

Profitability and Competitiveness of the Mango Sector in Ivory Coast

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Abstract

The aim of this study is to assess the profitability and competitiveness of the main actors in the mango sector in Ivory Coast. To achieve this, [Monke and Pearson \(1989\)](#) Policy Analysis Matrix (PAM) is used to analyze data collected from surveys carried out from October to November 2022 in the Korhogo department. The results show that the various links in the value chain studied are financially and economically profitable. In addition, the mango value chain presents a comparative advantage for the locality studied and the nation of Ivory Coast. However, the country is not yet reaping the full benefits of these foreign exchange gains, given the high rate of post-harvest losses (between 30% and 40%) and the low level of production and exports due to fruit flies. Therefore, to improve the profitability and competitiveness of the mango sector, development policies need to focus on exempting the main actors from various taxes and reducing export customs duties, value-added taxes and capital taxes, which are the main distortions.

Keywords: Mango; Profitability; Competitiveness; MAP; Korhogo; Ivory coast.

1. Introduction

In Ivory Coast, as elsewhere in sub-Saharan Africa, agriculture plays an important role in development policies ([UNCTAD, 2016](#)). On the one hand, through food crops, it helps to achieve food self-sufficiency, and on the other, through export products, it raises the level of the economy ([Kouakou, 2023](#)). Ivory Coast's agricultural sector accounts for 22% of gross domestic product (GDP), more than 3/4 of non-oil exports and provides jobs for 2/3 of households, with cash crops such as coffee, cocoa, rubber and oil palm in forest areas, as well as cotton and recently cashew nuts and mangoes in savannah areas ([Minader, 2017](#)).

Speaking specifically of mango, the first orchards were created between 1865 and 1910 with West Indian varieties commonly known as Gouverneur and Amélie ([PACIR, 2013](#)).

For a long time, mango was only harvested, but since 1981, when it was first exported to the French market, it has become the third most important cash crop in northern Ivory Coast, after cotton and cashew nuts. From 71 tons exported in 1981, Ivory Coast's mango exports have risen from 1,079 tons in 2011 to 3,143 tons in 2019. As a result, mango is the third most important fruit exported by Ivory Coast, after pineapple and banana. Spearheading fruit diversification, Ivory Coast has more than 16,000 hectares of orchards spread across the country's mango-growing regions.

Mango cultivation directly employs 5579 growers. For the 2019 season, the sector has distributed more than seven billion CFA francs to producers and other actors in the value chain. Ivory Coast is Africa's leading exporter and the world's third-largest supplier of mangoes to the European market ([Douan, 2022](#)).

However, concerns about perishability and vulnerability to pests and diseases, such as fruit flies (a pest subject to quarantine) and anthracnose, are having consequences that are still not improving the competitiveness of the sector ([Van and Buschmann, 2013](#)). Downward fluctuations and sharp depreciations in the currencies of the main mango exporting countries against the US dollar have had a negative impact and hampered trade ([ITC and Ecowas, 2011](#)).

In addition, in the mango sector, Ivorian exports are caught between climatic and commercial problems and quality problems that damage its brand image ([USAID et al., 2017](#)). Local demand is very high, but according to [Seydou \(2012\)](#), the very high cost of transport and high profit margins due to the many intermediaries and road hassles are partly responsible for the country's poor mango coverage. Distribution within the country is poorly organised and many regions of the country almost never consume mangoes from the North because of their excessive prices. Mango is distributed and marketed mainly in urban centres ([FIRCA, 2017](#)).

The general objective of this study is to assess the profitability and competitiveness of the main actors in the Ivory Coast mango sector.

Specifically, the aim is to

- determine the costs of producing and exporting mangoes in areas of high mango production;
- estimate the various profitability and competitiveness indicators for the production and export of this cash crop.

2. Methods

2.1. Data Collection Method

The criterion for choosing the area was the importance of mango production in the locality. On this basis, the department of Korhogo in Ivory Coast was chosen. Information was collected between October and November 2022, using direct observation, a questionnaire and an interview guide. The population of this study is essentially made up of mango producers and exporters. A sample of two hundred and twenty-five (225) stakeholders in the sector was drawn up on the basis of the number of stakeholders to be surveyed per zone, chosen in proportion to the number of agricultural workers and calculated according to the following formula:

$$Xi = \frac{n \cdot ni}{N} ;$$

Où :

Xi = number of stakeholders to be surveyed per study area ;

n = sample size ;

ni = number of actors per study area ;

N = total number of actors in the study area ;

$\frac{n \cdot ni}{N}$ = relative frequency.

The number of actors surveyed by function is shown in [Table 1](#).

Table-1. Number of stakeholders surveyed by function in the study area.

Actors	ni (actors or agricultural units listed)	ni/N	n.ni/N	Xi (Stakeholders or agricultural units surveyed per site)
Producers	2,050	0.953	205.00	205
Exporters	200	0.047	20.00	20
TOTAL	2,250	1.000	215	225

Source: Survey, 2022

2.2. Data Analysis Method

2.2.1. Policy Analysis Matrix (PAM)

The Policy Analysis Matrix (PAM), developed by Monke and Pearson (1989), was used to analyse data relating to the mango sector.

It can be used to assess the impact of agricultural policies on the sectors, while estimating the effects of government disengagement or intervention on the sectors. It can also be used to better quantify the effects of sectoral interventions by public authorities, and to take into account the equity dimension, i.e. the distribution of income and profits between actors.

The Policy Analysis Matrix (PAM) is made up of two types of budget: one assessed at market or financial prices (financial budget) and the other at opportunity costs or economic prices (economic budget). Before the budget is designed, all inputs are classified as tradable or non-tradable goods.

[Tables 2](#) and [3](#) present the Policy Analysis Matrix (PAM) model and measurement indicators respectively.

Table-2. Policy Analysis Matrix (PAM)

	Products	Costs		Profits
		Exchangeable inputs	Non-exchangeable inputs	
Market prices	A	B	C	D
Reference price	E	F	G	H
Divergence	I	J	K	L

Note that: A, B, C and D are the elements of the financial budget; E, F, G and H are those of the economic budget; I, J, K and L are the differences between the financial budget and the economic budget; D (Private (or financial) profit) =A-B-C; H (Social or economic profit) =E-F-G; I (Transfer of income) =A-E; J (Transfer of tradable inputs) =B-F; K (Transfer of domestic factors) =C-G; L (Net transfer) =D-H-I-J-K.

Source: [Monke and Pearson \(1989\)](#).

Table-3. Measurement indicators for the MAP Policy Analysis Matrix

1. Financial profitability	$[D = A - B - C]$
2. Financial cost-benefit ratio	$[FCBR = C / (A - B)]$
3. Economic profitability	$[H = E - F - G]$
4. Cost in Domestic Resources	$[CDR = G / (E - F)]$
5. Economic cost-benefit ratio	$[ECBR = (F + G) / E]$
6. Transfers	$[L = I - J - K]$
7. Nominal Protection Coefficient	$[NPC = A / E]$
8. Effective Protection Coefficient	$[EPC = (A - B) / (E - F)]$
9. Coefficient of Overall Profitability	$[COP = D / H]$
10. Subsidy Rate Producer	$[SRP = L / E]$
11. Producer Subsidy Equivalent	$[PSE = L / A]$

Source: Monke and Pearson (1989)

2.2.2. Determining Financial and Economic Prices

The financial price is the price at which the producer sells his product. For the trader, the financial price is the price at which he sells his merchandise for export.

The economic price is the price of the mango as received by the wholesaler on the one hand and the exporter on the other. It was calculated on the basis of the producer price by adding to the latter the various costs incurred from the field to the wholesaler and from the wholesaler to the exporter (customs duties, transport costs).

2.2.3. Estimating Production Costs and Physical Quantities

The cost of the various cultivation operations (clearing, sowing, weeding) was calculated on the basis of wage labour costs obtained from growers. The area-weighted average was used as the opportunity cost of labour per hectare.

2.2.4. Calculation of Input Costs

The financial price of inputs used in mango production is the current price, i.e. the market price. The economic price of tradable inputs (herbicides) is the CIF price (cost, insurance, freight) of these goods. These prices were obtained by deducting the relevant taxes from the financial price. The tradable inputs in the case of this study are: the sprayer, the herbicides, the harnessed plough, the small tools (the tape measure, the pickaxe, the shovel, the machete, the wheelbarrow, the rake, the daba, the file, etc.). The depreciation method used is the straight-line method. The cost of the tools used, as well as their useful life and number, are obtained directly from the producers. As for the cardboard boxes used to package the mangoes, the cost per ton has been accounted for in full because they are non-returnable packaging for the exporters.

3. Results and Discussion

3.1. Measuring the Financial and Economic Profitability of Mango Producers

3.3.1. Policy Analysis Matrix (PAM) for Mango Production

Table 4 presents the MAP for the mango production system in the Korhogo department

Table-4. MAP of mango production in CFA Francs/ha

Indicators	Revenue	Exchangeable factors	Non-exchangeable factors	Profits
Financial Price	A 345,000	B 71,083	C 252,417	D 21,500
Economic Price	E 390,000	F 38,850	G 226,750	H 213,650
Transfers	I -45,000	J 32,233	K 114,917	L -192,150

Source: Survey, 2022

Mango production is financially profitable. The financial profit per ha is 21,500 FCFA. This profit is distributed throughout the value chain among the various players.

Furthermore, the economic profitability (213,650 FCFA) means that the value chain contributes to the community's economic growth despite post-harvest losses. Analysis of transfers shows that tradable factors are taxed as much (32,233 FCFA) as non-tradable factors (11,4917 FCFA).

For a more detailed assessment, the various MAP indicators were estimated (Table 5).

Table-5. Indicators for analysing MAP results

Indicators	Formulas	values
Financial profit FCFA /ha	$[D=A-B-C]$	21,500
Economic profit FCFA /ha	$[H=E-F-G]$	213,650
Net transfers FCFA /ha	$[L=I-J-K]$	-192,150
Cost Financial Profit Rate	$[C/(A-B)]$	0.92
Internal Resource Costs (IRC)	$[G/(E-F)]$	0.39
Effective Protection Coefficient (EPC)	$[(A-B)/(E-F)]$	0.78
Nominal Protection Coefficient (NPC)	$[NPC=A / E]$	0.88

Source: Survey, 2022

The financial profit (D) shows that the mango production function is financially profitable with $D = 21,500$ FCFA/ha. Mango production is a profitable activity for producers in the Korhogo department.

The Cost-Benefit-Financial Ratio (0.92) is less than 1, so the income from mango production is well in excess of the expenses incurred. Producers are using their resources efficiently in this activity.

These figures therefore indicate that any intention to invest in the mango production system in the study area should be encouraged.

The economic profit is positive and equal to 213,650 FCFA/ha. Mango production therefore contributes to the economic growth of the Korhogo department. The Internal Resource Cost (IRC), equal to 0.39, is less than 1. Mango production in the department has a comparative advantage. In addition, the social costs of production are lower than the net income for the local community.

In addition, mango production has an Effective Protection Coefficient (EPC) of 0.78 and less than 1. Producers are therefore not exempt from taxes and have no incentive to produce. Similarly, the production system has a negative net transfer. In this case, producers are disadvantaged and suffer an implicit tax (Agrinatura, 2018).

Finally, the Nominal Protection Coefficient (0.88) less than 1, shows that producers are not protected by the current agricultural policy in Ivory Coast. These results are in line with those of Kouakou (2018a), in a study applying the Policy Analysis Matrix and analysing the competitiveness of the cotton sector in Ivory Coast.

3.2. Measuring the Financial and Economic Profitability of Mango Exports

3.2.1. Policy Analysis Matrix (PAM) for Mango Exports

Table 6 presents the MAP for mango exports.

Table-6. Mango export MAP in CFA Francs/ton

Indicateurs	Revenues	Exchangeable factors	Non-exchangeable factors	Profits
Financial Price	A 1,365,000	B 92,400	C 386,107	D 886,493
Economic Price	E 1,265,000	F 18,250	G 371,507	H 875,243
Transfers	I 100,000	J 74,150	K 14,600	L 11,250

Source: Survey, 2022

Analysis of the results in Table 6 shows that mango exports are financially profitable. The financial profit per tonne is 886,493 FCFA. This profit is distributed throughout the mango season among the various export stakeholders.

In addition, mango export is economically profitable, with an economic profit of 875,243 FCFA per tonne. This activity thus contributes to the economic growth of the Korhogo department.

However, there is a transfer of financial flows from the rest of the economy to the marketing function. This flow is equivalent to 11,250 FCFA/ton.

Table 7 presents the MAP analysis indicators for mango exports from Korhogo department.

Table-7. Indicators for analysing MAP results for mango exports

Indicators	Formulas	Values
Financial Profit (FCFA/ton)	$[D=A-B-C]$	886,493
Economic Profit (FCFA/ton)	$[H=E-F-G]$	875,243
Net Transfers(F CFA/ton)	$[L=I-J-K]$	11,250
Financial Cost/Income Ratio	$[C/(A-B)]$	0.30
Cost of Internal Resources (CIR)	$[G/(E-F)]$	0.29
Effective Protection Coefficient (EPC)	$[(A-B)/(E-F)]$	1.02
Nominal Protection Coefficient (NPC)	$[NPC=A/E]$	1.08

Source: Survey, 2022

The financial profitability of mango exports is positive. The export link generates a financial profit equal to 886,493 FCFA/ton. What's more, the financial cost-benefit ratio (0.30) is less than 1. So the revenue from mango exports is much higher than the expenditure incurred. The financial profit is greater than the economic profit, so the Ivorian nation is transferring income to the exporters. Moreover, even though exporters create wealth for the community, they arrogate more wealth to themselves than they create. The mango export sector is economically profitable. It generates a positive economic profit of around 875,243 FCFA/ton for exporters in the Korhogo department. In addition, the Internal Resource Cost (0.29) is less than 1. The mango export sector is therefore consolidating a comparative advantage. Nevertheless, the Domestic Resource Cost (DRC) is close to 1, indicating that the comparative advantage of the mango export sector is not very high. The net transfer is equal to 11,250 FCFA /ton. Exporters benefit from an implicit subsidy and joint protection on the export selling price of mangoes and on tradable factors (weighing scales, cartons, etc.). This economic policy measure is confirmed by an Effective Protection Coefficient (EPC) that is slightly higher than 1. The study carried out by Kouakou (2018b) on the analysis of the competitiveness of the cashew nut sector in Ivory Coast confirms these assertions.

4. Conclusion

The overall aim of this study is to analyse the profitability and competitiveness of the mango sector in Korhogo department using the Policy Analysis Matrix (PAM). The results show that the two main functions are financially and economically profitable. The mango sector is competitive, with a high degree of variation between players in the study area. The producer market is unprotected, while the exporter market receives an implicit subsidy from the state, albeit a small one. In addition, the mango sector presents a comparative advantage for the locality studied and the Ivorian nation.

Given the constraints still facing mango industry players, the study concludes that the following actions should be considered to make them more competitive. These include

- Encouraging production by exempting the main actors from various taxes.
- Reducing export customs duties, value-added taxes and capital taxes, which are the main distortions.

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