

Analysis of rice farming competitiveness in Cote d'Ivoire: An application of Policy Analysis Matrix (PAM)

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Abstract

The aim of this study is to determine the improvement factors of rice farming sector's competitiveness in Côte d'Ivoire. The Policy Analysis Matrix (PAM) methodology was used to determine the Competitiveness based on one hand on a sample of rice farmer's areas and on the other hand on the consolidation of data relative to rice farming issues. As a whole, 190 actors have been chosen at random in four municipalities in the regions of Agneby-Tiassa and Loh-Djiboua which are: Tassalé, N'douci, Divo, Sikensi. These actors were distributed as follows: 100 farmers, 40 processors, and 50 traders. The basic data have been collected through a structured questionnaire phase, per category of actor. The second part of data has been especially collected from Technical services of the agricultural ministry, research offices and supervision. From the results, it emerges that the domestic rice sector is competitive. This sector is financially and economically profitable. However, it is slightly protected. Even so, any policy which aims at improving rice production in Côte d'Ivoire requires an implementation of a powerful agricultural system through a best stratification of rice farming sector in order to improve the competitiveness of domestic rice farming which is facing the imported rice.

Keywords: rice, Competitiveness, Tiassalé, N'douci, Divo, Sikensi

In Côte d'Ivoire, like in most West African Countries rice has become the mainstay food of the major population. Because of the high rate of urbanization (48% of citizens) and the relative population growth estimated at 2.8%, rice consumption has increased from 140,000 Tons in 1961 to about 1.3 million tons in 2008 (USDA, 2009). Although the environmental conditions are good, the national rice production is still insufficient (Africa Rice, 2012).

Generally speaking, Côte d'Ivoire's rice farmers are small ones among who the majority are women

(about 55%) working in family farms (MINAGRI, 2012). The national production, estimated at between 650 and 700,000 Tons (CORAF/ WERAD, 2014) as rice from factories, only covers about half of the internal consumption needs. Because of the imbalance high rate between the national rice production rate which is 4% and the increasing rate of rice consumption which is 6%, the Ivorian government then resorted to imports in order to cover the shortage. These imports have considerably increased over years. So, they increased from 440,858 Tons in 2000 to 919,081 Tons of bleached rice imported mainly from Asia

(Thailand with 63%, Vietnam 13%, Pakistan 12%, China 4%, India 2% and 6% from others) for a total financial value of more than 234 Billion FCFA, in 2009 (CORAF/ WERAD 2014). The national farmers with a low level of incomes and investment abilities are strongly affected by disloyal competition of imported rice. This situation leads to the shortage of outlets and a lucrative price for local rice on the national and regional markets.

As a consequence, we notice an impoverishment of rural farmers in these wide areas of rice production (poverty rate estimated at 62.5% in 2008 according to FAO, 2010). Facing this situation, the implementation of an efficient and lasting policy of rice production by Ivorian government could allow to fight against poverty. This fight against poverty must necessarily take into account social, economic and financial dimensions of this agricultural sector. Local rice competitiveness has become a key issue leading to the questioning on the efficiency of political strategies in rice production sector.

So, the overall objective of this study aims at determining the improving factors of competitiveness of rice production sector in the different rice farming areas in Côte d'Ivoire.

Specifically, we have to:

1. Analyze the competitiveness and financial profitability of the different production systems, trading and processing.
2. Measure the distortion effects on the different production systems.
3. Determine the rice production costs price in the different identified production systems.
4. And suggest some measures for improving a lasting competitiveness compared with the imported rice.

Materials and Methods

The material and equipment which are used during the harvest or agricultural activities are especially: the hoe, seed drill chart, seeder, sprayer (oxen). For the achievement of this study, we resorted to

computer (the software Word for typing and Excel for the different calculations). The study happened in four municipalities of Agneby-Tiassa and Loh-Djiboua such as Tiassalé, N'douci, Divo and Sikensi. The choosing of areas for this study was made by taking into account the importance of this crop in those regions and also the closeness to the biggest Ivorian market (Abidjan's market). Two kinds of data were collected: secondary data (mainly in administrative services) and the basic data taken with main producers. The secondary data were collected from technical services of the agricultural Ministry, research services, supervision services (CNRA, ANADER, ONDR...).

Some administrative services such as Customs service, National Institute of statistics, General management of tax and so on, have been visited. The rice selling price was provided by the Support Office for Crops Trading opportunity. As far as basic data is concerned, we worked on a basic data which survey was carried out in 2009 by CNRA and Ex-PNR (now called ONDR) in the framework of the project called 'Disponibility Reinforcement and Rice growing Statistics Access: an emergency contribution to the initiative of Sub-saharan African rice. Then those data were completed with a survey done from 15th august to 25th October 2014 in Tiassalé, N'douci, Divo and Sikensi in order to establish the budget of farming, processing and trading.

During this current study, the Policy Analysis Matrix (PAM) methodology was used on one hand based on a group of farmers living in the areas of rice production and on the other hand on the basic data consolidation which deal with rice farming issues. The Policy Analysis Matrix (PAM) was developed by Monke and Pearson in (1989) in order to evaluate the impact of the arrival of Portugal as a member of European Economic Community on its agriculture. It allowed the estimation of agricultural policies' effects on the sectors, by estimating the non-devotion effects or the government interventions in these sectors. It also permits to better quantify the effects of public services' interventions in the different sectors, to take into account the equity

aspect, that is to say the distribution of incomes, benefits among these actors and how to succeed it through alternative agricultural policy which would reduce distortions. The Policy Analysis Matrix (MAP) Consists of two kinds of budgets: the first budget is evaluated according to the market price or financial prices (financial budget) and the second one according to the social opportunities costs or economic price (economic budget). The financial prices and economic divergences are calculated too. The budget is built for each production system that contributes to resources and for each actor of the sector. Before the conception of the budget, all the inputs and respective production are classified intradable or non-tradable products. Tradable or commercial products are those which can theoretically be imported or exported and evaluated with the international markets prices, while the non-tradable or domestic factors are the one which are not normally tradable on international market. The Policy Analysis Matrix method's results (PAM) allow to know if the sector in the different study areas are economically or financially profitable (collectively or individually speaking). In the framework of this study, the Policy Analysis Matrix is based on the prices observed in 2014. The Table below shows the model of Policy Analysis Matrix (PAM).

Table 1. Framework of Policy Analysis Matrix

	Revenues	Input cost		Profits
		tradable inputs	Domestic factors	
Valued at private prices	A	B	C	D
Valued at social prices	E	F	G	H
Divergence	I	J	K	L

NB: we note that A,B,C and D are the elements of the financial budget; E,F,G and H are the ones of the economic budget; I,J,K and L are the disparities between the financial budget and economic one; D (private or financial profit) = A-B-C; H (social or economic profit) = E-F-G ;I (incomes transfer)=A-E;J (tradable inputs transfer)=B-F ;K(domestic factors' transfer)= C-G ; L(net transfer)=D-H=I-J-K.

Source: Monke, E.A. and Pearson, S.R.(1989)

Since we know now the variables of Policy Analysis Matrix, we can then measure the competitiveness of rice farming sector through the indicators presented below.

Table 2. Competitiveness and economic efficiency indicators of Policies Analysis Matrix (PAM)

Private profits	[D= A - B -C]
Private cost ratio (PCR)	[PCR = C / (A - B)]
Social profits	[H = E- F - G]
Domestic Resource Cost Ratio	[DRC = G / (E- F)]
Social Cost Ratio	[SCR= (F + G) / E]
Transfers	[L = I - J - K]
Nominal Protection Coefficient	[NPCO = A / E]
Effective Protection Coefficient	[EPC= (A - B) / (E-F)]
Profitability coefficient	[PC = D/ H]
Subsidy ratio to producers (SRP)	[SRP = L / E]
Equivalent Subsidyto producers	[ESP= L / A]
Source: Monkeand Pearson (1989)	

Results and Discussion

The different results of the Policy Analysis Matrix of rice farming sector are presented in the following parts:

Policy Analysis Matrix of national rice farming sector and per areas of production

According to the results of the study, the Domestic Resources Cost (DRC) at the national level is 0.794 and less than 1 (Table 4). The national rice farming sector is then competitive with a great variation in the concerned production areas (Table 4). However, this sector is slightly protected. It is financially profitable (Table 4). It is also mentioned 103 F CFA / kg as a financial profitability made by farmers (Table 3). Côte d'Ivoire's rice farming sector is economically profitable with more than 35 F CFA/ kg of the so called rice Paddy rice. As a whole, the sector receives a financial net transfer of 33 F CFA / kg (Table 3). This fact shows that the sector is encouraged by existing policies and then confirms the State's aim so that to promote the local rice farming sector. With

regard to the same results; it seems more profitable for the state to invest in local rice production than importing.

In addition, the analysis per production area shows that the rice farming sectors of Tiassalé and N'douci are competitive except Sikensi's one. The Domestic Resources Costs (DRC) are respectively: 0.526; 0.595; 0.853 and finally 1.538 For the municipalities of Divo, N'douci, Tiassalé and Sikensi, (Table 4). Divo's rice farming sector is more competitive. It is followed by the one of N'douci and Tiassalé. The actors of Sikensi's rice farming sector are not competitive.

Table 3. Results of the Policy Analysis Matrix (PAM) of rice farming sector at national level and per production area

F CFA / kg	Revenue	Tradable inputs	Non tradable inputs	Profit
Private	A	B	C	D
Tiassalé	385	175	145	65
N'douci	395	170	105	120
Divo	405	175	125	105
Sikensi	345	235	290	-180
Nation	391	168	120	103
Social	E	F	G	H
Tiassalé	325	155	145	25
N'douci	385	200	110	75
Divo	395	205	100	90
Sikensi	360	230	200	-70
Nation	365	195	135	35
Divergence	I	J	K	L
Tiassalé	60	20	0	40
N'douci	10	-30	-5	45
Divo	10	-30	25	15
Sikensi	-15	5	90	-110
Nation	26	-27	-15	33

Source: Author's estimation based on field survey in 2014

Table 4. Competitiveness and economic efficiency indicators of Policy Analysis Matrix (PAM) of rice farming sector at national level and per production area.

Ratios	Nation	Tiassalé	N'douci	Divo	Sikensi
Private profits	103	65	120	105	-180
Subsidy ratio to producers: L/E	0.090	0.123	0.116	0.037	-0.305
Producers equivalent Subsidy: L/A	0.084	0.103	0.113	0.037	-0.318
Nominal Protection coefficient: A/E	1.071	1.184	1.025	1.025	0.958
Effective Protection coefficient: (A-B)/(E-F)	1.311	1.235	1.184	1.211	0.85
Private cost ratio (PCR): C/(A-B)	0.538	0.69	0.467	0.543	2.636
Social cost ratio (SCR): (F+G)/E	0.904	0.923	0.805	0.772	1.194
Domestic resource cost ratio (DRC): G/(E-F)	0.794	0.853	0.595	0.526	1.538

Source: Author's estimation based on field survey in 2014

Analysis of sector per income structure, of cost and profit

The results in Table 5 show that Sikensi area is the one that bears more the high part of the costs of the sector followed by Tiassalé then Divo (respectively 520 F CFA /kg; 315 FCFA/kg; 295 F FCFA/kg. Nevertheless all the rice farming sectors receive more or less the same incomes proportion except Tiassalé which has an income level slightly high. At the profit level, Tiassalé, N'douci and Divo farmers have a positive profit margin following the example of Sikensi (Table 5). With regard to these results, we can say that Sikensi inefficiently allocates the productive resources. The expenses are higher than the incomes.

Table 5: Structure of revenue, cost and profit per production area

	Structure (F CFA / kg)			Proportion (%)		
	Revenue	Cost	Profit	Revenue	Cost	Profit
Tiassalé	485	315	170	28.28	22.5	
N'douci	405	270	135	23.61	19.29	42.86
Divo	410	295	115	23.91	21.07	36.5
Sikensi	415	520	-105	24.2	37.14	-33.33
Total	1715	1400	315	100	100	100

Source: Author's estimation based on field survey in 2014

Table 6. Policy Analysis Matrix (PAM) per actors of the sector

F CFA	Revenue	Tradable inputs	Non tradable inputs	Profit
Private	A	B	C	D
Farmers	120	70	135	-85
Processors	20	15	10	-5
Traders	285	165	40	80
Total	425	250	185	-10
Social	E	F	G	H
Farmers	165	25	115	25
Processors	15	10	5	0
Traders	200	175	25	0
Total	380	210	145	25
Divergence	I	J	K	L
Farmers	-45	45	20	-116
Processors	5	0	I	0
Traders	85	-15	14	80
Total	45	40	40	-35

Source: Author's estimation based on field survey in 2014

Analysis of Policy Analysis Matrix (PAM) per actors of sector

The Tables 6 and 7 show the Policy Analysis Matrix per each actor. The analysis of this Matrix allows us

to say that the sector is competitive but is slightly protected. The rice farming sector is financially profitable with a Social cost ratio (SCR) which is 0.904 and less than 1. With regard to the results, the farmers receive a subsidy on input with an Effective Protection Coefficient (EPC) less than 1. However, the under-sector of processing is the most competitive one followed by farmers' and traders' ones. The study of these results shows that the subsidy measures are not profitable for farmers because the Producers equivalent Subsidy ratio is negative (see Table VII). But it is rather positive for traders, approximately 28%. Transfers affect negatively farmers because of taxes and then they are not devoted to keep on their work. On the contrary, the trader receives transfers in spite of distortion and market's imperfections.

Table 7: Indicators of the Policy Analysis Matrix (PAM) per actors

Ratios	Nation	Farmer	Processor	Trader
Private profits	103	-85	-5	80
Subsidy ratio to producers (SRP) : L/E	0.09	-0.703	0	0.4
Producer equivalent subsidy Ratio: L/A	0.084	-0.966	0	0.280
Nominal Protection coefficient: A/E	1.071	0.727	1.333	1.425
Effective protection coefficient : (A-B)/(E-F)	1.311	0.357	1	4.8
Private cost ratio (PCR): C/(A-B)	0.538	2.7	2	0.333
Benefit-economic cost ratio: (E+G)/E	0.904	0.848	1	1
Domestic resources cost (G/E-F)	0.794	0.821	1	0.125

Source: Author's estimation based on field survey in 2014

Analysis of the structure of income, cost and profit per actor

At the level of the whole sector, producers are the ones who invest more (49.38%). However, traders with an investment rate around 48.15% receive the highest profit (45%) of the sector (Table 8).

Table 8. Structure of revenue, cost and profit per actor

	Structure (FCFA/kg)				Proportion (%)	
	Revenue	Cost	Profit	Income	Cost	Profit
Farmer	120	200	-80	28.23	49.38	-400
Processor	20	10	10	4.71	2.47	50
Trader	285	195	90	67.06	48.50	450
Sector	425	405	20	100	100	100

Source: Author's estimation based on field survey in 2014

Analysis of a hectare of rice farming budget per farming areas in Côte d'Ivoire (FCFA)

The Table 9 presents the budget of a hectare of rice in Cote d'Ivoire per production areas.

The manpower cost which is used for local rice production is roughly homogeneous in all the production areas except Tiassalé where the manpower is more expensive. This justifies more the use of family manpower in this region. The use of inputs in the areas of Divo is higher. This easily justifies the good level of noticed outputs. The average production cost in the production areas is 108 FCFA/kg with a minimum of 90 FCFA in N'douci and a maximum of 123 FCFA /kg in Tiassalé. The average output of local rice is 3.350 tons/hectare. The area of Divo records the highest output per hectare which is 4.843tons /hectare. The farming

net income is positive for all the production areas. However, the net profitability is higher in Divo. In all the production areas, the average profitability is valued at 68 FCFA/Kg with a minimum of 58 FCFA and a maximum of 100 FCFA. The farming of rice is therefore a profitable activity.

According to the former studies done by researchers, it's first of all about the factors that substantially act in order to increase the production and consequently the output per hectare. That is about the respect of farming calendar and technological methods, functional adjustment, sufficient and appropriate farming material, nearest supervision, quality and accessibility of seeds and inputs for a reduced cost, easy credit access and a good control of water supply, the price of local rice and the consumption ways and /or alimentary habits of the population which are concerned (CORAF/ WECAR 2014).

Conclusion

The main objective of the study is to determine the competitiveness of Ivorian rice farming sector which is facing a disloyal competition with the imported rice. By considering the economic weight that represents this sector, the implementation of a reliable farming system has been a major difficulty for political authorities. However, despite the distortions, the rice farming sector is competitive with a high variation

Table 9. Budget of a hectare of rice farming in Côte d'Ivoire per production areas

Production areas	Manpower		Production cost					output	Paddy Average price	Net Result of farming
	Salaried	Family	Variable	Fixed	Total	No family Manpower	No family Manpower and land			
Tiassalé	15	33	37	38	123	90	92	2.041	125	2
Ndouci	10	17	30	33	90	73	40	3.087	100	6
Divo	12	30	45	20	107	77	57	3.843	115	8
Sikensi	11	28	35	23	97	69	46	3.432	100	3

Source: Author's estimation based on field survey in 2014

at the level of the concerned areas of production. At the national level, this sector is financially and economically profitable. Unfortunately, it is slightly protected and undergoes the effects of a disproportional competition. With regard to the results, it seems more profitable for the Ivorian State to invest in the domestic production rather than importing rice. Therefore, in the hope of improving the rice farming sector in Cote d'Ivoire, the national policies should first favor a best stratification of this sector then an optimal allocation of the productive resources by taking into account the determinants of competitiveness (quality, consumption price and production cost).

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