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Benefit-Cost Analysis

Costs and benefits of interventions to reduce post harvest losses and improve market access

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**ASSESSING THE COSTS AND BENEFITS OF GOVERNMENT
INTERVENTIONS TO MINIMIZE POST-HARVEST LOSSES AND
IMPROVE MARKET ACCESS OPPORTUNITIES, WHILE
TAKING INTO ACCOUNT TRANSPORTATION,
INFRASTRUCTURE, AND STORAGE ISSUES**

Haiti Priorise

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Abstract

Haiti's agricultural sector accounts for more than 25% of national GDP and employs over 60% of the available workforce¹. Yet local production covers about 43% of food needs; imports provide 51% and public aid 6%². This shows a significant reduction in local production, compared to the 1980s, when it provided more than 80% of food products consumed. This is a direct consequence of « the complete liberalization of agriculture by drastically reducing agricultural tariffs, eliminating nontariff barriers, and abolishing export taxes. » The result is a reduction of the average agricultural tariff to 4.5%. Previously it had been between 40% and 50%. To give a few specific examples, consider the current tariffs on the following products: rice and sugar: 3%, previously at 50%; chicken and pork meat: 5%, previously at 40%; bananas, eggs, and milk: 0%, previously at 50%.³

Despite the weak productive capacity of the agricultural sector, significant losses – estimated at more than 50%-60%⁴ of production – are recorded through the distribution chain. This is, amongst other things, the result of a lack of adequate infrastructure to facilitate market access for quality agricultural products.

Indeed, road networks in the countryside are severely lacking. Many regions with great productive capacity across the country are isolated and practically inaccessible during rainy seasons. The roads' state of disrepair means that a significant amount of products, especially fruits and vegetables, are spoiled on the spot, thus discouraging production of these crops.

It should also be noted that the lack of adequate storage infrastructure pressures farmers into selling their products immediately after harvest. This explains the large price fluctuations during the year and the entry of low quality products (notably fruits and vegetables) into the market (National Plan for Agricultural Investment, 2010).

Furthermore, the distribution of agricultural products relies on private middlemen, called 'madan sara'⁵, who buy them from producers and carry them to urban markets. Transportation used by the 'madan sara' is not adequate and presents very high risks.

As we can see, many and diverse constraints that hinder the profitability of the agricultural sector have been identified. However, this study will emphasize the following: transportation (30% loss

¹ MARNDR/FAO, Recensement général de l'agriculture 2010

² DÉVELOPPEMENT DES FILIÈRES ET RENFORCEMENT DES SYSTEMES DE COMMERCIALISATION, 2010

³ Politique de développement agricole 2010-2025

⁴ DÉVELOPPEMENT DES FILIÈRES ET RENFORCEMENT DES SYSTEMES DE COMMERCIALISATION, 2010

⁵ For more details on the « madan sara », see DÉVELOPPEMENT DES FILIÈRES ET RENFORCEMENT DES SYSTEMES DE COMMERCIALISATION, 2010

post-harvest)⁶, the lack of market infrastructure, and the lack of quality control systems and sorting and conditioning facilities.

The result is a rising dependence on foreign products – Haitians import approximately 50% of the food products they consume. This contributes to a reduction in farmers' income, their impoverishment, and the abandonment of agricultural areas for urban areas. This constant and growing migration towards urban areas puts pressure on current infrastructure, not intended for this number of people, and contributes in time to creating economically difficult and vulnerable living conditions in cities.

In order to stop this flow of people to urban areas and perhaps even reverse it, the Haitian government must put in place public policies that address recorded losses in the distribution of agricultural products, with an emphasis on interventions that can secure market access for these products. This can include measures to improve transportation conditions; create infrastructure for product conditioning; design and implement a quality control system; and encourage the development of agribusiness.

That said, two public policy interventions are proposed to support and improve marketing of agricultural products.

The first proposal will be to improve transportation of perishable and delicate products from the production area to the markets by making specialized trucks available to driver associations. This would reduce losses incurred by the “Madan Sara” during transportation between the production areas and the public markets, and increase their revenue. The intervention would also provide added value throughout the distribution chain.

The second proposed intervention consists of establishing a sorting, conditioning and preservation facility and developing a quality control system for producer associations in harvesting areas. A possible result would be an increase in producers' revenue.

For both of these interventions, the fruit and vegetable sector has been prioritized, and three important regions have been selected: the Saint-Raphael commune and the Sud and Artibonite departments.⁷

In terms of the first intervention, the benefits identified are a reduction in post-harvest losses and in the price of transportation for the ‘madan sara’. The identified costs are those related to acquiring specialized vehicles, raising awareness amongst beneficiaries, and improving transportation conditions. The calculation to determine the effectiveness of the intervention over a ten-year period will be based on present values of these indicators.

⁶ DÉVELOPPEMENT DES FILIÈRES ET RENFORCEMENT DES SYSTEMES DE COMMERCIALISATION, 2010

⁷ See the three documents on the micro-parks for the treatment, packaging and conservation of fruits and vegetables that were elaborated under the direction of the Ministry of Commerce and Industry (MCI), while highlighting the potential of these regions.

In terms of the second intervention, the benefit would be a reduction in post-harvest losses. The costs are those related to setting up and running the Sorting, Packaging and Conservation Center, and to putting a quality control system in place. The calculation to determine the effectiveness of the intervention over a ten-year period will be based on present values for these indicators.

Results from a cost-benefit analysis indicate that should the Haitian government undertake these two projects, the benefits recorded will more than proportionate to the costs. Tables 1 and 2 present results based on respective discount rates.

Indeed, if the government purchases specialized vehicles, for each gourde invested, agricultural production will gain 2.56 gourdes, 2.56 gourdes and 2.59 gourdes with discount rates of 3%, 5% and 12% respectively. The « madan sara » will gain these same amounts.

And if the government invests in the sorting, conditioning and preservation facility each gourde spent will bring back 1.18 gourdes, 1.19 gourdes and 1.24 gourdes with discount rates of 3%, 5% and 12% respectively.

Table 1: Benefits, costs, and cost-benefit ratio for proposed intervention 1

Intervention 1	Discount	Benefit	Cost	BCR	Quality of evidence
Improving the transportation of delicate and perishable products from the production areas to the markets by providing driver associations with specialized trucks.	3%	17,673,800,601.71	6,912,921,918	2.56	High
	5%	16,174,493,521.22	6,309,625,673.61	2.56	High
	12%	12,332,866,128.25	4,763,818,673.49	2.59	High

Amounts in gourdes

Table 2: Benefits, costs, and cost-benefit ratio for proposed intervention 2

Intervention 2	Discount	Benefit	Cost	BCR	Quality of evidence
Establishing a sorting, conditioning and preservation facility and developing a quality control system for the identified producer associations in harvesting areas.	3%	9,753,095,297.30	8,257,950,989	1.18	High
	5%	8,925,718,935.79	7,482,738,139	1.19	High
	12%	6,805,758,498.04	5,496,434,628	1.24	High

Amounts in gourdes

Policy abstract

Context

Post-harvest losses are relatively significant in developing countries in general, with a rate of about 40 to 50%.⁸ They are especially important in Haiti, where losses are evaluated at over 50% of production. These losses are due to a variety of causes including: the poor conditions in which ‘madan sara’, the principal middlemen, transport agricultural products to urban markets; the absence of market infrastructure; and the poor handling of these products.

The immediate consequences are the reduction in farmers’ income, their impoverishment, and the abandonment of agricultural areas for urban areas. This constant and growing migration puts pressure on current urban infrastructure, not intended for this number of people, and contributes in time to creating economically difficult and vulnerable living conditions in cities.

It’s important for the Haitian government to address these issues through public policies that aim to reduce Haiti’s dependence on imports (Haiti is a net importer), to promote the agricultural sector, and to add value throughout the marketing process, while also improving the exposition condition of products. This would reduce losses recorded by the “madan sara” during transportation between the production areas and the public markets, while increasing their revenue. It would also add value throughout the distribution chain as a whole.

In summary, building sorting, conditioning and preservation facilities will help to increase shelf life for delicate and perishable products et will ensure that the products is better presented to the consumer. This creates an added value for the product, the direct consequence of which is an increase in revenue for the farmer-producer.

Proposed Solutions

The first proposal will be to improve transportation of delicate and perishable products from their areas of production to the markets by making specialized trucks available to driver associations.

The second proposal will be to establish a sorting, conditioning and preservation facility and develop a quality control system for selected producer associations in harvesting regions.

Costs, Benefits and Benefit-Cost Ratio

If we hypothesize that the discount rate is 5%, we’ll have the possible outcome presented in the table below.

⁸ Identification of Appropriate Postharvest Technologies for Small Scale Horticultural Farmers and Marketers in Sub-Saharan Africa and South Asia – Part 1. Postharvest Losses and Quality Assessments.

Intervention	Discount	Benefit	Costs	BCR	Quality of Evidence
Improve the transportation of delicate and perishable products from the production areas to the markets by providing driver associations with specialized trucks.	5%	16,174,493,521.22	6,309,625,673.61	2.56	High
Establishing a sorting, conditioning and preservation facility center and developing a quality control system for the identified producer associations in harvesting areas.	5%	8,925,718,935.79	7,482,738,139	1.19	High

Amounts are in gourdes

Potential sources of revenue included in the plan:

The Public Treasury and Technical and Financial Partners (TFP) of the Haitian government.

Performance Indicators and Costs of Monitoring and Control

Intervention 1

We can use a number of indicators to evaluate this intervention. First off, long term indicators (impact indicators) will be: rate of reduction of post-harvest losses, rate of increase in farmers' incomes, rate of reduction of transportation costs for « madan sara. »

We are then planning to measure short-term results based on the amount of fruits and vegetables transported through specialized trucks.

Next, once the public intervention is completed, we will need to do an evaluation using the following indicator: number of trucks distributed to driver associations.

In order to track the implementation of the intervention, a good indicator will be the amount of fruits and vegetables available in urban markets.

Intervention 2

Long-term indicators (impact indicators) will be: rate of reduction of post-harvest losses, rate of increase in farmers' incomes.

Short-term results will be measured by the amount of fruits and vegetables being processed in the sorting, conditioning and preservation facility.

Next, once the public intervention is completed, we will need to do an evaluation using the following indicator: number of sorting, conditioning and preservation facilities built.

In order to track the implementation of the intervention, a good indicator will be the amount of fruits and vegetables available in urban markets.

Potential Implementation Partners

Haitian Ministry of Commerce and Industry, Haitian Ministry of Agriculture, Natural Resources and Rural Development (MARDNR), driver associations, Technical and Financial Partners (TFP) of the Haitian Government

Calendar (launch date and main stages)

- 1) Proposal to include the intervention project in the Public Investment Program (PIP): July 2017
- 2) Drafting of a project document to carry out the work relating to the integration of the clause: August 2017
- 3) Validation of the document and of granting of credit in the PIP 2017-2018: August 2017
- 4) Project Execution: December 2017- July 2018
- 5) Implementation of the included clause: October 2018

Threats to Implementing the Intervention

- Delay in approval for the project that includes the interventions
- Change in the government leader and thus a change in priorities
- Delay in acquiring equipment
- Non-appropriation of the project by potential stakeholders

Justification for public intervention

Benefits of Intervention 1

- Reduction in post-harvest losses
- Reduction in transportation costs for 'madan sara'

Benefits of Intervention 2

- Reduction in post-harvest losses

Description of Beneficiaries

- The direct beneficiaries are local firms.

Benefits not measured

- Number of jobs created
- Increase in producers' revenue
- Reduction of imports
- Agricultural land consolidation
- Development of the agro-industrial sector
- Stock availability of delicate and perishable products, no matter the season

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Introduction

The amount of loss of agricultural products recorded throughout the distribution chain (production zone to public market) is significant, estimated at more than 50 to 60% of the quantity produced. This is due to a badly organized distribution chain. Indeed, there are no adequate storage areas, no sorting or conditioning facilities, and the conditions in which the main middlemen between the producer and the consumer (the 'madan sara') transport the products are not modern and very risky.

This is a result of a lack of investment in the agricultural sector. According to a national survey on commercial and production enterprises (Le Recensement National des Entreprises de Production et de Commerce), approximately 75% of companies are involved in commerce (buying and selling). Less than 50 companies participate in agribusiness. This is a result of an opening of markets that began in 1987 and was accentuated between 1994 and 1996. Trade agreements were not made in favor of local industries in general and of the agricultural industry in particular, and local businesses were not able to stand up to international competition.⁹ Having lost their competitiveness, most local businesses that were involved in the agricultural/ agro-industrial sectors retreated.

Furthermore the agricultural sector is greatly plagued by risks tied to natural disasters, epidemics and a lack of infrastructure. Not to mention the absence of proper credit and credit insurance, and the lack of organization within the distribution chain, all of which discourages economic agents from participating in the sector.

That said, government intervention is needed to organize and put in place the infrastructure necessary to promoting investment in this industry, which we know employs two thirds¹⁰ of the population.

⁹ PLAN NATIONAL D'INVESTISSEMENT AGRICOLE, 2010

¹⁰ Results from the « Enquête Nationale d'Estimation de la Production Agricole », 2014 (a national survey on agriculture)

Consequently, the absence of market and transportation infrastructure, related to a lack of adequate investment¹¹ (as highlighted in the previous paragraph), constitutes an obstacle to the development of the industry, and creates a situation in which the Haitian economy is dependent on imports (Haiti is a net importer).¹²

Haitians import approximately 50% of foodstuffs consumed, which then contributes to a reduction in farmers' income, their impoverishment, and the abandonment of agricultural areas for urban areas. This constant and growing migration towards urban areas puts pressure on current urban infrastructure, not intended for this number of people, and contributes in time to creating economically difficult and vulnerable living conditions in cities.

In order to stop this flow of people to urban areas and perhaps even reverse it, the Haitian government must put in place public policies that address recorded losses in the commercial distribution of agricultural products, with an emphasis on interventions that can insure market access opportunities for these products. This can include measures to improve transportation conditions, create infrastructure for better product conditioning, implement a quality control system, and encourage the development of agribusiness.

The Haitian Ministry of Agriculture, Natural Resources and Rural Development (MARDNR) has access to a sizeable budget, and the Ministry of Commerce and Industry's budget has been increased over the past five years, yet steps taken to facilitate the commercial distribution of agricultural products have not been fruitful. In addition, in the document outlining the government's main strategic directions at the national level, modernizing agriculture was presented as one of the main goals for the first three years (2014-2016). But according to the Haitian Strategic Plan for Development (PSDH)¹³ status report, the results have yet to be seen.

In the present case, the emphasis will be on market access conditions for delicate and perishable products from the major production zones. We need to define the actions that need to be taken to: improve transportation of these products to the markets; insure stock availability no matter

¹¹ PLAN NATIONAL D'INVESTISSEMENT AGRICOLE, 2010

¹² Fourth United Nations Conference on Least Developed Countries, May 2011, Istanbul, Turkey

¹³ Plan Stratégique de Développement d'Haiti (PSDH)

the season; build sorting, conditioning and preservation facilities; develop a quality control system to improve the added value of the product throughout the distribution chain.

The study plans to evaluate two possible interventions to address this problem. One will focus on transportation issues faced by the middlemen (the madan sara) and the other will concentrate on product conditioning.

In order to measure the effectiveness of each gourde spent as a part of this intervention, we will conduct a Cost-Benefit Analysis (CBA). This will allow us to evaluate the impact of these two interventions.

First off, the work starts with a review of the relevant literature in order to better understand and discuss this initiative. We will conduct this review while highlighting the ways in which the implementation of sorting, conditioning and preservation facilities and the amelioration of transportation conditions can contribute to a reduction in post-harvest losses. We will then give an overview of the Cost-Benefit Analysis approach, and the reasons for using this approach. Next, we will set the analytical framework for this intervention.

And lastly, the focus will be on results obtained from the CBA to assess as accurately as possible the impact that this intervention could have on the Haitian economy.

Literature Review

Local production covers about 43% of food product needs in Haiti, so imports provide more than 50% of foodstuff consumed, creating a situation in which Haiti is dependent on imports. This is due in part to the agricultural sector's low production capacity even whilst contributing to 25% of GDP and employing two thirds of the working population. ¹⁴

Yet although production is low, an enormous amount of losses, related to structural constraints, are recorded in the commercial distribution of these products. These constraints represent obstacles to promoting the agricultural industry and contribute to reducing revenue for farmers, whose only option then is to abandon agricultural areas.

Essentially, the main constraints and problems that affect the different agricultural sectors are, amongst others: few roads and roads in bad shape; less than 5% of rural households having access to paved roads;¹⁵ lack of market infrastructure allowing for proper preservation of agricultural products, which are perishable products; poor transportation conditions; and lack of proper product handling, which accelerates the deterioration of the products and reduces their economic value.

We should also note the absence of a quality control system. This is the result of weak Haitian institutions. Indeed, there are serious shortcomings in terms of legal and regulatory frameworks, which have not changed in over half a century. Most of the laws are outdated or incomplete.

Not to forget problems linked to product handling and packaging, which affect the quality of fruits and vegetables when they arrive on the market.

These and many other issues have a serious impact on the agricultural sector in Haiti, affecting all of its activities, be it crop production, poultry farming, breeding...

¹⁴ Plan national d'investissement agricole, 2010

¹⁵ DÉVELOPPEMENT DES FILIÈRES ET RENFORCEMENT DES SYSTEMES DE COMMERCIALISATION, 2010

Crops are present on more than 95% of farmland. ¹⁶Fruits and vegetables account for 25% of crops and are present in large quantities in the area of Kenscoff, and in the Nord, Artibonite and Sud departments¹⁷. The areas selected to launch the two interventions are the St Raphael commune, and the La Vallée de l'Artibonite locality, and the Sud department. ¹⁸

These products, having a relatively short shelf life, cannot be preserved following standard norms to be carried to consumers in the best of conditions. Losses in the distribution chain are tremendous.

Because of this, it's important to look for a solution for distributing these delicate and perishable products, particularly fruits and vegetables.

In the case of this study, the focus will be on improving the transportation system and putting in place a conditioning center in order to have the desired impact. Indeed in Haiti, many projects financed by the government were developed with the aim of reducing post-harvest losses, particularly fruits and vegetables. In 2013, with the aim of better marketing fruits and vegetables in Kenscoff, the government established a sorting, conditioning and preservation facility there and provided it with specialized trucks.

Other attempts have been made by the Haitian government as part of an effort to build agro-industrial micro-parks, some of which should be specialized in the conditioning of products bought from the producers.

Furthermore, the national plan for agricultural investment, released in 2010, emphasizes that support for the 'madan sara' - ensuring better packaging and storage conditions, improving transportation conditions to reduce losses at the time of delivery - would be effective.

¹⁶ SYNTHÈSE NATIONALE DES RÉSULTATS DU RECENSEMENT GÉNÉRAL DE L'AGRICULTURE (RGA), 2008-2009

¹⁷ SYNTHÈSE NATIONALE DES RÉSULTATS DU RECENSEMENT GÉNÉRAL DE L'AGRICULTURE (RGA), 2008-2009

¹⁸ See the three documents on the micro-parks for the treatment, packaging and conservation of fruits and vegetables that were elaborated under the direction of the Ministry of Commerce and Industry (MCI), while highlight the potential of these regions.

This same document also stresses the need to develop modern processing facilities for agricultural products and the construction of mini industrial parks.

In addition, other projects have demonstrated the importance of improving transportation and packaging in order to ensure better marketing of the products. Indeed, transporting the product should include monitoring both temperatures and the way in which the merchandise is stacked (to facilitate air flow). The vehicle must also be equipped with a refrigeration system for certain products and the quality of boxes used. It's important to stress that packaging goes a long way to market the product while also reducing damage (Victor Kiaya, 2014).

A study on market gardening¹⁹ in Haiti stresses the need to improve the transportation system, and to reinforce organizational structures for group marketing from collection centers to facilitate post-harvest operations.

In addition, a support project as part of the Taiwan-Haiti cooperation, underlines that putting the conditioning facility in place, would result in a 15% reduction in losses related to the traditional system of processing fruits and vegetables.

And in terms of transportation, a study conducted by SOLAAL²⁰ in France shows that a better transportation system would lower recorded losses from 30% to 9% for delicate and perishable products like fruits and vegetables.

Establishing a center for activities linked to stocking agricultural products, as well as taking steps to transform and improve the transportation system (specialized trucks provided to driver associations) will enable us to better develop current production and reduce post-harvest losses, with a direct impact on food security.²¹

¹⁹ *Filière des cultures maraichère et opportunités pour un crédit sécurisé*, Système de Financement et d'Assurances Agricoles en Haïti

²⁰ SOLIDARITÉ DES PRODUCTEURS AGRICOLES ET DES FILIÈRES ALIMENTAIRES

²¹ PLAN NATIONAL D'INVESTISSEMENT AGRICOLE, 2010

Therefore, a reduction in post-harvest losses as well as a reduction in transportation costs for the 'madan sara', can be seen as benefits to the first intervention seeking to improve transportation.

The costs incurred for this intervention will be: the cost of acquiring specialized vehicles, the cost of awareness-raising activities, and the cost of transportation.

And in terms of the second intervention, the benefit is a reduction in post-harvest losses. The identified costs are: the costs of acquiring and then running the sorting, conditioning and preservation facility, and the costs of implementing a quality control system.

As highlighted within this project, a reduction in post-harvest losses will be used as an advantage.

Post-harvest loss can be defined as the decline in both quantity and quality of food products from harvest to consumption. Losses in quality include those that affect the nutritional and caloric value, and the acceptability and edibility of a given product. These losses are generally more common in developed countries. Losses in quantity refer to losses in the amount of a product. These are more common in developing countries (Victor Kiaya, 2014).

Loss reduction is calculated using the following formula:

$$\text{PHL}^{22} = \text{Total amount of post-harvest loss} * \% \text{ post-harvest losses attributed to transportation/packaging} * \% \text{ production affected by the intervention (specialized trucks)} * \% \text{ production actually preserved after removing losses linked to the improved system} * \text{market price of the targeted agricultural product}$$

Defining the Counterfactual Scenario

As part of this analysis, the starting assumption is that the status quo is maintained. The Haitian government continues to invest in the agricultural sector without targeting market access opportunities. This situation will be compared to one in which the Haitian government intervenes by putting in place a modern transportation system and building adequate market infrastructure.

²²Post Harvest Loss

To reduce post-harvest losses and lower transportation costs for the « madan sara », we will need to do some calculations on the costs and benefits identified in the table.

Measuring the impact

Indeed, in order to analyze the efficiency and efficacy of the proposed public policies, the Cost-Benefit Analysis is, amongst the different tools used, the one that can allow us to: evaluate returns on investment for different projects/programs/public policies; and see which project/program/policy brings the most benefits relative to resources invested.

Moreover, the CBA, if used both as an evaluation and planning tool, will aim to answer the following questions: has the intervention produced the desired change with the amount of resources invested? Would it be possible to generate more benefits with the same resources but a different approach? Should we, in the future, seek to improve the intervention approach instead of choosing an entirely different approach? (Olivier Vardakoulis, 2014)

So the CBA measures the Net Present value of project flows. The steps are relatively simple:

- 1) Identifying results
- 2) Quantification of raw results
- 3) Measuring input and the counterfactual
- 4) Quantification of the impact (net results)
- 5) Monetization of impacts
- 6) Cash flow analysis and actualization

Based on this approach, we've identified the analytical framework presented in the following table:

Table 1: Summary of the Methodology

Benefits	Intervention – Expected Result	Approach for determining the value of the intervention
Reduction in post-harvest losses	A 9% reduction in losses recorded in the distribution chain of delicate and perishable products by improving the transportation system	Empirical data from madan sara
Reduction in post-harvest losses	A 15% reduction in recorded losses in the distribution chain of delicate and perishable products	Statistics based on other pilot programs implementing sorting, conditioning and preservation facility
Costs of Intervention 1	Private or Public	Method of quantification of costs
Cost of acquiring specialized vehicles	Public	Empirical data on costs from suppliers
Cost of transportation, per tonne of agricultural products destined for the markets	Private	Empirical data on costs reported from transportation actors
Costs of Intervention 2	Private or Public	Method of quantification of costs
Cost of setting up the sorting, conditioning and preservation facility	Private	Empirical data on costs collected from reports of similar projects by the MCI
Cost of implementing the quality control system	Private	Empirical data on costs collected from reports of similar projects by the MCI
Costs of running the sorting, conditioning and preservation facility	Private	Empirical data on costs collected from reports of similar projects by the MCI

Table 2: Indicator values

Indicator	Value
Length of project	10 years
Productive capacity of the center	6000 tonnes per month
Surface area occupied by perishable products (fruits and vegetables)	24.5% of agricultural land
Cost of production per tonne (in gourdes)	22, 641.00
Volume of production consumed without the intervention	250,000 tonnes per year
Contribution of the agricultural sector to GDP without the intervention	20%
Contribution of the agricultural sector to GDP with the intervention	28%
Rate of loss linked to the absence of a quality conditioning	15%
Post-harvest loss rate	50%
Length of project	10 years
Loss attributed to new system of conditioning	3%
Market price per metric tonne in 2013	31,737.60
Average production per metric tonne	430,000.00
Production capacity of the center per zone	6000 tonnes per month
Cost of implementing the quality control system in 2013	7,000,000.00
Cost of running the center in 2013 per metri tonne	3,084.98

Amounts are expressed in gourdes

Calculating Costs and Benefits

As outlined in the methodology description above, we need to identify benefits of the project. For intervention 1, the benefits are: a reduction in post-harvest losses and in transportation costs for the 'madan sara'. The costs are those related to: acquiring specialized vehicles, raising awareness, and international transportation.

For intervention 2, the benefit is the reduction in post-harvest losses. The costs are those related to: acquiring and running the sorting, conditioning and preservation facility, and implementing a quality control system.

The analysis will cover a ten-year period to follow the change in variables, and three discount rates (3%, 5%, 12%) are taken into account for the study. We've used the CBA approach in order to estimate the impact of implementing the two interventions. And after updating the different indicators, we've gotten a rather satisfactory result for each discount rate.

Indeed, if the government purchases specialized vehicles, for each gourde invested, agricultural production will gain 2.56 gourdes, 2.56 gourdes and 2.59 gourdes with discount rates of 3%, 5% and 12% respectively. The « madan sara » will gain these same amounts.

And if the government invests in the sorting, conditioning and preservation facility, each gourde spent will bring back 1.18 gourdes, 1.19 gourdes and 1.24 gourdes with discount rates of 3%, 5% and 12% respectively.

Admittedly, in terms of the second intervention, returns are relatively low in relation to the benefits identified. But the government should encourage any activity that develops national production, and food production in particular, as it's important to guarantee food security for the population as a whole. In addition to the benefits identified, the impacts that will follow are important.

First of all, the implementation of the sorting, conditioning and preservation facility will improve the quality of products and thus increase their selling price, which will mean an increase in producers' revenue. There are two reasons for this. Firstly, the product's value is increased and

secondly, there are fewer losses. In addition, it will be possible to sell these higher quality products to hotel chains and restaurants, which will contribute to a reduction in fruit and vegetable imports on the Haitian market. Not to forget the possibility of exporting to the Caribbean market.²³

Besides, the improvement of post-harvest activities, and particularly storing conditions, as well as the development of better transportation conditions, will further develop fruit and vegetable production, and thus will reduce post-harvest losses. The result is an increase in the efficiency and productivity of farmer-producers, the immediate result of which is an increase in food availability. This will have important effects on food security and will contribute to the reduction of imports.

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The tables below provide a recapitulation of the cost-benefit ratios.

Intervention 1	Discount	Benefit	Cost	BCR	Quality of evidence
Improving the transportation of delicate and perishable products from the production areas to the markets by providing driver associations with specialized trucks.	3%	17,673,800,601.71	6,912,921,918	2.56	High
	5%	16,174,493,521.22	6,309,625,673.61	2.56	High
	12%	12,332,866,128.25	4,763,818,673.49	2.59	High

Amounts in gourdes

Intervention 2	Discount	Benefit	Cost	BCR	Quality of evidence
Establishing a sorting, packaging, and conservation center and developing a quality control system for the identified producer associations in harvesting areas.	3%	9,753,095,297.30	8,257,950,989	1.18	High
	5%	8,925,718,935.79	7,482,738,139	1.19	High
	12%	6,805,758,498.04	5,496,434,628	1.24	High

Amounts in gourdes

²³ PLAN NATIONAL D'INVESTISSEMENT AGRICOLE, 2010

²⁴ PLAN NATIONAL D'INVESTISSEMENT AGRICOLE, 2010

Conclusion

One of the main issues faced by participants in the agricultural sector is the set of constraints tied to marketing the products. The direct consequence of this is a decrease in revenue and an increase in consumer goods imports. Consequently, the study has shown that the improvement of transportation conditions and the implementation of sorting, conditioning and preservation facilities would be a major asset to reducing post-harvest losses and transportation costs of the 'madan sara' and to increasing producers' revenue.

Indeed, by using the CBA approach, we were able to assess the positive impact that these interventions could have on the agricultural sector. Indeed, if the government purchases specialized vehicles, for each gourde invested, agricultural production will gain 2.56 gourdes, 2.56 gourdes and 2.59 gourdes with discount rates of 3%, 5% and 12% respectively. The « madan sara » will gain these same amounts.

And if the government invests in the sorting, conditioning and preservation facility, each gourde spent will bring back 1.18 gourdes, 1.19 gourdes and 1.24 gourdes with discount rates of 3%, 5% and 12% respectively.

The ability to properly store products will allow the 'madan sara' to keep unsold items and sell them at a later date, as opposed to throwing them away. Losses will be reduced while revenue will increase. Furthermore, with a better system de conditioning, the value of products will increase, as will revenue for both the 'madan sara' and the producers. The overall effects will be an increase in the production of fruits and vegetable for the local population, which will lead to a reduction in imports, and an increase in the agricultural sector's contribution to GDP.

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Haiti faces some of the most acute social and economic development challenges in the world. Despite an influx of aid in the aftermath of the 2010 earthquake, growth and progress continue to be minimal, at best. With so many actors and the wide breadth of challenges from food security and clean water access to health, education, environmental degradation, and infrastructure, what should the top priorities be for policy makers, international donors, NGOs and businesses? With limited resources and time, it is crucial that focus is informed by what will do the most good for each gourde spent. The *Haiti Priorise* project will work with stakeholders across the country to find, analyze, rank and disseminate the best solutions for the country. We engage Haitians from all parts of society, through readers of newspapers, along with NGOs, decision makers, sector experts and businesses to propose the best solutions. We have commissioned some of the best economists from Haiti and the world to calculate the social, environmental and economic costs and benefits of these proposals. This research will help set priorities for the country through a nationwide conversation about what the smart - and not-so-smart - solutions are for Haiti's future.



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