income elasticity with respect to yield. Income elasticity with respect to tariffs is even lower (more inelastic than the last), with a value of 0.03, where increases in the tariff generate low revenue growth.

Figure 5 shows that the consumer price is more sensitive to variations in international prices than to changes in tariffs. This is seen in the increasing value of the coefficient for the international price. Considering elasticity, the consumer–international price elasticity has a value of 0.91, while the consumer price–tariff elasticity is 0.03.⁸⁹ That is, the price is significantly more elastic to consumers from international price movements than to variations in the tariff rate, which is consistent with the previous analysis.

In summary, the modeling results show consistently high-income elasticity for changes in productivity, and lower elasticity for changes in the tariff level, considering a 15 percent tariff ceiling. On the other hand, international price variations seem to have a high potential impact on consumer prices.

89. In the simulation, changes in consumer prices are proportional to changes in farm income, hence the elasticities for consumer–international price and consumer price–tariff are the same as those for farm income–international price and farm income–tariff.

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