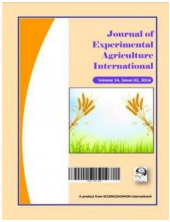

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Determinants of Cashew Growers' Participation in a Joint Contract Farming-and-processing Investment Project in Benin

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Authors' contributions

This work was carried out in collaboration between all authors. Authors SMA and BGH jointly wrote the first draft of the manuscript. Author BGH designed the study, wrote the protocol, provided in-depth literature review and policy insights of study results and reviewed all drafts of the manuscript. Author JD offered the experimental setting of the study, clarified the investment background and contributed to policy implications of the study. Author SMA supervised data collection and performed early statistical analysis. Author HS gave additional literature and useful views in the international dimension of the study results. All authors read and approved the final manuscript.

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ABSTRACT

Aims: This research aimed to identify the determinants of Village Cashew Growers Cooperatives (CVPA)'s participation in a joint cashew contract farming-and-processing investment project.
Study Design: The processing system includes village-level pre-processing satellite units which would supply unhusked kernels to a central unit in charge of the next stages of processing and

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marketing of white and roasted kernels. The study design includes (i) a profit sensitivity analysis based on cashew price simulation, and (ii) an elicitation of farmers' opinions about the joint investment venture.

Place and Duration of Study: From September to December 2015, a survey was conducted in Glazoue and Dassa-Zoumè districts, the main cashew growing areas of Benin, where annual rainfall ranges from 960 – 1260 mm.

Methodology: Processing technology documentation and field observations were done for the profit sensitivity analysis, and questionnaire-based interviews and focus group discussions were conducted with 43 CVPA to assess growers' willingness to participate in the project. Data on CVPA characteristics and their functioning were collected and a logistic regression model was run to identify the determinants of the joint venture investment.

Results: The study found that the price range of unhusked kernels for a profitable processing system was 1640-2493 FCFA/kg. The main determinants of CVPA participation in the investment included expected cashew producer price at 5% significance level, and sex of cooperative's chairman, expected commission and cashew assembly service income (rebate), and size of cooperative at 10% level. Expected price, expected rebate, sex of chairman and registration fostered participation, whereas size of cooperative and exit likelihood hampered participation.

Conclusion: The joint processing investment project can be successfully implemented with farmers' participation, if cashew nut producer prices are attractive, and cooperative's gender-wise leadership and contract farming management are improved. Producer price monitoring and promoting professional farmers' business groups and innovative trade partnerships, with enhanced negotiation and investment capacities, will be key to increase farmers' income and ensure poverty reduction in the cashew sub-sector in Benin.

Keywords: CVPA; participation; investment; determinants; cashew; contract farming; satellite units; central unit.

ABBREVIATIONS

CVPA : Village Cooperatives of Cashew Growers
PSRSA : Strategic Plan to Boost the Agricultural Sector
UCPA : Communal Union of Cashew Growers
URPA : Regional Union of Cashew Growers
FENAPAB : National Federation of Cashew Growers
FCFA : French-speaking West Africa currency
SU : Satellite Unit (Village raw cashew nut unhusking plant)
CU : Central Unit (Regional plant for white and roasted kernels' production)
MAEP : Ministry of Agriculture

1. INTRODUCTION

1.1 Background

Cashew is the second export crop in Benin, contributing 8% to total exports' value, 7% to agricultural Gross Domestic Product (GDP) and 3% to national GDP in 2008 [1]. Most of the total added value in the cashew value chain is captured by local traders and exporters of raw nuts, at the expense of growers. Traders and exporters represent only 10% of the sub-sector's workforce but they earn almost half of the total added value [2]. The local processing link of the value chain remains weak as only 5% of total cashew nut production is processed [2]. Processing operations are currently carried out both by traditional and semi-industrial units facing many problems. These include inappropriate access to credit, difficult supply of raw nuts, inappropriate processing equipment, low technical knowledge, lack of knowledge and training for coherent business plans development, and finally low quality and uncompetitive kernels. Among these problems, the supply of raw material (cashew nuts) remains a crucial one. In 2015, many processing units in Benin as well as in the West African sub-region closed down mainly because they were not able to purchase nuts at high prices and compete with foreign buyers. Indians, with their financial and organizational power, applied eviction prices to indirectly impede local units to buy nuts. The non-processing up to 95% of cashew nuts

represents a huge shortfall for Benin in terms of wealth creation at local level and poverty reduction.

In light of the foregoing, it is necessary to effectively and efficiently invest in the processing of cashew nuts by establishing profitable and viable processing systems. To achieve this, it is important to study factors that would critically influence the decision of CVPA (Village Cooperatives of Cashew Growers) to invest in the processing equipment of satellite or village processing units. This action will allow them to take ownership of the system and enhance their commitment to make available the quantities of nuts required each year for a cost-effective functioning of the system. This study aims at analyzing the factors that determine CVPA's participation in the investment for a modern processing equipment of cashew kernels production under a contract farming project in Glazoue and Dassa-Zoume districts of Benin. Its findings are expected to contribute to designing sustainable strategies and policies to limit the huge annual raw cashew nuts exports by Indo-Pakistani buyers and improve growers' income and well-being.

1.2 Literature Review

The theoretical background of the study includes the relationships between agricultural trade, industrialization, economic development and rural poverty reduction in Africa, and the current state of cashew processing in Benin and in the West Africa sub-region.

Most countries in West Africa (including Benin) are characterized by weak economies and a growing poverty, in spite of their high natural potential for agricultural production [3]. That situation is due to low wealth creation capacities, including weak production, processing and trade capacities. In particular agricultural trade is dominated by exports of raw or crude farm products. While processing technologies are crucial to increase productivity and market access of agriculture, policy efforts in Benin are still weak [4]. The development of agriculture-based African economies will not be possible without accelerated industrialization, especially modern processing of locally-produced crude farm products, and trade mechanisms that promote quality standards to attract foreign exchange. Trade will revert wealth losses that occur through massive imports of basic goods that can be produced locally. A dedicated support of the industrial sector is required in African countries to improve trade and payment balances and boost economic growth [5]. Industrialization will contribute to reducing consumer prices of such goods and raise market accessibility for the poor [6]. In Benin, the Strategic Plan for Boosting the Agricultural Sector (PSRSA) promotes small-scale farming while considering the industrial push that is needed to boost productivities, and increase agricultural competitiveness and farmers' incomes. However, competitiveness (of a nation, a sector or a firm) is dynamic and closely related to its economic conditions as well as to international market conditions. An entity will remain competitive as long as it can continuously adjust in response to forces and factors that determine its position or competitive advantage in a liberalized market [7].

Adoption of post-harvest technologies, dedicated inclusive investment programs and related trade policies and regulations will be needed to foster agricultural competitiveness and economic development in Africa [8,7]. Several studies have confirmed the links between technology adoption (and the related investment) and competitiveness or market participation of emergent locally-produced agricultural products such as rice [9-12], shea butter [13] and pineapple and cashew [14] in Benin and elsewhere in Africa. However, the relevance of collective action, such as CVPA, for investing in processing technologies has not been unanimously proven. Some authors [15] believed that investment schemes by private firms will be sustainable in rural areas if they are inclusive of village cooperatives that are built on confidence and group solidarity. However, there is need to promote independent rural entrepreneurs – which may be market-oriented individuals or economic interest groups (instead of traditional cooperatives) – for an effective lifting-up of agricultural value chains and poverty reduction in rural areas through dedicated technology development [16]. In Nigeria for example, the promotion by the government of young Nigerian entrepreneurs (small, medium and larger) in the priority value chains (N-Agripreneurs) to constitute effective business networks amongst themselves and other stakeholders of the value chain [17], belongs to such a perspective.

Contract farming arrangements, also known as out-grower schemes, have governed production of a wide range of cash crops throughout the developing world for many decades [18,19].

When effective, these approaches allow smallholder farmers to profit from a crop they might ordinarily not have access to, and allow processors and exporters to benefit from these farmers' low costs of production while ensuring sufficient supply to make their investment profitable [20]. Yet the conditions under which contract farming can be expected to emerge and persist are relatively restrictive, relating primarily to production and marketing characteristics of the crop and to characteristics of the market into which farmers sell [21,22]. Numerous examples exist of failed efforts, primarily related to the inability of processors to recover input credit (often referred to as "side-selling" [23,19]. Overall, fairness of contract partners and conducive policy environment could not be always guaranteed [24].

Cashew processing in the West Africa sub-region is quite stagnant due to unfair marketing channels and low accessibility to modern equipment. In 2015, many processing units in Benin and elsewhere in West Africa have closed down, leaving hundreds of youth jobless, mainly because they were not able to purchase nuts at high prices and compete with foreign buyers, including Indian and Vietnamese, who used to apply eviction prices. However, some plants showed resistance: the Viet Mold and Machine, a plant installed by a Vietnamese investor in Côte d'Ivoire (Yamoussoukro), the Cajou Espoir in Togo (Tchamba region), and the Afokantan Benin cashew factory in Benin republic. The cashew kernel production plants in Benin and Côte d'Ivoire have survived certainly because of the investors' financial strength; but in Togo, retention of suppliers through a fair trade approach has played an important role. Cashew growers are so delighted of the fact that the promoter of the cashew processing plant has always immediately and fully paid cash since many years until now the price they ask for.

Today, it is expected that farmers will get better producer prices and become shareholders in a decentralized processing system which will increase their access to niche markets and generate substantial income for them. Adekambi [25] found that bottom-of-the pyramid producers intended export market integration is higher when prices are paid upon delivery, when a trusted third party is involved in quality certification, and when an organization with operational marketing competency support is present. The fair trade approach being advocated for by some technical partners in Benin certainly buys in this perspective. Drawing lessons from the failure of previous farmers' Cooperatives that functioned with weak or distorted market connections and perverse incentives in the cotton sub-sector in Benin [24], this study will contribute to investigating an approach where a specific contract farming is proposed to CVPA through satellite units' shareholding, with the prospect of getting farmers' participation in that joint processing investment venture. Considering success stories reported by [26], this study analyzes the case of a contract farming with cashew growers' Cooperatives in Benin. These cooperatives are expected to participate in the 'contract farming-and-processing' system by jointly investing in the equipment of satellite processing units, and thereby get better access to markets for their harvests and earn greater incomes. The determinants of such participation are investigated in this study.

2. METHODOLOGY

2.1 Research Areas and Sampling

This study was carried out in Glazoue and Dassa-Zoume which are two districts belonging to the central region or Collines department of Benin. Glazoue is located 7°58′ 25″ North latitude and 2°14′ 24″ East longitude and has an average annual rainfall ranging from 960 to 1,260 mm. Dassa-Zoume is located 7°41' 33" North latitude and 2°13' 25" East longitude and gets about 1,100 mm annual rainfall. The choice of these districts is justified on the one hand by their geographical position, which allows the growing of tree / perennial crops (especially cashew) and various annual cash and food crops such as cotton, maize, cassava and yams, and on the other hand by the non-existence of functional processing units. Research villages (Fig. 1) in these districts were chosen based on their cashew cooperatives' production capacity to meet the required annual volume (645.45 tons) for optimal functioning of at least 4 satellite processing units, each with an annual capacity of 151.2 tons. The latter value is the volume of raw cashew nuts required to run one satellite unit over a year. This will generate a white kernel output of 31.752 tons (i.e. a 21% output rate) able to fill two containers of white kernels, each with 15.876 tons (700 boxes, each weighing 22.68 kg).

The research sample is made up of 43 Village Cooperatives of Cashew Growers (CVPA), of which 18 in Glazoue and 25 in Dassa-Zoume. Cashew cooperatives in Benin are organized

from village level to national level. At village level they are called CVPA whose association is Communal Union of Cashew Growers (UCPA) at district level, Regional Union of Cashew Growers (URPA) at regional level and National Federation of Cashew Growers (FENAPAB) at national level. CVPA were chosen considering mainly their regular functioning over the last two agricultural years and availability of cashew nuts stocks with all members. The functioning of a cooperative means existence of a governing body (Chairman, Secretary and / or Treasurer) and periodic meetings of members. Data were then collected from 32 men-headed and 11 women-headed CVPA, through interviews with the Chairman of each cooperative. They concern CVPA's characteristics, their functioning and their willingness to participate in the joint cashew production-and-processing venture. Semi-structured and structured interviews and focus group discussions were conducted from September to December 2015. Data matrix was built using Excel 2013 and processed with STATA 13.

A few contract farming-related characteristics of the CVPA are presented in Table 1. The size (number of members) of each cooperative varies from 6 to 58, with a total of 803 for the 43 surveyed CVPA in the two districts. Most of them were established between 2002 and 2014. 74.4% are male-headed and 25.6% are female-headed. Their main business is cashew production and marketing. As secondary activities, they dwell in the production, processing and marketing of soybean or rice. The minimum planted area to cashew trees is 16 hectares (ha) and the maximum is 136 ha, with a total of 1,650 ha for all 43 CVPA. Overall, 37.2% of CVPA agreed to participate in the capital of satellite processing units. Those who did not express willingness to participate prefer to sell all their cashew nut harvests for cash to the project.

2.2 Criteria for Profitability Analysis of Satellite Units and the Central Unit

Before assessing beneficiaries' participation in an investment project, profitability and competitiveness have to be analyzed. Any investment should be justified by its profitability or the rate of returns on capital. An industry is competitive when it has the capacity to make profit and keep a certain share in the domestic and/or international market [27]. Hence the need to analyze the profitability of the investment-based processing chain calling for CVPA's participation. To achieve this, the Internal Rate of Return (IRR) was chosen as the main indicator of profitability, considering a 10-year planning horizon. This period was determined with regard to criteria such as technological obsolescence and the lifetime from the technical and economic point of view of the most expensive project assets. The IRR calculation was made using the financial function of Excel 2013 at a 19% discount rate corresponding to the interest rate charged by the local microfinance institution (CLCAM) of Glazoue.

As the price of unhusked kernels is not known on the market, simulations were made to determine the net margins or profits and the selling price of unhusked kernels that would allow the central unit's profitability. The profit rate is calculated here as the percentage share of net margin in the consumer selling price. By applying profit rates between 0% and 40% to the selling price of unhusked kernels, different price values were determined by the following formula: $P = C / (1-T)$, where T is the profit rate of the satellite unit, C its production cost and P the price per kg at which it would sell unhusked kernels to the central unit.

2.3 The Project's Cashew Processing System and Management Model

The project aims to promote a satellite processing system, in which satellite units are smaller and labor-intensive units located at village level, upstream of major processing units called central units that are supposed to deal with the remaining aspects of the processing chain [26]. Fig. 2 shows the functions of the various units in a satellite processing system. The role of satellite units includes sorting, cooking with steam and shelling of nuts. The central unit's role consists of drying, peeling, classification, seasoning, packaging and marketing. The investment capital of one satellite unit is 28,117,797 FCFA. The minimum share that a cashew grower can release is 5,000 CFA FCFA. Producers are able to pay this in kind with raw nuts, which is equal to 16.18 kg of nuts to be sold at 309 FCFA/kg. The 43 CVPA have 803 members, meaning a minimum amount of 4,015,000 FCFA as their participation in the capital of a satellite unit is 14.27% the initial capital required to install a satellite unit. After selling the major part of his harvest to the project, the amount of 5,000 FCFA will be withdrawn from the revenue to which the producer is entitled.

Table 1. Characteristics of the sample CVPA

Communes	Number of functional CVPA*	Total membership	Average yield observed (kg/ha)	Total cashew area (ha)	Annual production (T)
Dassa	25	477	350	970.5	339.675
Glazoue	18	326	450	679.5	305.775
All	43	803	391	1650	645.45

** in the district.*
Source: Field Survey Data

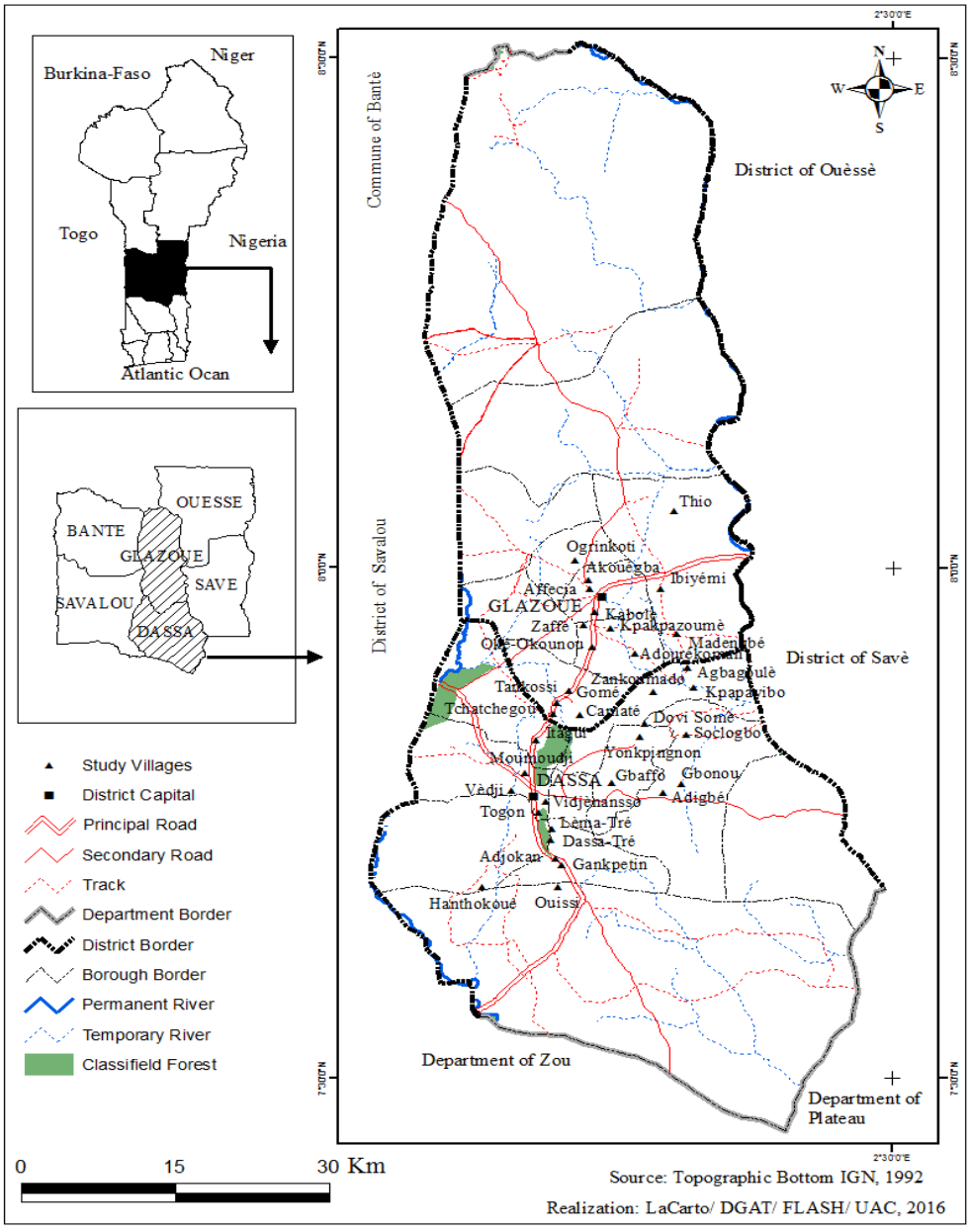

Fig. 1. Map of research areas' location in the central region of Benin
Source: Adapted from National Geographic Institute - IGN (1992) by LaCarto/DGAT/FLASH/UAC (2016)

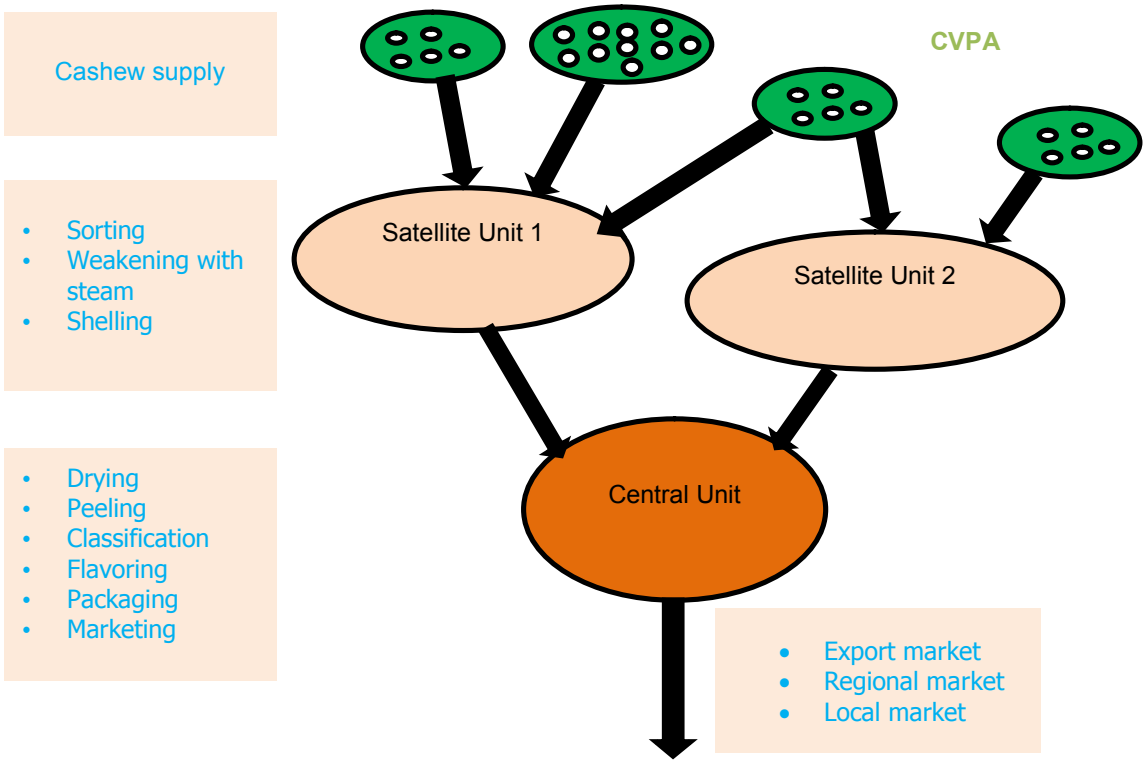

Fig. 2. Different links in a satellite processing system and their roles
Source: [28]

The prospect of this joint investment venture in satellite processing units is of major interest to CVPA, because it will allow them to earn dividends each year from the net profit made. In addition, they will benefit from cashew plantations' maintenance credit and training, to improve the level of production. This action will also allow them to take ownership of the processing model and thus provide the volume of nuts needed for a sustainable functioning of the processing units. The manager of satellite units will be a recruited expert with a minimum level of bachelor's degree and at least five years' experience in the field of cashew nuts' collection, processing and quality control. Fig. 3 shows the mapping of the satellite processing system envisaged by the project.

2.4 Empirical Model of Participation in the Joint Investment Venture

Modeling of CVPA's participation in the joint investment venture was performed using the logit model. Gourieroux [29] argued that logit models were initially introduced as a proxy for Probit models for simplest calculations. These models have previously been used for biological studies, but they have a very broad scope: sociology, psychology and more recently in economics [30,29]. The decision to invest only occurs when the utility associated with the asset to be evaluated reaches a given value. Assuming that this utility is measured by an unobservable index (I_m) for cooperative m, and I_{0m} the critical value of the index on which it agrees to invest in the processing equipment of the satellite units, two cases may arise:

If I_m is greater than or equal to I_{0m}, then the cooperative invests and the investment variable Y is set to 1. The higher the index I_m exceeds the critical value, the greater the likelihood that the cooperative invests in the project. If I_m is below I_{0m} the cooperative does not consent and Y is 0.

This can be shown by the following mathematic formula:

$$I_m \geq I_{0m}, Y=1 \quad (1)$$

$$I_m < I_{0m}, Y=0 \quad (2)$$

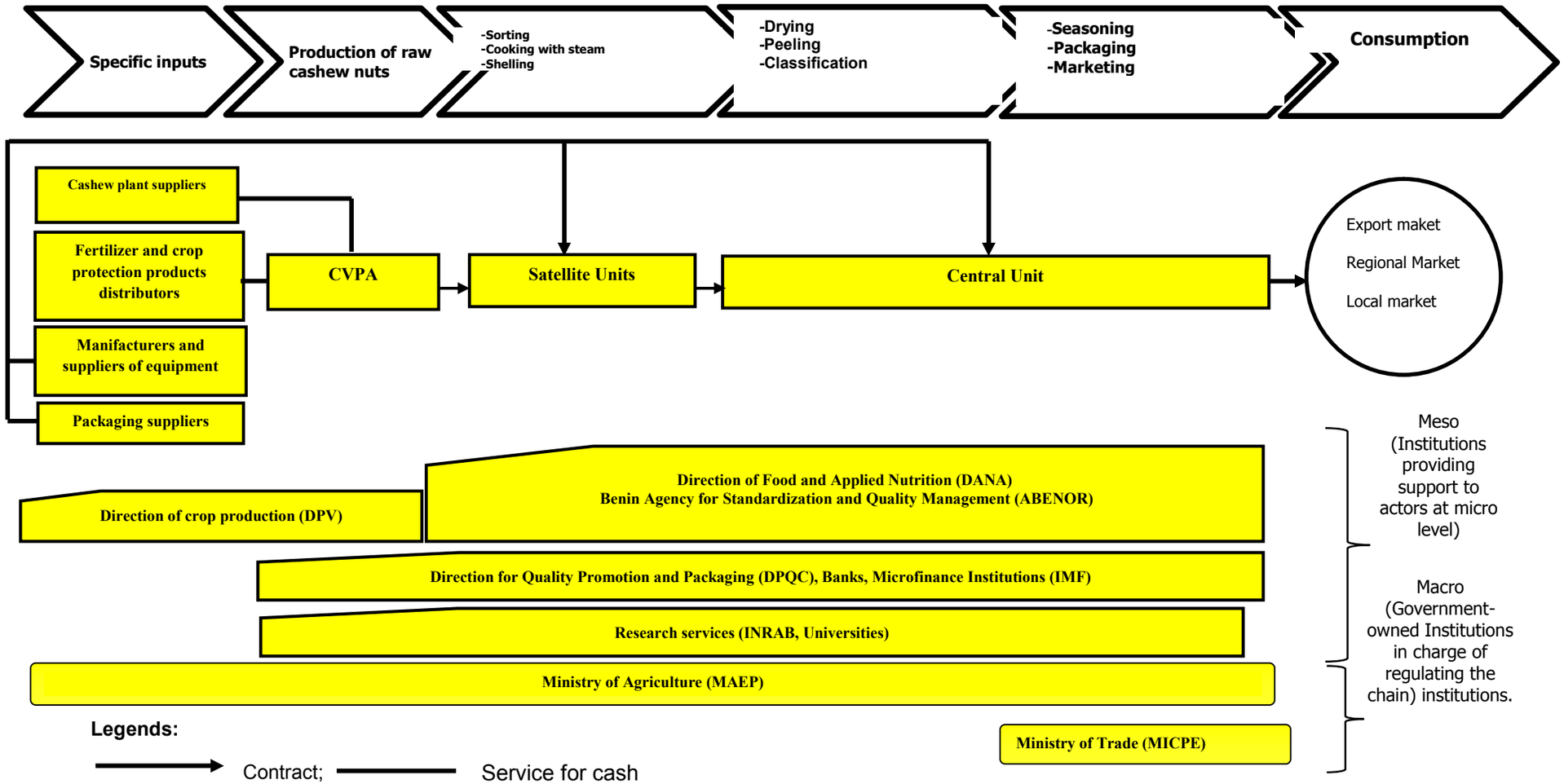

Fig. 3. Mapping of the satellite cashew processing chain envisaged by the project (ValueLinks approach)

Sources: GIZ and MAEP, and Field Survey Data

For the cooperative m, the I_m index can be a linear combination of X_i variables that determine the willingness of CVPA to invest and β_i are the coefficients to be estimated. Its expression is then mathematically given as follows:

$$I_m = \Sigma \beta_i X_{im}, i = 1\ldots k \quad (3)$$

With X_{im} the i^{th} independent variable explaining the consent of the cooperative m to invest and β_i its corresponding parameter to be estimated.

Let's Γ be a vector of β_i parameters to be estimated and by X a matrix of independent variables, the equation (3) can be written in matrix form as follows:

$$I_m = \Gamma X \quad (4)$$

The probability P_m that the cooperative consents is:

$$P_m = P\ (Y=1) \quad (5)$$

As the I_{0m} index is a random variable, if F is its cumulative probability function or distribution function, then:

$$P\ (Y=1) = P\ (I_{0m} \leq I_m) = F\ (I_m) \quad (6)$$

$$P\ (Y = 0) = 1\text{-}F\ (I_m) \quad (7)$$

The functional form of F is determined by that of the probability density function of the random I_m variable. For the logit model, it is a logistic function with the form:

$$F(x) = \frac{1}{1 + e^{-bX}} \quad (8)$$

[31]

The empirical equation after the theoretical model is as follows:

$$P\ (Y_i = 1 / \text{Invest}) = 1 /(1 + e^{-bX})$$

With X the matrix of variables to be introduced into the model, which writes as follows:

$$\beta X = \beta_0 + \beta_1 SEX + \beta_2 EDU + \beta_3 REG + \beta_4 AREA + \beta_5 CSIZE + \beta_6 EXIT + \beta_7 EXPRICE + \beta_8 MKTEXP + \beta_9 OFFARM + \beta_{10} COM + \beta_{11} YIELD \quad (9)$$

These variables in the model pertain broadly to key farmer's characteristics that are background to profit seeking and risk aversion propensity and may influence the adoption of an agricultural innovation (which usually involves a new investment) [10,13], and the main characteristics of the innovation itself [32] which are core to investment decision-making [15,22,33] and to final level of innovation demand (i.e. extent of adoption) [32].

In this study, the innovation is the cashew processing joint venture investment where farmers are requested, under conditions specified in a contract, to put their efforts and revenue from cashew farming in a new and participatory cashew processing system and become shareholders of a "decentralized" enterprise towards future ownership of village satellite units by their cooperatives. It is a financial and institutional innovation, beyond ordinary quality improvement brought by a modern equipment. Like any innovation, this goes with some risks, including here those related to (i) climate/rainfall uncertainty that affects cashew production, (ii) cashew international market and instability of domestic pricing policy [34], which will determine quality specifications for buying unhusked cashew kernels from satellite units, and (iii) sink costs of investments that cannot be transferred to other businesses [35]. The farmer's characteristics selected here include sex (SEX) and education (EDU) of cooperative's chairman (the decision center, equivalent to head of household in similar studies), cooperative's registration (REG) in the joint venture investment project, total area (AREA) planted to cashew trees by cooperative's members, size of cooperative (CSIZE, representing household size in similar studies), off-farm income (OFF-FARM) and average yield of cashew farms (YIELD). We did not include age of chairman in the model, because it is a quite controversial explanatory variable in relation with youth's propensity to discovery vs. low resource endowment or elders' failure/success experience vs. high resource endowment [36]. The main innovation's characteristics include: the decentralized managerial approach of the processing system and the related contract arrangements [37,22] which determine the number of growers willing to adhere to a cooperative and the latter's likelihood of exit (EXIT); the expected producer price (EXPRICE) and the expected commission and cashew assembly service income (COM) in relation with profit seeking propensity.

3. RESULTS AND DISCUSSION

3.1 Profitability Analysis of Satellite Units and the Central Unit

The main question here is how much should the central unit buy unhusked kernels to remain profitable. In Table 2, the value of 6.27% represents the minimum profit rate that the satellite unit should set to recover its investment over the entire planning period. This is equal to unhusked kernels' price of 1640 FCFA/kg. At this rate, IRR = 19%. Below this rate, the satellite unit is not profitable. However, the central unit is very profitable and the investment is recovered in the second year. At the rate of 38.48% (unhusked kernels' price of 2493 FCFA/kg), IRR is 19% for the central unit. This rate allows the central unit to only recover its investment. But the satellite unit is very profitable, and the investment is recovered in the first year.

In short, the satellite unit is profitable when it applies a profit rate higher than 6.27% (IRR above 19%), while the central unit is profitable by processing white kernels when the satellite unit profit rates do not exceed 38.48% (IRR above 19%). The trade is possible between the two units when the satellite unit profit rates are between 6.27% and 38.48%, corresponding to selling prices per kg of unhusked kernels lying between 1640 FCFA and 2493 FCFA.

If unhusked kernels' price is 2423 FCFA/kg, both units have the same level of profitability (128%). This corresponds to the intersection of the two curves on Fig. 3. It is the equilibrium price of SU and CU for white and roasted kernels production. The central unit would have liked to buy kernels at prices that allow it to be more profitable than the satellite unit. The reason is that its investment and operational costs are higher than those of the satellite unit. Satisfactory prices should be lower than 2423 FCFA/kg, but no less than 1640 FCFA/kg which is the breakeven point of the satellite unit.

3.2 Results of the Logistic Regression Analysis

Average values of the independent variables included in the logistic regression model and the predicted signs of coefficients are reported in Table 3.

The regression model for cooperatives willingness to invest in the cashew selling-and-processing investment scheme (participation) is very significant ($p<0.001$). The most critical determinant of CVPA's participation in the project is the cashew nut expected price (significant at 5% level). The higher the purchasing price expected from the project (buyer), the more CVPA are willing to participate in the investment venture. This finding is in line with that of [38] who found that the increase of the price proposed to CVPA goes with the increase of the volume of nuts delivered to CVPA by its members and thus favors the delivery of nuts to satellite units. Other relevant variables (at 10% level) that are favorable to investment participation, include sex of chairman and registration status of the CVPA (Table 4). Men-headed CVPA are more willing to participate than female-headed ones, and a registered cooperative seems to have more confidence in the investment scheme. Indeed, women are reported to take less risk and invested less of their wealth in risky assets than men [39], while registration provides the legal background to better deal with misunderstandings that may arise from contract implementation. Women invest less, and thus appear to be more financially risk averse than men [40, 41, 42]. A majority of women also prefers taking average or below-average risks, whereas about half of the men prefers taking above-average or substantial investment risks.

Table 2. Effect satellite unit (SU)'s profit rate on central unit (CU)'s profitability

SU profit rates (%)	SU			CU	
	Unhusked kernels price (FCFA/kg)	IRR (%)	Pay back period (Year)	IRR (%)	Pay back period (Year)
0.00	1534	-2		115	2
6.27	**1640**	**19**	**10**	**105**	**2**
10.00	1704	30	6	99	2
20.00	1917	62	3	79	2
30.00	2191	102	2	52	3
38.48	**2493**	**146**	**1**	**19**	**10**
40.00	2556	155	1	11	

Source: Field Survey Data

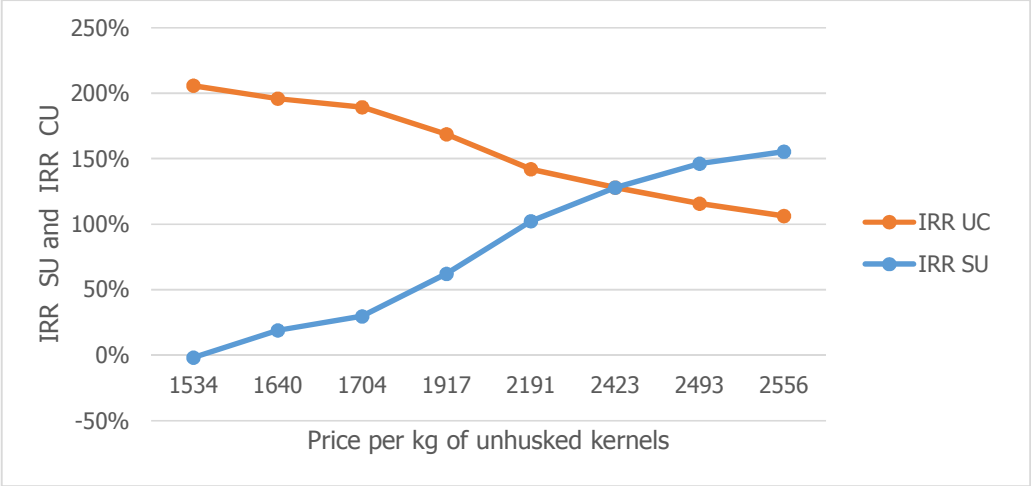

Fig. 4. Profitability (IRR) of SU and CU based on the price of unhusked kernels
Source: Field Survey Data

Table 3. Description of the variables in the regression model

Variable name	Description	Unit	Values	Expected sign
Dependent	**Willingness to invest**		**Yes 1, No 0**	
Independents				
SEX	Sex of cooperative's chairman		Male 1, Female 0	+
EDU	Education of chairman	Years	0-15	+
REG	Registration status of cooperative		Registered 1, Non registered 0	+
AREA	Total area planted to cashew by cooperative members in 2015	ha	16-136	+
CSIZE	Size of the cashew cooperative	Number of members	6 - 58	-
EXIT	Likelihood to exit the cashew purchase contract (selling to other buyers)		Yes 1, No 0	-
EXPRICE	Expected cashew producer price	FCFA/kg	250-500	+
MKTEXP	Marketing experience of the cooperative	Years	1-7	+
OFFARM	Off farm income		Yes 1, No 0	+
COM	Expected commission and cashew assembly service income (rebate)	FCFA/kg	30 - 80	+
YIELD	Average cashew yield obtained by cooperative members	Kg/ha	280 - 700	+

Source: Field Survey Data

The expected commission and cashew assembly service income (rebate) is a variable that is significant at 10% level. The more a buyer pays for the commission and assembly service the more CVPA are interested in investing in the satellite units. A similar finding has been reported that farmers manifesting a strong preference for patronage refunds become CVPA's members

Table 4. Parameters of the logistic regression model

Dependent variable: Willingness to invest in the project's processing equipment		
Independent variables[1]	**Coef. (Std. Err.)**	**Marginal effects (Std. Err.)**
SEX	4.000*(2.417)	.865 (.546)
EDU	-.0110 (.198)	-.002 (.042)
REG	6.192* (3.400)	1.340* (.737)
AREA	.118 (.083)	.025 (.017)
CSIZE	-.506* (.278)	-.109* (.058)
EXIT	-4.114* (2.508)	-.890* (.535)
EXPRICE	.083** (.038)	.0180** (.008)
MKTEXP	.781 (.616)	.169 (.137)
OFFARM	-.623 (1.616)	-.134 (.345)
YIELD	-.004 (.005)	-.001 (.001)
COM	.556* (.298)	.120* (.062)
_cons	-47.288 (23.521)	
Log likelihood = 10.79		
LR chi2 (11) = 35.18***		
Pseudo R2 = 35.18		
Observations = 43		

**** P<1%; ** P<5%; * P<10%*

Source: Field Survey Data.

[1] *SEX: Sex of cooperative's chairman; EDU: Education; REG: Registration; AREA: Area planted to cashew trees; CSIZE: Size of cooperative; EXIT: Likelihood to exit the cashew purchase contract; EXPRICE: Expected cashew producer price; MKTEXP: Cooperative's experience in cashew marketing; OFFARM: Off-farm income; YIELD: Average cashew yield; COM: Expected commission and cashew assembly service income (rebate)*

and go into partnership with satellite units [38]. On the contrary, CVPA with big size or high likelihood to exit are less inclined to participate in the program. This finding confirms that cashew cooperatives usually fail to agree on implementation of common decisions when there are too many members. Cooperatives with large size face problems such as: low involvement of members and the increasing adoption of a consumer attitude in their dealings with the cooperative, increased tensions between the commercial activities and those related to the mission of the cooperative [43,44] and therefore are not prompt to participate in an investment scheme. It is important to notice that all the variables with significant coefficients, except the sex of chairman, have significant marginal effects[1].

4. CONCLUSION

In this study, the determinants of cashew growers' participation in a joint venture processing project were identified using a logit model estimation. The findings revealed that profitability of investment can be expected, and that Village Cooperatives (CVPA)'s participation in the investment of satellite units is determined by expected cashew producer price, sex of the cooperative's chairman, expected commission and cashew assembly service income (rebate), size of cooperative, likelihood to exit the cashew purchase contract (selling to other buyers) and registration status of cooperatives. Expected price, expected commission and assembly service income, sex of chairman and registration foster participation, whereas size of cooperative and exit likelihood hamper participation. The satellite units and the central unit being profitable, the processing system envisaged by the project can be successfully installed with farmers' participation, provided that attractive cashew nut producer prices are proposed to growers and a dedicated attention is given to gender-wise management of CVPA and to above-mentioned critical aspects of contract farming.

A few policy implications of these findings include that the Ministry of Trade in Benin and elsewhere in Africa would need to revisit the legal framework of private-led joint investment ventures in the agricultural sector, especially those requiring sustained farmers' participation, in order to ensure win-win outcomes for contract farming partners. Producer price monitoring by an independent private-public body and lifting-up

[1] *Marginal effects give the amount and direction of change in the outcome variable when an explanatory variable changes [45].*

farmers (especially women) from traditional cashew growing/assembly towards professional business groups and innovative trade partnerships, with enhanced negotiation and investment capacities, will be key to increase farmers' income and ensure poverty reduction in the sub-sector.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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