Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.8, No.10, 2017

The Marginal Profitability Share among of Stakeholders in Rice Value Chain: A Case Study in Banian Commune, Faranah Prefecture, Guinea

Siba Kolin Koivogui[1,2] Yonggong Liu[1,*] Diawadou Diallo[2] Alexandre Konaté[2] John Morris Togo[3]
1.College of Humanities and development study, China Agricultural University PO box 100083, Beijing Haidian, Qinghua DongLu, P.R. China
2.Higher agricultural and veterinary institute of Faranah, Republic of Guinea
3.College of Engineering, China agricultural University

Abstract
Africa's inability to achieve rice self-sufficiency is the result of major constraints in the entire chain of the rice production industry. The study aims to carry out the participatory diagnosis analysis for rice income sector in order to stimulate the yield improvement to stabilize food security. The study was carried out in rural commune of Banian through eleven villages. Data were collected through intensive survey of randomly selected 343 respondents using gross margin analysis and descriptive analysis whiting participatory method. The diagnosis included the producers and rice processors (buyer-steamers and shellers). Assessing these three producer categories, it was indicated that the net income of rice farmers is 140, 313 and 772 US$/ha based on the small, medium and large farming scales respectively and 1.13, 1.14 and1.21 respectively as average benefit cost ratio (BCR) of each producer category. These results revealed that the socio economic factors have a profound influence on profitability of rice production. The second group of rice actors is composed by buyer-steamers and is the main beneficiaries of rice value chain; they are able to generate much higher net incomes with an average BCR of 2.85, followed shellers with an average BCR of 1.23. These figures show that the large scale rice producers, and post-harvest processors are the major profitable stakeholders in the rice value chain, whilst small and medium scale rice growers are the groups sharing the small profits from the direct production.
Keywords: Rice production, rice value chain, cost- benefice analysis, gross margin analysis, Guinea.

1. Introduction

The theme Rice is Life was adopted to implement the International Year of Rice (IYR, 2004), declared by the United Nations General Assembly during its 57th Session. One major objective of IYR was to raise governmental attention to the roles of rice production industry in providing the population with food security and addressing poverty alleviation. Other issues addressed in IYR included sustainable development of rice sector, preservation rice cultural heritage and rice genetic biodiversity, scientific cooperation and economic policy for promoting the rice production (Aliou Diagne, Didier Y et *al*, 2012).

Rice is the staple food for many Africans and constitutes a major part of the diet for many other countries in South and Southeast Asia. During the past three decades, as the steadily demand increase on rice production is playing a major role in the strategic food security planning policies of many countries. (Aliou Diagne, Didier Y et *al*, 2012).

Africa's inability to achieve rice self-sufficiency is the result of major constraints in the entire chain of the rice production industry. It is necessary to minimize overreliance on rice imports for meeting increasing domestic consumption (Okry, Van Mele et al. 2011). Rice has always been an important staple food in many African countries. For some decades, it has also been the most rapidly growing food source across the continent. However, the local production is largely insufficient to meet the consumption needs. In 2009, Africa imported 10 million tons of milled rice, at a cost of US$ 5 billion. With increased food and fuel prices, in the coming decades, relying on rice imports is no longer a sustainable strategy for most of African countries.

The development of rice sector could be an engine for economic growth across the continent, which would further contribute to eliminating extreme poverty and food insecurity, and raising the social wellbeing of millions of poor people. Rice production will create employment along the value chain and in related sectors, and lead to improve nutritional and health status of the rural poor. It will allow families to better finance education, giving the next generation more opportunities to break the remaining shackles of underdevelopment (Africa Rice, 2011 p.84).

Although most rice is produced in Asia, it is an important food crop in many other parts of the world including West Africa, especially Guinea, where rice is the staple food. With a per capita consumption of 69 kg per year, Guinea is the second largest consumer of rice in West Africa after Sierra Leone (WARDA, 2007). Despite production growth of 5.3% (2001–2005), the production still cannot meet the local demand: 40% of the rice consumed in Guinea is imported (Ministry of Agriculture and Livestock, 2007a). Increasing domestic rice production is a priority in Guinea (Ministry of Agriculture and Livestock, 2007b), as well as in other African

countries.

As with any crop, seed availability and quality are considered bottlenecks in developing competitive agricultural sectors (Bam et al., 2007; McDonald, 1998). Corresponding author: florent.okry@wur.nl; okryflorent@yahoo.fr 138 FLORENT O. et al. Like many countries in the region, Guinea has tried to establish a formal national seed production and supply system, with several projects addressing seed production, multiplication and distribution (Service National pour la promotion et la Vulgarisation de la Riziculture, 2001). However, such efforts have yielded little success: only 8% of the rice farmers have access to seed from the formal supply channels (SNPRV, 2001). Most smallholder farmers, as in most developing countries, rely on the informal seed system (Almekinders and Louwaars, 2002; SNPRV, 2001; Tripp, 2001) and 60-100% are depending on the locally produced and exchanged seeds (Almekinders et al., 2007); (Duijndam, Evenhuis et al. 2007) and (Seboka and Deressa 1999) argue that the lack of seed multipliers and inefficient distribution channels explain why farmers acquire informal seeds through indigenous social networks. (Joshi and Witcombe 1996) further argue that low adoption of new varieties is due to insufficient supply to small farmers. The formal seed sector's dependency on the extension system has often limited the number of farmers it can reach, especially in marginal and remote areas, making formal seed expensive due to high transaction and information-gathering costs (Almekinders et al., 2007). Further aggravated by the declining support for public sector extension services, various donors believe that large private seed enterprises could offer a solution.

Rice is the world's most important human food, comprising 60% of the diet of 40% of the world's population. Yet, its cultivation encompasses only a tenth of all arable land, some 124 million hectares. It is grown in 114 countries, mainly Asian, where the world's densest, fastest growing populations consume most of it themselves. World production in 2007 was 650 million tons, about a third from China and a quarter from India.2 Chinese rice is mostly cultivated in the south and mainly irrigated, while Indian rice is grown in West Bengal, Uttar and Madya Pradesh, Bihar and Orissa (USDA) and We tend to think of India as drier than China, yet India produces more paddy rice (Bouman, B., et al. (2007). Rice provides four-fifths of all calories for more than two billion people (mainly Asian and Latin American), and about one-third of the diet for another half billion. Per capita consumption varies from 186 kg/year in Burma to 4 kg in the United States (IRRI3 1988). In the 1960s, 70s and 80s, rice output increased 40%, 30% and 3.1%, respectively, while world population exploded to 5 billion. Rice is the only cereal harvested almost entirely for human consumption. More acreage is given to corn and wheat, but they are also used in animal feed, indirectly feeding humans by providing meat and milk. Wheat yield per hectare is much less than that of rice, which has up to four annual harvests in China. One hectare of rice supports 5.63 people compared to 3.67 for wheat (Chang 1985:426; 1988). Rice produces more calories (20%), protein (13%) and carbohydrates per hectare than any other cereal grass (wheat, barley, maize, rye, oats, millet and sorghum), and is second in protein only to oats, which is fed mainly to horses and livestock (Cantrell, R. and G. Hettel 2004).

2. Review of relevant researches

2.1 Categories of rice producers and status

According to the collective facts of this study area, the households are consisted of three categories of production scales: small scale which the average area of production ranged from 0 to 2 hectares, 48.68% of total population. They operate in the bottom, the plains and the hillsides, which is easy access to flat surfaces land for production (Prefectural Directorate of Agriculture 2016).

Intermediate scale (medium) with the 32.45% of the total population, constituted as the second major category of rice production.. This category cultivates the area between 2.6 and 5 hectares. They are found in the plains lands where the size is larger compared with bottom in terms of cultivation. This sector use both ploughs and tractors for plowing.(Guinean alimentary security initiative. 2016).

The Large scale, 17.98% of the total population of the rural commune of Banian they are less population compared to the previous groups, due to the financial capability which are an able them to exploit more than 5 hectares, owning a second hand tractors rehabilited as the means for mechanized production system and regularly expose them to expenses related to repairing and maintenance at very high cost. With this sector is far to achieve success to fulfill the objectives of the rice production as resulted in low incomes. The sector is concentrated largely in the land on the plains that is encountered on a large scale in all production areas (ANPROCA. 2016)

According to the Prefectural Directorate of Agriculture (2016), the rural commune of Banian has an estimated arable land of 30265 ha including 955 ha of Plains, 353 ha of land and 29217 hectares of hillsides. It is already revealed that these figures are enormous for the area; only the foundational characteristic of this rice farming relies essentially on the rain. Thus, it is reasonable to assume that this production of rice is based on the quantity and duration of the rainfall during the agricultural year, since the 98% of the land is unimproved.

2.2 The Rice Channel in Guinea

The most prevalent rice commercialisation network of is schematised below. A collecting dryer buys the paddy from the producer, the steamer pays the person receiving the benefits for the husking, and sells it back to a net rice collector who sells it back again to a retailer. » [DYNAFIV. June 2005]. Of course, the scheme is a generic one, which could experience different variables depending on the numerous rolls played by the actors (shortening), or depending on the intervention of new intermediate (lengthening). The transaction between primary producers and collectors are often realised on the collecting markets, and often they are the weekly local rural markets. The supplying of large centres lengthens the channel with the intervention of numerous wholesalers. (Agricultural campaign activity report, SNPRV, 2000, 2004).

In Guinea, there is a phenomenon called the soldering period. The phenomenon designates the time interval between the preceding cereal campaign stock outage and the appearance of the new harvesting of the present campaign. Depending on the agricultural regions, each year, that interval covers the period from the beginning of July to the end of September. The rupture is more accentuated between mid-July and mid-September (around two months).The rural surrounding, in conformation with its crop growing nature has to put up in a more important way with that phenomenon; it is a period in which it is difficult to nourish one conveniently. In a rural surrounding it corresponds with a rise of rice prices (local rice channel in Guinea 2005)

2.3 Steaming

Steaming consists of a processing of paddy rice to steam. It allows the grain to enrich itself with vitamins and mineral salts which migrate from the envelope to the almond and, by partially gelling the starch, to obtain a breaking rate of less than 5% during husking. In addition to this improvement in huskiness, parboiled rice is appreciated by the local population for its taste and nutritional qualities and enjoys a quality premium over imported rice on the domestic market. (Japanese Embassy in the Republic of Guinea, 2006)

After soaking for 6 to 12 hours, usually in barrels containing about 100 kg of paddy, the rice is steamed in pots, half barrels or barrels in which a sieve separates the rice from the boiling water. This operation lasts about 1 hour. The rice is then dried in the sun before being husked. Steaming is a binding operation in several respects. For Joshi, A. and J. Witcombe (1996), it is first and foremost a difficult job for women, requiring the handling of heavy loads (paddy, water) and close monitoring of the operation, in the vicinity of fireplaces giving off a high heat. This operation is then consuming firewood in fairly large quantities (about 2 fagots per bag of paddy). (MAE, BSD, Guinea 2009)

2.4 Shelling

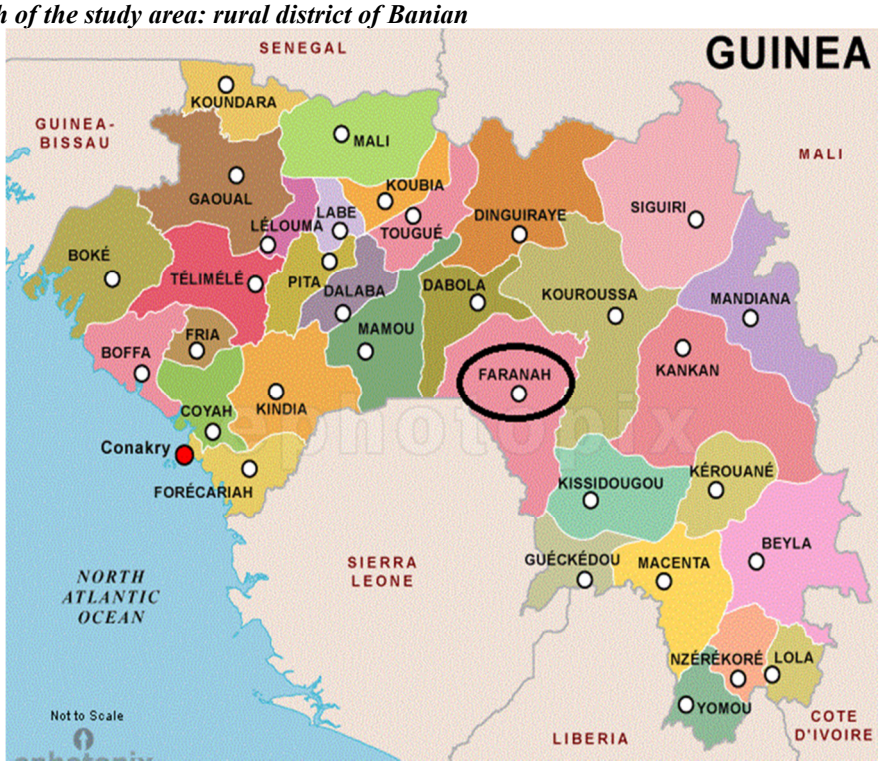
Market conquest requires quality rice production. Improving processing is the key factor. Indeed, in the past, almost the entire paddy marketed was distilled from rice mills that were more or less dilapidated but produced high-quality rice. Due to technical and management problems, these mills have given way to small, low-capacity hullers that do not classify the product. Guinea has the particularity of having avoided the stage of large rice mills during the liberalization of the rice market, strategy adopted by its neighbors RCI, Senegal, Mali and which mostly ended in failures. The hulling, mainly manual or carried out in some centers using old machines, remained a bottleneck of the local rice sector. (MAE, BSD, Guinée 2009)

3. Materials and methods

3.1 The research design

The study aims achieving the diagnosis of the income of rice stakeholder in order to improve rice value chain profitability. Specifically the study consists to: identified the producer's categories and analyze the income of all actors in the study areas.

3.2 Monograph of the study area: rural district of Banian



Study area map (http://www.emapsworld.com/guinea-regions-map.html)

Banian, as a village, was created in 1910 by two brothers: Demba Camara and Lamine Camara Karifa. Banian became District in 1960 and erected in rural district in 1992. It derives its name from the original stream bagna meaning the eye of the River.

The first inhabitants are the founders Camara, and then come the other families who settled in the following order: Cissé, Dabo, and Faro. The family holds the remaining land Camara.

The rural town of Banian is one of 11 sub prefecture of Faranah, located to 62 km from Faranah and 547 km from the capital Conakry. It is limited: 1) In the North by the C RTiro; 2) In the South by RC Yombiro (Kissidougou) and Kobikoro; 3) to the east by RC Douako (Kouroussa) and Sangardo (Kissidougou); 4) to the west by CR Songoyah and the Republic of Sierra Leon. According to Guinean Ministry of Agriculture (2000), there are three types of soil: gravelly soils on the slopes; sandy-clay soils in the plains; clay loam soils in the shallows. Vegetation is characterized by grassland and some forest patches within which we find species like: the Linke (Afzelia africana), néré (Perkia bialobosa), Mahogany (Western Anacardium), etc ... The climate is sub-Sudanese characterized by the alternation of two seasons of unequal length; a dry season runs from November to April; a rainy season that lasts from May to October; a cool dry wind (Harmattan) blows from November to February. Covering an area of 1947 km2, the Rural Municipality of Banian has a population of 31,271 inhabitants (2012), an average density of 16.06 people per km2 distributed unevenly among 18 districts: Banian 1, Banian 2, Bandayah, Balayah, Bambayah, Baouriyah, Doumbafè, Douwouléma, Kaola, Kankowa, Kossaba, Kouratou, Mandou, Nianfourando, Sembeldo, Sokourala, Yèrewadou and 77 sectors or small villages.

3.3 Sampling

Table 1: selection criteria

Village visited	Categories of producers			Rice processors	
	Small (0-2) ha	Medium (2.05-5) ha	Large (up 5) Ha	Buyer-steamers	Shellers
Banian	13	8	6	15	8
Bambaya	10	7	4	10	5
Bandaya	8	6	3	8	5
Balaya	11	8	4	9	3
Doumbafè	12	6	4	5	2
Kaola	9	8	3	4	4
Kossaba	8	6	2	3	2
Kouratou	11	8	4	5	3
Nianfourando	10	7	4	5	4
Sembeldo	7	4	2	3	2
Sokourala	12	8	5	6	4
Total	**111**	**76**	**41**	**73**	42

Computed from survey data (2016)

The table 1 shows that, the selection criterion covers the following categories: rice producers composed in small producers, medium producers and large producers. That the small producers operate from 0 to 2 ha in size; the medium producers exploit areas from 2.05 to 5 ha and large producers operate more than 5 ha. The survey had also affected paddy rice processors, in which we can see the buyer - steamers and shellers. Thus using the pre cited collection tools, work is carried out in the presence of all actors and in plenary, interviews by socio-professional groups, age and sex to obtain quantitative and qualitative information on all the data that are the subject of the research.

3.4 Data Collection and analysis

Using quantitative and qualitative method, data was research carried out in eleven (11) villages of the rural commune of Banian, in Faranah prefecture*:* Banian center, Bambaya, Bandaya, Balaya, Doumbafè, Kaola, Kossaba Kouratou, Nianfourando, Sembeldo and Sokourala.

The method of data collection included focus group discussion involving 343 respondents with 111 small producers, 76 middle producers and 41 large producers to which must be added the rice processors made up of 73 buyer-steamers and 43 shellers. Individual interview was also done, randomly selected from each focus group in each of the community.

Gross margin analysis and descriptive statistics where used to discuss the socio-economic characteristics of rice farmers.

Gross margin analysis

The Gross margin analysis was adopted in this research for variables measurement accordance with Nwaobiala, (2010):

$$GM = \Sigma pi\ (Qi - \Sigma pjXi) \quad (1)$$

Where GM = Gross Margin; Pi = Unit price of output; Qi = Quantity of each output;
Pj = Unit of each input; Xi = Quantity of each input.

$$NR = GM - TC \quad (2)$$

Where NR = Net Revenue; TC = Total fixed costs derived by depreciation of fixed costs;

$$BCR = \text{Gross margin} / TC \quad (3)$$

Where BCR = Benefit Cost Ratio; GM = Gross margin; TC = Total Costs

Descriptive statistics was used also to identify mean and standard error of the variable (Total cost, gross margin, net income and benefit cost ratio). For the qualitative data, we collected:

a. Consultation frames archives and general documents to collect data relevant to the realization of the diagnosis on the rice actors income in the Rural commune (RC) of Banian from development services in the prefecture.

b. The conduct of thematic Participatory diagnosis: the conduct of the diagnosis is based on the

Following 4 phases and tools: 1.preparatory phase of the diagnosis; 2. Phase diagnosis; 3. Phase participatory planning; 4. Phase assessment.

The historic Profile: With which we were able to know the history and the succession of significant events that have had an impact on village life from its inception to the present day;

- ✓ The map of the area: we identified the agricultural potential of the production areas that have been the subject of investigation;
- ✓ The polarization diagram: Understanding how the village has developed relationships with others

around him? What kind of relationship exists between them?

- ✓ The Venn diagram: which allowed us to identify all villages institutions (internal) interacting with those that support the development of the village (external);Semi-structured Interview (ISS): We have an inventory of assets of sites visited through the collection of groups (focus groups, key informants);
- ✓ Transect: through which we were able to identify the different types of soil, vegetation, animal husbandry, rivers, the crops grown, trends, problems and proposed solutions from a representation of relief;
- ✓ Seasonal calendar: allowed us to identify the agricultural, social and cultural activities during the year in order to know the favorable periods of the achievements of the community services;
- ✓ Life line: allowed us to know the age groups by zone of production to know the level of the agricultural population and the active layer;
- ✓ Prioritization grid: that has allowed us to establish a list of priority issues and their hierarchy related to rice cultivation in rural commune of Banian;
- ✓ Analysis of the problem grid: in all the sites visited, problems related to rice cultivation are analyzed for a desired yield (AACG, 2005).

4. Results and discussion

4.1. Results

4.1.1 Examining the rice farmer's profile in rural commune of Banian, Faranah prefecture

Table 2: Lands availability per hectare

village	Type of lands used / Ha			
	Total Land	**Lowlands**	**Plains**	**Hillsides**
Banian center	3573	115	356	3102
Bambaya	2613	45	104	2464
Bandaya	1876	65	89	1722
Balaya	2520	108	293	2119
Doumbafè	1428	50	120	1228
Kaola	1566	82	130	1354
Kossaba	2045	100	245	1700
Kouratou	1895	97	316	1482
Nianfourando	2732	109	330	2293
Sembeldo	1253	80	187	986
Sokourala	2541	112	335	2094
Average	2185.63	87.54	227.72	1867.63

Computed from survey data (2016)

Rice production is based on the availability of arable land in the areas under investigation. We found in our field of study three types of land such as: lowlands, plains and hillsides that have been practiced by rice producers for the decades but unfortunately have not experienced major changes in the direction of significant improvements allowing achieving highly qualified returns.

Table 1 shows the availability of arable land in the rural commune of Banian, which is highly appreciated; the average of the total production average lands of (2185.61ha) are identified at 87.54 ha of the lowlands, 227.72 ha of plains and 1967.63 ha to hillsides; comparing the above tree land categories of the production, hillsides lands are mostly utilized lands due the easy access to the land and free cost that encourage more agricultural activities, where the production relay under the influence rainfall.

The productions depend on the availability of land in each village from Banian center, Nianfourando, Bambaya, Sokourara, Balaya, Kossaba (3573, 2732, 2613, 2541, 2520 and 2045 ha) respectively. However, less production areas where found in Sembeldo, Doumbafe, Kaola, and Bambaya (1253, 1428, 1566 and 1876 ha) inclusively.

Findings show that, the total rural population in those villages is 1493.36 confirming the status of the rural commune in the study area. (Table 3) shows that average of the households is 574.54 where labor average was 259.81. It was indicated that, Banian center and Balaya obtaining the higher population average of 3040 and 2520 comparing with the Sembeldo and Doumbafe resulted in 850 and 820 lower in terms of household and labor. Sembeldo and Bambaya were found to be having the small labor due to emigration of young people to the mining areas during the beginning of field activities which causes the scarcity of hands of works causing the high cost of the work of fields in these localities.

The availability of the production land in each village per capita, was indicated by the area size of an average of 2.94 ha, it was observed that Banian and Balaya, obtained less production area size of 1.23 and 1.48 hectares respectively due to their height rural population, while Bambaya, Doumbafè, and Sembeldo have more land ranged between 3.87; 4.56 and 4.40 hectares per capita due to their less population, resulted in low cost of

land renting

Table 3: Socio-economic profiles of study area

village	Total population	Household	Labor	Land (ha) /capita
Banian center	3040	1071	284	1.23
Bambaya	966	508	190	3.87
Bandaya	1583	504	314	2.36
Balaya	2520	859	293	1.48
Doumbafè	820	345	238	4.56
Kaola	1194	340	351	3.13
Kossaba	1054	422	250	3.55
Kouratou	1350	427	316	2.77
Nianfourando	1733	752	230	2.16
Sembeldo	850	480	177	4.4
Sokourala	1317	612	215	2.84
Average	1493.36	574.54	259.81	2.94

Computed from survey data (2016)

4. 1. 2 proposing management measures to rice production cost in the study area

Table 4: The total cost of production by producer category in US$/ha

items	Producer categories		
	Small	Medium	Large
Labor cost	269	534	954
variable inputs	216	472	854
Commodities	265	435	643
Interest on loan	132	182	225
Land rental	75	157	188
Ploughs	56	128	218
Tractor	-	189	269
Depreciation	41	180	266
Total cost/ha	**1054**	**2277**	**3617**

Computed from survey data (2016)

Table 4 shows that, the Small farmers got no access to the tractors in their fields due to the small cultivation areas, therefore they rely on hand labor to achieve farming work to reduce production cost, which explained in (Tab, 3) and (table 1), the producers are divided into three groups: Small with estimated scale area size of (0-2) ha, Medium (2-5) ha and Large which exceeding (5) ha, it was found that the majority of producers are from small scale sector, with less financial access to advance their field activities and making a potential combination of production aimed to increase yield. Though, It was observed that the population of labor within the production areas has an influence on the hiring cost at time of demand, the simple reason that these producers prefers to work themselves as workforce it showed the household importance, so in this case the higher average cost ranged between US$ 265; 216 and 269 US$ (variable inputs; Labor cost and Commodities) respectively.

On the other hand, the medium and large producer, mostly use labor cost as mean hoping have more yield from their culture, successively between 539 to 954 US$. The same is true for the other variables like variable inputs (US$ 472 and US$ 854); commodities (US$ 435 and US$ 643) because the values change from the smallest to the largest, depending on the availability of cultivated land, i.e. small producers to medium and large producers.

It was indicated that spending is based on the size of the arable land, because the large land is synonymous of higher investment according to the testimony of the farmers themselves. It can be seen that the total cost of production of the different producers is chronologically from the smallest to the largest and shows that these categories of producers do not have all the same costs.

The study was interested at the economic performance of the producers in order to appreciate the profitability of the production activity in the study area. Table 4 shows that the cost total of the quantity produced by each producer category, the unit price through which the variables as such as gross margin, net income and profitability were calculed.

Table 5: Economic performance of producer categories in US$/Ha

items	Producer categories		
	Small (0-2)	Medium(2.05 to 5)	Large (Above 5)
Total cost/ha	1054	2277	3617
Paddy output (Kg)	2654	5756	9754
Unit price (US$)	0.45	0.45	0.45
Gross margin (US$/ha)	1194	2590.2	4389.3
Net income (US$/ha)	140	313	772
BCR	1.13	1.14	1.21

Computed from survey data (2016)
It observed that the kilogram of paddy rice was negotiated at 0.45 US$

It was observed in (Table 5) that the Small producer has used only 1054 US$ of average of labor cost although they were the most numerous producers. In terms of paddy rice quantity produced, it was indicated an average of 2664 kg and get after selling a gross margin of 1194 US$ through which they generate an average of net income estimated at 140 US $ and which is judged very low comparing to the volume of the works realized in these fields during the year. This very low net income is due to the size of lands cultivated (0-2) and where they use very few factors to enable high yield. The average of benefice cost ratio (BCR) is 1.13. It was concluding that, small 'rice production is not much profitable M.Z. Hoque and M.E. Haque (2014).

Through the medium and large producers, it is observed that, the highest average of cost production were respectively (2277 and 3617) US$/ha, while paddy rice quantity produced were 5756 and 2590.2 kg respectively. The average of gross margin still between (US$/ha 2590.2 and US$ 4389.3)

Assessing the three producer categories in terms of net income, we can see that the large producer still having the best income of (772 US$/ha) follow-up of the medium producer with 313 US$/ha and the end coming the small producer (140 US$/ha). Through the benefice cost ratio (BCR), the order is the following: large (1.21) medium (1, 14), and small (1.13). That situation is because the average of gross margin from medium and large producer is high.

Statistics analysis was used to elaborate figure 1were we identified the variables mean and standard error of the total cost of production, the gross margin and net income. We realized that the net income mean is depends on the rate of the inputs used (seed, fertilizers, pesticides etc), and it's also depends on land (soil) type used, number of irrigation needed, number of labor and their wage rate, the producers 'management practices, marketing facilities of the rice production etc…

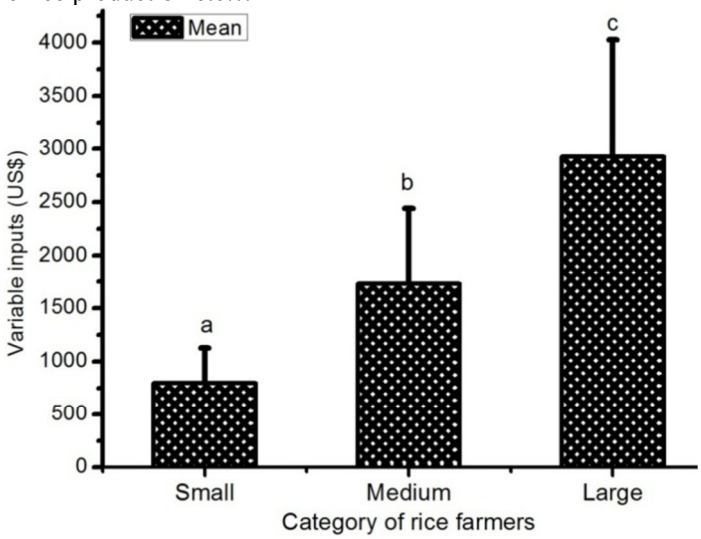


Figure 1: Rice producer's economic performance descriptive in US$

The findings indicated that there is significant mean difference between small and medium producer (796.00±331) and (1726.73±712.62) respectively. The same observation is also making between the small and large producer, it exists significantly difference to see the value ((796.00±331) and (2926±1099.8). With evident, it is logically observed between medium and large, (1726.73±712.62) and (2926±1099.88) respectively.

4. 1.3 Rice processors analysis

Table 6: Rice processors' annual total cost in US$

Items	Rice processor	
	Buyer-steamer	**Shellers**
Price of paddy rice	1080	-
Transport	202.5	-
Price of dead wood	270	-
food	193	253.6
Cost of husking	135	-
Lubricating oil	-	324
Fuel (gasoil)	-	323.05
Cost of maintenance frequency	-	243
Depreciation	380	254
Total cost	**2260.5**	**1397.65**
Price of rice decorticated	6450	1720

Computed from survey data (2016)

The analysis at the level of buyer-steamers and shellers of rice seems one of the most important points in our study area. The study identified two categories of rice processors including buyer-steamers and decorticators or thrashers. Buyers-steamers are both merchants who pay paddy rice with producers during the harvest period and after harvest, where the paddy rice is shelled into net rice before final selling to retailers or direct consumers. The steams paddy rice was dried, then, the shellers were contacted to pound through the machines. Thus, there, it was necessary to touch the second actor that called decorticator or shellers; who usually transforms paddy rice steamed by the steamers in net rice grains. Whereas, many people are engaged in this business due to the lack of rice technology.

Through the table 6, indicates the first processing group is consist of the buyer-steamers who do not have expending on lubricating oil, fuel, maintenance frequency, comparatively with the thrashers, these who are the second processor groups, do not expend for price of paddy rice, transport, price of wood and husking.

Rice processor as actors in rice production in this study explains how the value chain of the rice is generally practiced in Guinea and especially in the rural commune of banian. It is clear that rice processor receives more income from rice commercial activities than rice growers. Thus, the purchasers-steamers alone obtain a trifle of 6450 US$ as gross margin against 2260.5 US$ as the average cost of buying, steaming and pounding the rice which allows them to generate 4189.5 US$ in net income after selling to retailers those who sell also permanently to consumers.

These purchasers have a large net income each year because they are the biggest financiers of the producers. In this perspective, they can even pre-finance theme for the success of the crops and the harvest it comes to take the equivalent of its prefinancing in kind (paddy rice). The big problem is that there is no governmental structures that can help producers sell their products at high prices. They are left to their own devices, in terms of trade policy, and that favors these buyers - steam at the forefront of the rice trade to the detriment of poor producers in our field research.

Table 7: Rice processors 'economic performance in US$/ha

items	Rice processors descriptive	
	Buyer-steamers	**Sheller**
Total cost (**US$**/ha)	2260.5	1397.65
Net rice (Kg)	7500	2000
Unit price ($)	0.86	0.86
Gross margin(**US$** /ha)	6450	1720
Net income (US$/ha)	4189.5	322.35
BCR	2.85	1.23

Computed from survey data (2016). 1kg of net rice = 0,86 US$

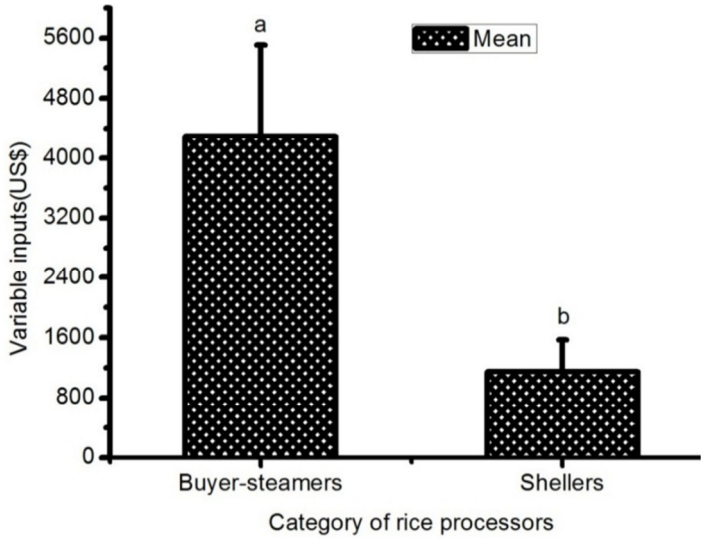


Figure 2: Rice processors 'economic performance

The second group of processors consists of those who own machines that process paddy rice into net rice but also provide small-scale industry by turning the net rice into powder for other specific foods (cakes, pasta, bread, Sauce).

Returning to tables 5 and 6, we see that machine holders have spent an estimated US $ 1397.65 by processing 2000 kg of paddy rice per year and generated an estimated net rice amount of 1720 US $ (2000x 0.86 US $). The average net income observed was 322.35 US $/ ha, which proves that these processors generate very little income compared to their co-actors (buyer-steamers) due to the multiplication of the hair machines throughout the study area; but also, due to the bad organization of their activities because they are not in cooperative of transformers and each runs towards its interest. Knowing already all the realities around the labor force, gross income and net income of processors, it is observed in Table 6 that these two actors have an average of benefice cost ratio 2.85 and 1.23 respectively. It can be concluded that, the rice husking is not very profitable for the shellers.

Figure 2 explains the significance between variables average of buyer-steamers and shellers (4300±1211) and (1147±422.53) respectively, due to fact of high average of gross margin and net income generated by buyer-steamers. Following the figure 2, the finding shows that there it be concluded that buyer-steamers generated a large gross income, more than their co-actors who are shellers, but it is also clear that the total costs are lower than the gross income and which are the basis of their large net income over the entire marketing chain of rice cultivation in the study area.

Table 8: Summary of economic performance of rice actors in US$/ha

Actors	Synthesis descriptive				
	Total cost	Quantity Produced/ Kg	Gross margin	Net income	CBR
Small producer	1054	2654	1194	140	1.13
Medium producer	2277	5756	2590.2	313	1.14
Large producer	3617	9754	4389.3	772	1.21
Buyers-steamer	2260.5	7500	6450	4189.5	2.13
Shellers	1338.05	2000	1720	381.95	1.29

Computed from table 4 and 6 data (2016)

1kg of paddy = 0, 45 US$; for the rice processors, 1kg of net rice = 0, 86 US$

Through this table 7 and figure 3, we wanted comparing with simultaneity all average from all actors in this study. The actors composed by producer (Small, Medium, and Large) and processors (Buyer-steamers and Shellers), from this table, it is showing that the high net income is generated by Buyer-steamers (4189.5 US$/ha) gracious their high gross margin (2260.5 US$/ha) obtained from the sale of the 7500 Kg of net rice produced in the purchasing and steaming activities during a given year. They are followed by the large producers in which it was observed a quantity produced of 9754 Kg/ha for an average of US$/ha 772. The finding at the level of this producer category is that the gross income is large but the total cost estimated at 3617 US$/ha.

It be concluded that these producers spend a lot but do not pay attention to the factors that need to be combined such as (respect for crop time, variety, fertilizer, water control), while they work largely on The plains that need to be working well. The two other producers, who are small and average, follow the same rule, because among average producers, net income is even lower (313 US$/ha) for an amount of 5756 kg/ha of paddy rice

generating a gross income of 2590.2 US$/ha for them. While the small producers produce a total production of 2654 kg/ha, at the end of which they generate a gross income of 1194 US $ / ha and a net income estimated at 140 US$/ha. It should be noted that the cost per kilogram of net rice is equal to 8.6 US $/kg in Republic of Guinea, so it is not easy for these producers to generate high farm income if the annual production is not very increasing.

The shellers with a total cost of exploitation of 1338.05 US$, produce a total average of 2000 kg of net rice which allows them to generate a gross income of 1720 US$/kg for a net income estimated at 381.95 US$/Kg. Thus, the situation of benefit cost ratio (BCR), at the level of all actors (small, medium and large producers, buyer-steamers, shellers) is as follows: 1.13: 1.14: 1.21: 2.13: 1.29: respectively. It can conclude that, the actors like Buyer-steamers, thrashers, large, are best in terms of rice production profitability in the study area. The rest of actors as Small and medium producer, must improve more their field system (improving seed adoption, using more bio fertilizes and working time each year).

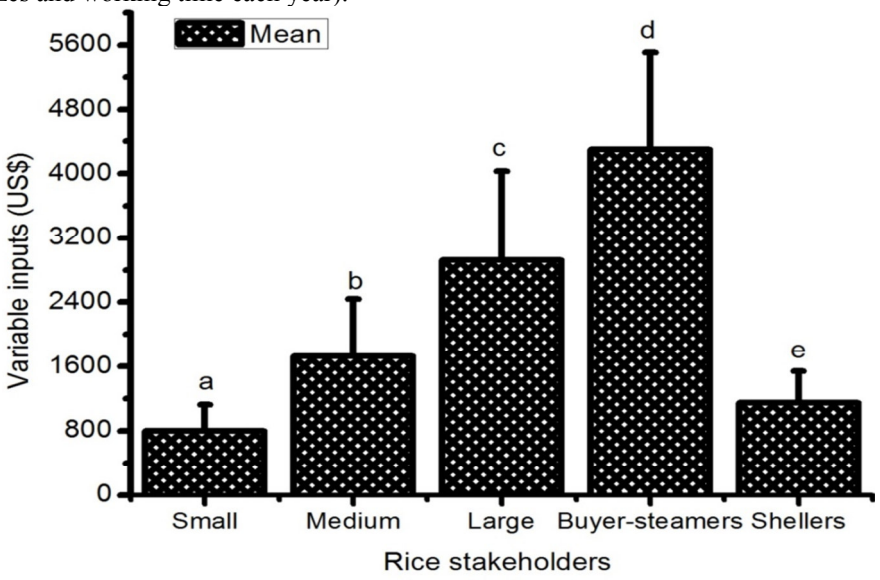


Figure 3: Synthesis of actor's economic performance

Figure 3 describes exactly the trajectory of the economic performance of all the actors (producer and processors) specifically represented in mean and standard error to all actors (small, medium large (producers) and buyer-steamers, decorticators or shellers. It is indicate that the value (mean) average of all variables of producer categories are less from small producers to large ones, the average obtained are gradually, from the smallest to the largest. This significant difference between these actors is largely explained in FIG 1.

On the other hand, there is a significance difference between small producers and Buyer-steamers because the average is (796.± 330.48) and (4300±1211) Which means that these small farmers generate a low net income compared to the medium, and large, the buyers, who buy their annual production at non-competitive prices before transforming the quantity into net rice and reselling at high prices to retailers or consumers.

It was also observed that comparing the average net income between small producer and shellers, there is a significance difference (796.± 330.48) and (1146.67±397.93) respectively. it was clear that the sellers are getting more income than small producer due to the difference of their activities. The shellers pound the paddy rice of its customers in return, receive in net rice according to the terms of the contract, and store this quantity to wait for a sale price in their favor.

The same reality is observed between medium producer and buyer-steamers and shellers, because the average is comprise (1726.73±712.62), (4300±1211) and (1146.67±397.93). There also it is observed clearly that the processors are generating significant advantage in the rice sector in our study area.

The comparison between largest producers and rice processing actors can help us to understand the disparity in terms of revenue of rice actors in study area when large producers are using only a less mean average variable (29261±1099.88) than rice processors (4300±1211) and (1146.66±397.93)

Through this analysis, we can assume that the variables used by producers are low, explaining the reason for their low income and affecting the standard of living of those households who think they have achieved their dream rather than the rice production in which they were born and know better than other activities.

5. Conclusions and Recommendations

This study was conducted in 11 villages of the rural commune of Banian, prefecture of Faranah, Republic of

Guinea. To better perceive the income of the different rice actors gross margin analysis and descriptive statistic were adopted in this research for variables measurement and statistics analysis to identified mean and standard error for each variable. The total average of rural population is about 1493.36, with as household of 574.54 with average of labor force of 259.81, where productive land ranged between 1 to 4 hectares per capita and by village. the actors are distinguished into: Small (0-2) ha, they constitute as the largest group of employees, accounting for 48.68% of all producers in the study area, Medium producers (2-5) ha, which occupied 33.33 % of producers and Large (Above 5) ha, this actor category closes the margin with only 18% of the producers in the zone.

Assessing these three producer categories in terms of net income, that the large producer obtained the highest income of 772 US$/ha followed by the medium producer with the average income of 313 US$/ha and the least income indicated by the small producer of 140 US$/ha. Through the benefit cost ratio, observed in the following order: large (1.21) medium (1, 14), and small (1.13). It can be concluded that, rice production profitability is not satisfactory for the rice farmers on the moment, M.Z. Hoque and M.E. Haque (2014).

The study reveals the value chain of the rice generally practiced in Guinea and in particular in the rural commune of banian. It is clear that rice processors are consisted of the buyer-steamers (73 members) and the thrashers or decorticators (42 members) in the study area (table 1). They obtained higher income through the commercial activities and processing of rice comparing to the rice growers. Thus, the purchasers-steamers alone obtained a trifle of 6450 US $/ha as gross margin against and 2260.5 US $/ha as the total cost of buying steaming and pounding, which allows them to generate a profit of (US $ 4189.5) in net income after selling to retailers whom obtained the average cost-benefit ratio is high estimated at 2.83 which can allow a real significant profitability.

Those who own machines for thrashing paddy rice into net rice but also provide small-scale industry grinding rice into flour for other specific foods as such as cakes, pasta, bread. It was found that machine owners spent an estimated average of 1397.65 US $ to processing an average weight of 2000 kgs of paddy rice per year and generated an estimated gross margin of 1720 US $/kg. So far the average net income observed 322.35 was US $/ha, and 1.23 as benefit cost ratio which proofs that these processors generated lower income compared to the co-actors (buyer- steamers).

It can be concluded that all actors of rice production in this study area, of the rice chain value is confronted with many obstacles, which challenging rice production activities. Obstacles as such as farm investment, manual labor, the cost of irrigation system, poor management of the most arable land, lack of well skill trainers and access to the agricultural inputs (Zoumbiesse T and Diallo D. 2003). For these multiple reason, farmers need larger attention and enterprise investment from the government as follows:

1. Investment in irrigation and drainage system technology which improofs water usage and management to increase yield that reflected in better income and improving living conditions of household;
2. Provide new machines for the thrashing and rice parboiling tools to replace traditional once which are less profitable, and conducting regular training to upgrade skill of all the actors in the production.
3. The government should set a good policy to keep rice price at the desired price to enable them to generate benefit from their agricultural activity.
4. The producers need to be organized into groups, associations and cooperatives for them to be heard by the state and by all the organizational structures that support the sector in the decision-making process concerning their production activities
5. The rice market deserves to be organized; The State should control and buy the surplus production of producers at a reasonable price to prevent actors such as steam buyers from buying rice at low prices and set up autonomous credit cooperatives in each rural commune to enable growers to grow over time in keeping with the agricultural calendar.
6. can be conclude that the success of rice production in the study area depends on the rate of inputs used (seed, fertilizers, pesticides etc), as well as land (soil) type used, number of irrigation needed, number of labor and their wage rate, the producers ‘management practices, marketing facilities of the rice production etc… As all these factors differed from one location to another across the study area, the issues of production costs and the improvement of economic performance must be taken seriously by national agricultural policies in order to enable producers to generate income and provide for their subsistence.

Acknowledgements
This paper is an outcome of my Ph.D. dissertation research funded by China Scholarship Council (CSC). The dissertation was carried out at College of Humanities and Development Studies, China Agricultural University (CAU). The author likes to thank CSC for its generously financing my PhD study in China. I also like to thank Prof. Liu Yonggong, CAU for his excellent academic supervision and Dr Diawadou Diallo, John Morris Togo and Alexandre Konaté, the Higher Agricultural and Veterinary Institute of Faranah for their supervision and direct contribution to this paper. My sincere thanks also go to the farmers and village leaders who actively

participated in the field data collection process. .

Siba Kolin Koivogui
Beijing, China, 18 May, 2017

References

AACG (2005), Training Guide for facilitators of the implementation of local development plan in the Republic of Guinea.22 - 29.p

Aliou Diagne, Didier Y. Alia, Marco C.S. Wopereis, and Kazuki Saito (2012*):* Impact of Rice Research on Income and Poverty in Africa: An *Ex-Ante* Analysis

Agricultural campaign activity report, SNPRV, 2000, 2004).Annual report of activities for the. CBSS Nerica agricultural campaign, DR-SNPRV Guinea

Bouman, B., et al. (2007). Water management in irrigated rice: coping with water scarcity, Int. Rice Res. Inst.

Cantrell, R. and G. Hettel (2004). Rice-based production systems for food security and poverty alleviation in Asia and the Pacific. Proceedings of the FAO Rice Conference 'Rice is life'. International Rice Commission Newsletter.

Chang, J. C., et al. (1985). "UV inactivation of pathogenic and indicator microorganisms." Applied and environmental microbiology 49(6): 1361-1365.

Diagne, A, Sogbossi, M.J., Diawara, S. & Camara, A. 2006. *Succès de la dissémination des* variétés de riz NERICA en Guinée: estimation des superficies totales emblavées et potentielles. Mimeo, ADRAO.

Diagne, A. (2006) Impact assessment at WARDA: scope and summary of major outputs. Report prepared for the

Center Commissioned External review (CCER) of WARDA's Integrated Genetic and Natural Resource Management (IGNRM) program.

Descroix, F. (2001). "Appui au Programme de recherche-développement sur les cultures pérennes de l'IRAG en

Guinée forestière: compte-rendu de mission en Guinée du 19 avril au 5 mai 2001."

Duijndam, F. P., et al. (2007). "Production and use of maize seed for sowing in Bolivar, Ecuador." Euphytica 153(3): 343-351.

FAO (2004), International Year of Rice (IYR)

Florent Okry*,* Paul Van Mele, Edwin Nuijten, Paul C. Struik *and* Roch L. Mongbo (*2010)*Organizational analysis of the seed sector of Rice in Guinea: Stakeholders, Perception and institutional linkages.

Guinean alimentary security initiative, (2013). Annual report of activities for the Nerica agricultural

Hoque, M. and M. Haque (2014). "Socio-economic Factors Influencing Profitability of Rice Seed Production in Selected Areas of Bangladesh." The Agriculturists 12(1): 33-40.

Joshi, A. and J. Witcombe (1996). "Farmer participatory crop improvement. II. Participatory varietal selection, a case study in India." Experimental Agriculture 32(04): 461-477.

Kiple, K. F. (2000). The Cambridge world history of food. 2, Cambridge University PressLondo, J. P., et al. (2006).

"Phylogeography of Asian wild rice, Oryza rufipogon, reveals multiple independent domestications of cultivated rice, Oryza sativa." Proceedings of the National Academy of Sciences 103(25): 9578-9583.

Ministere de L'agriculture et de L'élevage (MAE, BSD, 2009) Stratégie nationale de développement de la riziculture

Nwaobiala, C. (2010). "Economic Analysis of Swamp Rice Production in Ebonyi Southern Agricultural 46(11): 3255-3261.

Prefectural Directorate of Agriculture. IRAG/ANPROCA (2013), Synthesis report on the regional rice growing technological transfers pilot program.

Sato, T., et al. (1987). "Deposition of diamond-like carbon films by pulsed-laser evaporation." Japanese embassy in the Republic of Guinea, BSD (2005) Nerica evaluation in the Republic of Guinea

Seboka, B. and A. Deressa (1999). "Validating farmers' indigenous social networks for local seed supply in Central Rift Valley of Ethiopia." The Journal of Agricultural Education and Extension 6(4): 245-254.

Sweeney, M. O. and A. S. Hellkamp (2006). "Heart failure during cardiac pacing." Circulation113(17): 2082-2088.

Thierno A D and Sébastien S (2004), Note de capitalisation sur la filière riz en Guinée

Takahashi, K., et al. (2003). "Role of ERas in promoting tumour-like properties in mouse embryonic stem cells." Nature 423(6939): 541-545.

The local rice channel in Guinea (synthesis), Dynafiv, BCEPA (June 2005) Follow up evaluation service, information and communication,

Vaughan, D., et al. (2008). "The minimum information about a genome sequence (MIGS) specification." Nature biotechnology 26(5): 541-547.

Zoumbiesse T and Diallo D. (2003) Drought resistance of rice (Orysa Sativa L): varietal screening vegetative phase, p 6-11.