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Determinants of Agricultural Activities Selections and Adoptions of Rural Households in the Cotton Basin of Benin

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

The aim of this paper is to identify the determinants of the various agricultural activities selected and adopted by producers in the cotton zones of Benin. With a multilogit estimation, a sample of 702 producers of different agricultural activities is extracted in a random way. Results of the estimation show that several factors inhibit the agricultural growth in the cotton zones of Benin. These factors are organizational, institutional, political and sociocultural order. The constant implication to decision-makers and producers in the implementation of sustainable agricultural growth have to be operated by, grouping farmers' organizations in each agricultural sector, base training, complete distribution of new innovations. The structures of vulgarization have to integrate the perception or producers expectations and question about reluctances of producers to fully integrate recommendations relative to practices for improving durably productivity of production systems through agricultural activities selections and adoptions.

Keywords: Selection; adoption; agricultural activities; selection models.

JEL Classification - D13, O15.

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1. INTRODUCTION

Although agriculture occupies about 80%[1] of the working population of Benin, it still unable to feed the whole population. This non-performance is not only due to the socioeconomic and climatic conditions. In the cotton zones of Benin, producers seem to be agro-pastoral type with crops production in predominance [1]. The cultural system belongs, according to the typology of various cotton zones agro-ecological potentialities, to the cereal system based on cotton. Indeed, cereal and tubers (maize, sorghum, millet, manioc and yam) occupy less than 45% of tilled surfaces in the cotton zones. The cultural sequences are characterized by the systematic alternation of cotton with cereal and tubers, with frequently the rotations cotton /maize; cotton/ yam; cotton/mil; cotton / manioc …….The maize is the most cultivated cereal in all cotton zones, marketed toward the south of Benin and the bordering countries, but it is not consumable in these zones. The Other cereals and tubers (yam, manioc, and millet) are partially intended for subsistence farming, but also marketed. Systems of selection and adoptions of agricultural activities became some strategies for producers to increase their productions and productivity, their agricultural income and especially in the optics to guarantee their food security and welfare. The cotton is the main culture in the North - Benin. This culture benefits supports from a national structure which intervenes in the campaign organization since the production until the marketing. The structure made available credits inputs for producers. A big part of the cotton production is exported towards Europe and Asia.

Cereals constitute the main base of the daily food ration of Beninese. The notion of cereal balance sheet is used in Benin to estimate the cover of the country's food needs. Today, although the notion of food security cannot be appreciated in terms of cereal balance sheet but in terms of quantity of calories and micronutrients consumed, it is opportune that we consider as base of calculation the essential component of the daily food ration. [2] indicates that cereals constitute the main component of the daily food ration in rural areas (70 to 80%). In spite of the important role of cereal in the daily food ration, the general trend of the cotton production growth in departments of North Benin is in full evolution. The cotton production in this zone has increased during the campaign 2011-2012, from 130 000 tons for the last campaign to about 300 000 tons for this campaign [3]. The cotton, due to its importance for the economy of Benin, is the sector which continues to benefit of some particular attentions for its upturn. The campaign 2011-2012 was the object of a quite particular attention of the government and which was lead to the inputs subsidy and the improvement of the purchase prices of cotton seeds for producers. During this agricultural campaign of 2011-2012, the government of Benin decided, among others, to satisfy the request of producers to reduce from 240 to 220 CFA francs (1 US dollars = 499 CFA francs) the kilogram, or from 12.000 CFA francs to 11.000 CFA francs the 50 kg bag selling price of fertilizers to cotton producers, and to pay to producers the first choice of cotton seed at 250 / KG against 200 CFA francs in 2010-2011 and 190 CFA francs during campaigns 2008-2009 and 2009-2010 and second choice at 200 CFA francs / KG against 140 CFA francs / KG for the campaign 2009-2010 and 160 CFA francs /kg for the campaign 2010-2011 [3].

This cotton growth poses a problem of selection and adoption between the cotton and the food productions. Selections and adoptions of agricultural activities continue to occupy an important place in the strategies of agriculture boosting as the base of the economy of Benin. The population growth with an average of 3, 25% between 2002 and 2008; 3.73% in 2011; 4. 78% in 2013 seems to be very strong compared with agricultural development indications estimated to 2.5% in 2011; 2.4% in 2012 and 3.6% for 2013 [2]. Some agricultural product such as maize, manioc and niebe are marketed in informal way towards Niger, Nigeria, Burkina Faso and Togo where the demands are very high [4]. The high demands of these speculations in these bordering countries infer the increase of the food goods prices in Benin. Nigeria, only absorbs more than 45% of the informal marketing of these food productions [4]. This sector characterized by a weak growth due to numerous necks of structural, organizational, institutional and political order. The cotton basin produces more than 78% of the "white gold" in Benin [5]. This basin covers, except the sub prefecture of Gogounou, the sub-prefectures of Ségbana, Banikoara, the Urban District of Kandi in the department of Borgou and the sub-prefecture of Kérou in the department of Atacora. The basin

[1] *INSAE (2014).*

named ZAE [2]2 is estimated at 20.930 km2 (that is, 18% of the national territory) among which approximately 56% of arable land. It is bounded at East by the Federal republic of Nigeria, at North by the sub-prefectures of Malanville, Karimama and by the Republic of Burkina Faso; at South by the sub-prefectures of Kalalé, Bembéréké, Silence, Péhunco and Kouandé; and at West by the sub-prefecture of Tanguiéta. The agricultural activity in the ZAE2 was only limited to subsistence crops such as sorghum, yam, millet, peanut, maize, niebe, manioc, sesame, sweet potato, etc. The rice is known and practiced in the village since the beginning of the 50s with French Company for Textiles Development ((Compagnie française pour le Développement des Textiles (CFDT)). The cotton production seems from now on associated with subsistence crops as maize, manioc, sorghum, rice, etc. The ZAE2 is characterized by two seasons: a rainy season spread over 6 months from April to October and which would grow shorter more and more. It really settles down from May in the best case, and a dry season which begins in October and finish in March. The annual average rainfall oscillates between 800 and 1200 mm. The period of vegetative growth varies between 140 and 180 days. In the ZAE 2 the pluviometry is very irregular and this shows itself in several ways: early, late starting up; rough interruption; premature or late end; etc. From the beginning of 2013, we note that the annual height of water exceeds hardly 1000 mm while for the previous period this height was reached more frequently. Besides, rains were distributed on a number of higher days before 1980; it often rained during more than 80 days a year against approximately hardly 70 days during the last two decades. The dominant vegetation is a grassy raised savanna strongly degraded by the anthropological influence, so evolving towards the shrubby savanna. We distinguish three types of grounds: the argilo-muddy grounds: they are very convenient to the agriculture, in particular to the culture of yam, and meet in the slums and forest galleries; the sandy grounds: they are generally little fertile and quickly dry out. The monopoly of cotton exportation is granted to a public company named SONAPRA (Société Nationale pour la Promotion Agricole) which is the only one to take care on the collection's organization to farmers and shelling. In the ZAE 2, between 1995 and 2012, the intensity of selection and adoption passed from 28,5% to 42,3% for maize, from 24% to 29% for niebe, from 64% to 100% for peanut and 74% for cotton, [3]. What are thus the socio-economic determinants of agricultural activities' selections and adoptions in the cotton zones of Benin? We hoped this article contribute to the sustainable development of agricultural research in Benin. After a literature review in second section, the third section exposes first of all the model and the econometric options. It describes then the data and specifies variables. The fourth section presents results and discussions, and the fifth proposes the conclusion.

2. THEORETICAL AND EMPIRICAL REVIEW

In theory, the contribution of selections and adoptions of the agricultural production activities to the agricultural, industrial and commercial sectors development is known. It imposes agricultural productions strategies centred on optimizations of the agricultural income and the economic efficiency. These selections and adoptions infer some demanding operations in energy as the ground works, improve the performances of operations needing technicality as sowing and hoeing, allows to increase the cultivated surfaces and to value the human work for less painful or more productive tasks. At the level of farms, these improvements are estimated by the increase of the production and the productivity (lands, labor) and the reduction of production cost. Selections and adoption of the agricultural activities are inevitably oriented on the producer theory of well-being. For that, [6] confirms that there is a weak and positive relation between agricultural income and happiness when we compare at a given instant, persons having different incomes, but no relation when we make a comparison in time. These works also underline the existence of important differences in satisfactions declared by producers from the point of view of their economic development. The research for new evaluation tools for the individual well-being and for the social choice took in short, two different ways: i) the feed-back on the hedonist conception of utility and ii) the adoption of more objective definitions of life quality. The happiness felt by producers is the only component of the well-being, why not to conceive indicators which allow to measure it directly with the concerned? The economy of happiness [3], which was

[2] *Agro-ecologique Zone 2*

[3] *The term " economy of happiness " is used in a common way since its entrance to New Palgrave Dictionary of Economics with Carol Graham's article " The Economics of*

developed in the 1990s, is characterized by the feed-back on the hedonist conception of utility. In another hand, empirical confirmation of the importance of adaptation phenomenon gives all its relevance to the criticism of the welfarist frame and to the approaches which suggest estimating the people position and comparing it with other types of data than those supplied by subjective indications of the well-being. The Social situation of a producer can be measured, for example, based on resources, by the detention of goods in a rank of premium goods[4] or by life quality's objective indicators such as the life expectancy, the level of nutrition, the level of qualifications, according to [7]. In these approaches, the components of the well-being are not only defined in reference to producer's preferences. The "list" of the well-being factors can be elaborated by ethical criteria that defines the quality of life. The theory of the capability of [8] constitutes at this time one of the most important alternative metrics of welfarism. The welfare components, named functioning by Sen, indicate social or physical activities or states of the existence. In the approach of [8], the situation of people is not estimated by the result really reached in terms of realizations but by the set of selections accessible to people that Sen called capabilities. For the physiocrats, the procurement of the remunerative price by farmers is a central objective and will become the sign of the kingdom prosperity. «It is necessary to consider as a sacred principle, that what constitutes the state of Empire prosperity, is the competition of the big population, the abundance and the good productions price. François Quesnay had insisted on the fact that "such is the market value, such is the income." Not only has the good price favored the agriculture progress, added Quesnay: but it is in the good price that consist the wealth which it gets. Unproductiveness with the abundance is not wealth; the high price with shortage is poverty; the abundance with high price is wealthiness. Numerous authors of this stream of thought such [9-11] dedicated many important papers.

The agricultural activity selection and adoption are consecutives, with a certain delays for apprehension, because certain agricultural producers need to be convinced of the profit expected by the agricultural activities selection and adoption, whereas others will need time to mobilize their financial and human resources. In this perspective, certain empirical works such as those of [12], show that the highest rates of adoption were recorded with the improved varieties; more than 95% in Ghana and in Burkina Faso. The low rates of adoption of improved varieties were observed in Senegal and in Benin, 20 - 30%. Likewise, [13] explains that the determinants factors of selections and adoptions of new varieties of maize are: the academic level, the membership in a peasant organization and the commercial orientation. On the other hand, the age, the surface, the sex and the risk seem to have no effect on the adoption of the improved variety. In the same perspective, [14] explains that the high climate change determines the agricultural activities' selections and adoptions. [15] shows that changes of agricultural activities selection and adoption are rather oriented on an environment degradation which is indicated by the decrease of the farming yields. [16] shows that an increase of 1 % of the agricultural productivity in Africa, reduces the poverty of about 0,6%, and the increase of 1 % of the production drops of 6 million the number of people living with less than 1 US dollar a day.

3. DATA, MODEL REGRESSION AND ECONOMETRICS OPTION

3.1 Data Collection

Several methods are used by the "Centre d'Action Régional Pour le Développement Rural (CARDER)" of Borgou-Alibori (Parakou) and Atacora-Donga (Natitingou) under the direction of the "Ministère de l'Agriculture de l'Elevage et de la Pêche (MAEP)" for data collection. The first category of technics is the Accelerated Method of Participative Research (AMPR). This is oriented on the works of [17]. The advantage of this method, is that it generates quite soon, information which are analyzed with producers' cooperation. The application of AMPR requires a high quality of communicative and sensibility, [18]. Results supply a first understanding of the potentialities and constraints of the agricultural activities selection and adoption systems. This method thus allows to identify the various selections and adoptions of generative agricultural activities income, the various techniques associated with strategies of selection and adoption operated by producers. It also allows producers to explain the choice of new technologies proposed by the technical

Happiness ". For a general presentation of this stream see for example Bernard M. S Van Praag, «Perspectives from the Happiness Literature and the Role of New Instruments for Policy Analysis ", Iza, Discussion Paper, 2568, January, 2007.

[4]Rawls (1987)

supervisions. The information collected in 2013 2014 during the sessions of the AMPR concerns the objectives of selections and adoptions of such agricultural activities of productions (strategies of productions) and their level of realization. The use of internal inputs and / or externals relative to their agricultural production selection and adoption strategy, the cultural varieties and animal species, the evolution of the physical performances of selected and adopted agricultural activities, the relative explanations and the corrective strategies brought between producers and agricultural supervision agents. Information on a number of parameters and factors are also collected such as, the practice of non-agricultural activities; the academic and educational level; the uncertainties and risks perception; the agroecological potentialities of cultivated surfaces; the health annual expenses, the annual children's educational and accommodation expenses; the inputs and cash credits access and the agricultural income delay and the membership in an agricultural cooperative. The second method of data collection uses at first the agricultural production evaluation slip from selections and adoptions operated by producers; from the agricultural, breeding and nonagricultural activities association. A survey in two passages concerning more than one thirds of producers is led in each of cotton zone. The socio-demographic characteristics, the vegetable and animal speculations operated by producers, the grounds and cattle food fertilization techniques, the uses of products and of agricultural and non-agricultural income are collected. The constraints and the potentialities of the agricultural and non-agricultural activities are questioned. At all, on 750 agricultural rural households, 702 gave reliable responses compared with the first passage, that is the rate of pertinence and reliability is 93.6% of collected information. The choice of agricultural producers is in a random way and without focus group. The number of agricultural producers selected in every zone varies according to the density and its agro-ecological potentiality.

3.2 Variables Specification and Model Regression

- X_i (actagrc): The explanatory variable identifying the selected and adopted agricultural activities by producers in the cotton zones. We make the hypothesis that the choice of an agricultural activity by a producer is conditioned by the utility which It gets to him. Thus this choice influences positively and significantly (+) his well-being. With i = 1 …. 6. Where
- actcton: The variable unique cotton agricultural activity (actcton m=1) I with S_1 = 1……122 on 702 of the sample; We make the hypothesis that the production of the cotton is the one dominant in the zone of study. This production gets more utility than the other agricultural productions. The choice of this agricultural activity has a positive and significant incidence (+) on the well-being of the producers. actcmas (m =2): the variable cotton production activity associated with maize, i S_2 = 1……184 on 702 of the sample; We make the hypothesis that the production of the cotton is the one dominant in the zone of study. This production gets more utility than the other agricultural productions. The choice of this agricultural activity has a positive and significant incidence (+) on the well-being of the producers.
- actctomil (m = 3): The variable cotton production activity associated with millet, I with S_3 = 1……113 on 702 of the sample; We make the hypothesis that the production of the milet associated with the cotton (actctomil) adopted in the optics to assure and to guarantee especially the food security of the producer. This strategy induce a positive and significant incidence (+) on the producer's well-being.
- actctomac (m =4): The variable cotton production activity associated with manioc, I with S_4 = 1……105 on 702 of the sample ; We postulate that this strategy of agricultural production (actctomac) impacts substantially the agricultural income as far as the productions are marketed. This strategy induces a positive and significant incidence (+) on the well-being of the producer.
- actctontrs (m=5): The variable cotton production activity associated with the others variables not considered in this article, i with S_5 = 1.. 51 on 702 of the sample; We make the hypothesis that the other agricultural activities associated with the cotton (actctontrs), not identified in this article do not induce high agricultural income. This strategy impacts negatively and significantly (-) the well-being of the producer.

- Actctoigme (m=6): The variable cotton production activity associated with yam, I avec S_6 = 1… ….127 on 702 of the sample; we make the hypothesis that this agricultural strategy is adopted to assure the short and long-term food security of the producer. It induces a strong consumption and a marketing of the yam; then the marketing of the cotton. Thus it generates a positive and significant incidence (+) on the well-being of the producer.
- assv: The variable assistance of agricultural technical vulgarization. it is a dummy, with u = 0 and 1. Where 0 corresponds in no access and 1 access to the technical vulgarization assistance. 502 (71.51%) producers don't have access, against 200 (28.49%) which have access to the assistance of technical vulgarization; We make the hypothesis that the producers who benefit from the support of the assistance of vulgarization (assv) have better agricultural productivity. These best agricultural productivity induces a positive and significant incidence (+) on the well-being of the producer.
- mbrec: the variable, be a member of a cooperative or an agricultural or peasant organization. It is a dummy, with h = 0 and 1. Where 0 corresponds to not be membership and 1 to be a membership in an agricultural cooperative. 403 (57.41%) producers are not a member of an agricultural or peasant cooperative, against 299 (42.59) who are a membership of an agricultural or peasant cooperative; The membership in an agricultural (mbrec) cooperative generates an organizational entrepreneurial capacity at the producer. It thus favors an increase of the agricultural productivity. It thus infers a positive and significant incidence (+) on the well-being of the producer.
- Access: the variable access to the cash credits of the microfinance institutions. It is a dummy, with t = 0 and 1. Where 0 corresponds no access to cash credits and 1 access to cash credits. 424 (60.40%) producers don't have access to cash credits against 278 (39.60%) which have access to the cash credits; we make the hypothesis that the agricultural cash credits (Access) is diverted towards other purposes. These cash credits thus infer a significant decrease (-) of the production, the productivity and the degradation of the long-term well-being of the producer.
- acesint: The variable access to inputs credits. It is a dummy, with q=0 and 1. Where 0 corresponds no access to credits inputs and 1 access to credits inputs. 378 (53.77%) producers don't have access to the credits inputs, against 325 (46.2%) producers who have access to inputs credits; We make the hypothesis that the inputs credits (acesint) are often disposed towards the bordering countries of Benin. These credits cannot thus increase (-) the production, the productivity and to improve the long-term well-being of the producer.
- elvag: The variable association between agriculture and breeding. It is a dummy with **n** = 0 and 1. Where 0 corresponds to the dissociation between agriculture and breeding and 1 association between the agriculture and breeding. 483 (68.80%) separate the agriculture and breeding, against 219 (31.20%) which associate the breeding with the agriculture; we postulate only the dissociation between the agriculture and the breeding (Elvag) cannot coat a good fertility of lands already to impoverish. This situation induces a decrease (-) of the production, the productivity and damage in the long term of the well-being.
- Delay: The variable delay in payment of the agricultural income. It is a dummy with v= 0 and 1. Where 0 corresponds to the delays in the agricultural income payment and 1 absence of delay in the agricultural income payment. 437 (62.25%) producers give evidence of the delays in agricultural income payment, against 265 (37.75%) which reject the delays in agricultural income payment; we make the hypothesis that dates of payments of the agricultural income (Delay) are very long. This situation does not create motivation at the producers, it leads enormous disturbances during the various phases of the agricultural activities. Thus it reduces the agricultural and long-term yields degrade the well-being of the producer (-).
- Insurance: The variable subscription to agricultural insurance. It is a dummy with r = 0 and 1. Where 0 corresponds to no subscription to agricultural insurance and 1 for subscription to agricultural insurance. 460 (65.53%) producers do not insure their productions and their goods against 242

(34.47%) producers who insure their productions and the goods; We make the hypothesis that the agricultural producer is not interested in the agricultural insurance (Assurance) to guarantee his production and his harvest in case of the risks bound to the flood, the drought, the attack of the rodents, to the fires. This situation decreases the production and the yield (-) and in the long term degrades the well-being of the producer.

- desteinsc: The variable debt of the producers toward credits structures and other micro-credits institutions. It is a dummy with k = 0 and 1. Where 0 corresponds to the debtor producers and 1 to the solvent producers. 461 (65.67%) producers are debtor of the micro-credits structures and 241 (34.33%) are solvent of these micro-credits structures; We make the hypothesis that the debts (desteinsc) of the producer with the financial institutions influence negatively and significantly (-) the production, the agricultural and long-term productivity on the producer well-being.
- level: The variable producers' education and instruction level. It is a dummy with l= 0 and 1. Where 0 indicate the producers having no education and instruction level and 1 those having the primary, secondary or upper level and other practical trainings levels in the agricultural domain. 493 (70.23%) producers have no education and instruction level, against 209 (29.77%) producers having an education and instruction level or practical trainings; We make the hypothesis that the educational level brought up by the producer has a positive and significant incidence (+) on the production, the productivity and the short and long-term well-being.
- Lpricotb: The variable price of cotton expressed in CFA francs. It is quantitative and measures the purchase price of a kilogram (kg) of cotton quantity sold by the producers. This average price is 240 FCFA between 2013 and 2014 in the cotton zones; it influence positively and significantly (+) the production, the productivity and the short and long-term well-being.
- Lprixmais: The variable price of maize expressed in CFA francs. It is quantitative and measures the purchase price of a kilogram (kg of maize) sold by producers in south Benin and in the bordering countries. This average price is 310 FCFA between 2013 and 2014 in the cotton zones; it influence positively and significantly (+) the production, the productivity and the short and long-term well-being.
- Lprixigme: The variable price of yam expressed in CFA francs. It is quantitative and measures the purchase price of a kilogram (kg) of yam sold by producers. This average price is 1 2000 FCFA between 2013 and 2014 in the cotton zones; it influence positively and significantly (+) the production, the productivity and the short and long-term well-being.
- Lprixman: The variable price of the manioc expressed in CFA francs. It is quantitative and measures the purchase price of a kilogram (kg) of the quantity of the manioc sold by producers. This average price is 310 FCFA between 2013 and 2014 in the cotton zones; it influence positively and significantly (+) the production, the productivity and the short and long-term well-being.
- Lprixigme: The variable price of the yam expressed in CFA francs. It is quantitative and measures the purchase price of a kilogram (kg) of yam sold by the producers. This average price is 12000 FCFA between 2013 and 2014 in the cotton zones; it influence positively and significantly (+) the production, the productivity and the short and long-term well-being.
- Lprixman: The variable price of the manioc expressed in CFA francs. It is quantitative and measures the purchase price of a kilogram (kg) of the quantity of the manioc sold by the producers. This average price is 540 FCFA between 2013 and 2014 in the cotton zones; it influence positively and significantly (+) the production, the productivity and the short and long-term well-being.
- Lprixmil: The variable price of the millet expressed in CFA francs. It is quantitative and measures the purchase price of a kilogram (kg) of the quantity of the millet sold by the producers. This average price is 640 FCFA between 2013 and 2014 in the cotton zones; it influence positively and

significantly (+) the production, the productivity and the short and long-term well-being.

- Lages: The variable age of the producers expressed in the years. It is quantitative, the average age of the producer is of 35 years, the maximal age is of 64 years and the minimal age is of 20 years; We make the hypothesis that the raised age (Lages) of the producer reduces negatively and significantly (-) the production, the productivity and the short and long-term well-being.
- Lndepeducat: The variable producers' children educational expense expressed in CFA francs. It is quantitative and this average expense is 35 000 FCFA between 2013 and 2014 in the cotton zones of Benin. It biggest value is 54 600 FCFA and its minimal value is 15 000 FCFA; it impacts negatively and significantly the production, productivity and the producer's well-being.
- Lndépsanté: The variable dedicated to the producers' family health expense expressed in CFA francs. It is quantitative and this average expense is 15 000 FCFA between 2013 and 2014 in the cotton zones of Benin. Its biggest value is 24 000 FCFA and its minimal value is 7 000 FCFA. ; it impacts negatively and significantly the production, productivity and the producer's well-being.
- Lndéplogmt: The variable producers' accommodation expense expressed in CFA francs. It is quantitative and this average expense is 385 000 FCFA between 2013 and 2014 in the cotton zones of Benin. Its biggest value is 554 600 FCFA and its minimal value is 90 000 FCFA. ; it impacts negatively and significantly the production, productivity and the producer's well-being.

Several studies assessed the impact of various socio-economic, cultural, institutional and political factor on the willingness of farmers to adopt new activities [19-21]. In most adoption studies, the dependent variable takes value between 0 and 1 and the models used were exponential functions while univariate and multivariate logit and probit models including their modified forms have been used extensively to study the adoption behavior of respondents. Economists were inspired by works in psychology [22] for a historic and epistemological presentation of the discreet choices models. [23], in particular, had introduced the notion of chance to explain the variability of the answers of the same individual to identical stimuli. By interpreting the level of stimulus as a level of utility, [24] then transposed the original idea of Thurstone into the economic framework, shown the RUM models (Random Utility Maximization).

The logit multinomial model was already used in agricultural economics to specify equations of parts of surfaces [25]. This theoretical frame allows to divert equations of parts of surfaces of logit multinomial shape.

Two approaches are considered: "the costs function approach and the discreet choices approach". In this paper, the discreet choices approach is used. This approach allows to define a multi-produced economic model which considers cultivated surface as an allocable fixed input and takes into account the cultural rotations effects (maize or / and cotton). A choice of agricultural production can turn out to be difficult to make or not, but whatever is its nature. The agricultural producer estimates the various possibilities which offer themselves to him by basing itself on criteria and choice which adorned him the most adequate. The choice's decision criteria can be quantifiable by yes or no, then there is an economic theory which proposes models allowing to predict the behavior of agricultural producers facing a choice of cultures. This economic theory is the one models of discreet choices by [26,27].

The mathematical modelling of this economic model bases on several fundamental hypotheses. Among this one, we consider that an individual (agricultural producer) chooses the alternative which provides him the biggest utility. Indeed, the multinomial model is the most used, because it is based on a hypothesis of independences of the unpredictable terms of the utility functions.

A multivariate logit model is used In this paper due to the several selections' modalities of ours variables [28,29]. The selection and the adoption of an agricultural activity method can be considered as the realization of a latent variable U_m^* (unobservable) indicating certain level of satisfaction or utility withdrawn from this selection and adoption and depending linearly of a set of variables vector of observable determinants X_i (i = 1,.....k). As this relation is not only determinist, an error term is introduced into the relation and its law of distribution defines

the estimation model of the probability of the alternative occurrence. If *J* choice and adoption are possible, the followings is the probability of selection and adoption:

$$Prob(Y = m) = Prob\left(U_m^* > U_j^* \quad \forall \quad j \neq m\right) \quad with \quad U_m^* = X_i\beta + \varepsilon \tag{1}$$

In this paper several possible alternatives are defined, without predefined or pre-established rank, it is advisable to estimate jointly the probability of every alternative compared with an alternative taken as reference. The required econometric model is then a logit or probit multinomial in accordance of distribution law of the error terms, [28,29]. The multinomial model allows to estimate the probability of five (5) modalities with regard to a modality taken as reference. We suggest to estimate the probability of the modalities 1, 3, 4, 5, 6 in reference to the modality 2.

$$Prob_m = Prob\,(Y = m/X) = \frac{\exp(X\beta_{m/2})}{1+\sum_{j=1}^{6}\exp(X\beta_{j/2}} \quad j \neq 2 \quad for\ m = 1,3,4,5\ and\ 6 \tag{2}$$

In relation with the probability of reference alternative 2

$$Prob_2 = Prob(Y = 2/X) = \frac{1}{1+\sum_{j=1}^{6}\exp(X_i\beta_{j/2})} \quad j \neq 2 \tag{3}$$

With $\sum_{m=1}^{6} Prob_m = 1$, X_i a vector of K explanatory variables common to all alternatives of agricultural activities selection and adoption in the cotton zones of North Benin and $\beta_{m/2}$ the vector of parameters estimated for the modality m (m = 1, 3, 4, 5, 6) compared with the reference modality 2, with $\beta_{2/2}$ = 0. As the estimated coefficients β of the logistic models is not directly interpretable, it is easy to present results directly like" odds" (noted Ω); or more exactly, like "odds ratio" (noted OR) that apply "exponent" to the coefficients estimated to observe how an increment unity (marginal effect) of the explanatory variable modifies the relationship of such probability. In the case of binary logistic model, the interpretation of the “OR” is relatively easy because this relationship returns to the occurrence probability of the studied event on the opposite event probability:

$$\text{Odds (X)} = \Omega(X) = \frac{P_1}{1-P} = \frac{Prob(Y=1/X)}{1-Prob(Y=1/X)} = \exp(X_i\beta) \tag{4}$$

$$\text{OR} \quad (X_k/X) = \frac{Prob(Y=1/X_k+1,X)\,/(1-Prob(Y=1/X_k+1,X))}{Prob(Y=1/X_k,X)/(1-Prob(Y=1/X_k,X))} \tag{5}$$

With a multinomial logistic model, the analysis is more complex because several events are considered. From that, the probability ratio of every modality of the event compared with the reference modality do not correspond directly to an "odds" which indicates, a probability ratio of an event with its opposite. We thus prefer to use «conditionals odds ratio» (noted COR), also indicated under the term of «ratio of relative risk» (noted rrr), which correspond to the ratio of every probability with regard to the probability taken in reference (here the modality 2: associated cotton and maize production):

$$\text{Conditional Odd} \quad s_m(X) = \Omega_{m/2}(X) = \frac{P_m}{P_2} = \frac{Prob(Y=m/X)}{Prob(Y=2/X)} = \exp(X\beta_{m/2}) \tag{6}$$

For m = 1, 3, 4, 5, 6.

$$\text{CO} \quad R_{m/2} = \frac{\Omega_{m/2}(X,X_k+1)}{\Omega_{m/2}(X,X_k)} = \exp(\beta_{k,m/2}) \tag{7}$$

For m = 1, 3, 4, 5, 6.

$$\text{Or, CO} \quad R_{m/2}(X_k/X) = \frac{Prob(Y=m/X_k+1,X)/Prob(Y=2/X_k+1,X)}{Prob(Y=m/X_k,X)/Prob(Y=2/X_k,X)} = \exp(\beta_{k,l2}) \tag{8}$$

For m = 1, 3, 4, 5, 6.

The COR allow to estimate if an explanatory variable increases or decreases the probability to choose such alternative compared with the alternative taken in reference. For example, in the equation (8) an incremental variation of the variable $X_k$increases the occurrence probability of the modality m instead of the modality 2 of an exponential factor.

3.3 Descriptive Statistics of the Multilogit Model Variables

We use here the chi2 test to analyze the distribution between the binary variables of the various agricultural activities selections and adoptions. This test is centred on two hypotheses supplied by the Pearson statistics, the threshold with which we can is not agree with the null hypothesis. The null hypothesis is strongly is not agree withed here if (Pr < 0.05) that implies an Independent distribution, and is strongly accepted if (Pr> 0.05) that implies a dependent distribution [30].

The Table 1 indicates a number of stylized facts in the cotton zones of Benin. Among these facts we have: - the framing of the agricultural technical vulgarizations actions are not independently distributed with various agricultural activities selections and adoptions; - the members of an agricultural cooperative are independently distributed with various agricultural activities selections and adoptions; - the access to the cash credits is not distributed independently with various agricultural activities selections and adoptions; - the access to the inputs credits is distributed independently with various agricultural activities selections and adoptions. The access to the inputs credits is not connected to various agricultural activities selections and adoptions; - the breeding activity is not independently distributed with various agricultural activities selections and adoptions. This result shows an association between the breeding and the certain agricultural activities selections and adoptions; - the delay in payment of the agricultural income persists about the agricultural activities selection and the adoption in the cotton basin of Benin; - the debts are not connected to the agricultural activities selection and adoption in the cotton basin of Benin; - the agricultural insurance is connected to agricultural activities selections and adoptions; - the academic levels are independently distributed with various agricultural activities selections and adoptions in the cotton basin of Benin.

The probability of Skewness (Pr (Skewness)) is close to 0 for the majority of variables. It is the same for the probability of Kurtosis (Pr (Kurtosis)); they are thus leptokurtiques (the presence of thick tails). The hypothesis of normality of variables during the period of our study is thus verified. Gaps returns to the norm further to a confrontation, of agricultural products, of expenses (health; education and accommodation) quantified essentially on the basis of the prices to producers. In this example, we conclude in the rejection of H_0 for the majority of variables ((P_r< 0.05)). These agricultural prices characteristics return on the practical plan to the existence of fluctuations which are normal and without memory.

3.4 Hausman Independence Test of Non-relevant Alternatives: In Favor of a Theoretical Justification

The necessary and sufficient condition of using the multinomial logit is the respect centred on the hypothesis of independence of the non-relevant alternatives (IIA). The most used tests are those of [31]. The recent works on this test reject the results of [31,32], show that the [31]'s IIA test does not still allow to reach a good decision. From the theoretical point of view, the selection of the agricultural activities in this article retain the independence hypothesis of [31], as far as each of the agricultural activities seems good as agricultural activities strategy different from others.

3.5 Modalities Grouping

The multilogit model wonders on the relevance to distinguish alternatives if certain explanatory variables tend to the same direction. So, the Wald test on the multilogit equations regressors shows us that none of alternative does not tend to explain significantly the well specified activities.

3.6 Results and Interpretations

Results of the estimated multilogit model are so directly presented as exponent coefficients in the Table 3. The interpretation of results of Table 3 allows to release some stylized facts on the determinants of selections and adoptions of agricultural activities in the cotton zones of Benin. On the other hand, treatments confirm relations of classic independents observed in the agro-economic literature between the age, the credits access, the academic level and the various agricultural activities. They underline the existing links between the agricultural technical agents of vulgarization and the selections and adoptions of various agricultural activities. Finally, they reveal the influence of the subscription in the agricultural insurance in the agricultural activities selection and the impacts of agricultural productions prices and finally the role of agricultural cooperative membership. Table 3 shows that variables such as the assistance of technical vulgarization (assv); the breeding (elvag) have positive and significant effects on the variation of probability of selection and adoption of the agricultural activities. The fact of benefiting technical vulgarization assistance (assv) increases the agricultural activity of 15 points of percentage compared with those of the agricultural rural households (0.02 points) who practiced the breeding (elvag). This result mean that the vulgarization agents' actions are perceptible in the cotton basin of Benin, the agricultural rural households benefit from a good membership of an agricultural cooperative (mbrec); the access to the cash credits (access) and the access to inputs credits (acesint) have positive effects.

Table 1. Descriptive statistics of the multilogit model qualitative variables

Distribution between the technical vulgarization assistance of the agricultural activities selections and adoptions								
Selection and adoption		**Actcton (1)**	**Actcmas (2)**	**Actctomls (3)**	**Actctomac (4)**	**Actctontrs (5)**	**Actctoigme (6)**	**Total**
Assistance	0	86	127	86	69	36	98	502
	1	36	57	27	36	15	29	200
Total		122	184	113	105	51	127	702
		Pearson c hi2(5) = 5.5391 Pr = 0.034						
Distribution between a membership of agricultural cooperative and selections and adoptions								
Cooperativemembership	0	58	72	48	45	22	54	299
	1	64	112	65	60	29	73	403
Total		122	184	113	105	51	127	702
		Pearson c hi2(5) = 2.1338 Pr = 0.830						
Distribution between c ash credits access and agricultural activities selections and adoptions								
creditsaccess	0	73	103	66	70	24	88	424
	1	49	81	47	35	27	39	278
Total		122	184	113	105	51	127	702
		Pearson c hi2(5) = 11.4246 Pr = 0.044						
Distribution between inputs credits access and agricultural activities selections and adoptions								
Inputs credits	0	66	94	60	65	28	65	378
	1	56	90	53	40	23	62	324
Total		122	184	113	105	51	127	702
		Pearson c hi2(5) = 3.7219 Pr = 0.590						
Distribution between breeding and agricultural activities selections and adoptions								
Breeding	0	85	131	75	77	36	79	483
	1	37	53	38	28	15	127	219
Total		122	184	113	105	51	127	702
		Pearson c hi2(5) = 4.50 06 Pr = 0.008						
Distribution between payment delay and agricultural activities selections and adoptions								
Retard	0	79	105	63	32	85	43	437
	1	43	79	40	42	19	42	265
Total		122	184	113	105	51	127	702
		Pearson chi2(5) = 4.1112 Pr = 0.534						

Selection and adoption		Actcton (1)	Actcmas (2)	Actctomls (3)	Actctomac (4)	Actctontrs (5)	Actctoigme (6)	Total
Distribution between producers debts and agricultural activities selections and adoptions								
Debts	0	39	62	38	30	18	54	241
	1	83	122	75	75	33	73	461
Total		122	184	113	105	51	127	702
		Pearson chi2(5) = 5.70 34 Pr = 0.336						
Distribution between agricultural insurance and agricultural activities selections and adoptions								
Insurance	0	87	119	70	71	35	78	460
	1	35	65	43	34	16	49	242
Total		122	184	113	105	51	127	702
		Pearson chi2(5) = 3.8776 Pr = 0.567						
Distribution between instruction level and agricultural activities selections and adoptions								
Instruction	0	89	132	80	76	28	88	493
	1	33	52	33	29	23	39	209
Total		122	184	113	105	51	127	702
		Pearson chi2(5) = 6.6665 Pr = 0.247						

Source: Results of Chi2 test; author; 2015

Table 2. Descriptive statistics of normality test on the multilogit model quantitative variables Skewness / Kurtosis tests for normality

Variables	obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
ages	702	0.0000	0.0014	24.79	0.0000
depeducat	702	0.0000	0.0000	.	.
dép_santé	702	0.0000	0.0308	.	0.0000
ldéplogmt	702	0.0198	0.7391	5.53	0.0030
pricotb	702	0.0000	0.0000	.	.
primais	702	0.0039	0.0003	18.50	0.0001
prixagme	702	0.0000	0.0000	.	0.0000
prixigman	702	0.0000	0.0001	.	0.0000
prixmil	702	0.0000	0.0000	62.79	0.0000

Source: Author, 2015

3.6.1 Relation between age, credits access (inputs and cash), education level and agricultural activities selected and adopted

The variable age (lnages) of the agricultural producer influences negatively and significantly the various agricultural activities. This result confirms the works of [33-35]. The old producers have less opportunity of selection and adoption of efficient and profitable agricultural activities. They are little inclined to adopt the new techniques and modern inputs. The young producers have the opportunity to get a formal education.

They can be more skillful in the research for information and the practice of new techniques. The variable education level (nivea) influences negatively and significantly the various agricultural activities in the cotton zones of Benin. This result shows that in these zones the numbers of years of primary or secondary studies and the experience years of certain agricultural activities exercise are very low. Results thus confirm the works of [36,21,16,37] indicate a positive relation between the technical efficiency and the educational level. Variables cash and inputs access credits (Accesint and access) influence negatively and significantly the other agricultural activities. These results confirm the works of [38-42].

3.6.2 Relations between agricultural vulgarization agents and agricultural activities Selections and adoptions

The variable technical assistance of vulgarization (assv) influences negatively and significantly the agricultural activities. This result shows that producers whatever are their selections and adoptions do not benefit from elementary advice concerning the conduct of the various cultures and few agricultural investments are granted for selected and adopted agricultural activities. The result confirm the works of [43-45] whose results show that the investments which are granted for creation of the varieties and for their vulgarization give a profitability rate of 81, 28%. The technical assistance seems often not as the mean to help producer but the way to integrate or to get a job in public office by letting rural world. These agents live in cities whereas the agricultural producers are in village. This behavior of the technical assistance agent justifies the negative impact of the agricultural activities selection and adoption.

3.6.3 Relations between agricultural insurance subscription and agricultural activities selections and adoptions

Agricultural producers' needs are varied as their tasks and their lifestyle require adapted insurance protections to all kinds of exploitations. The variable agricultural insurance subscription has a negative influence on various agricultural activities in the cotton zones of Benin. The insurance structures propose indexed insurances to levels of pluviometry and concern the production of cereal, guarantee credits taken by producers, in particular campaign credits (inputs, etc.) but they are doubtful. We noticed that agricultural activities are done in the small areas inducing producer not get insurance services. These producers are often subject to flood or animals attacks. This perverse effect explain why insurance has negative impact on various agricultural activities [46].

3.6.4 Relations between agricultural productions prices and agricultural activities selections and adoptions

The multiplication of agricultural activities selections and adoptions in the cotton zones is positively impacted by agricultural price to producers. The selection and adoption of unique agricultural activity of cotton (actcton) and the other agricultural activities are influenced positively and significantly by the price of cotton to producers (lpricotb). This result is not surprising because "the gold" benefits from enormous government supports (price before agricultural campaign; organized sector; access to the cash and inputs credits). In opposite productions prices marketed to the south of Benin and bordering countries such the one of maize (Lprimais) and manioc (Lprixman) influence positively and significantly the unique agricultural activity of cotton. This last result shows that the cotton, the maize and thus the manioc are positioned as substitutable cultures according to the monetary report during the agricultural campaigns 2013-2014 in Benin. In the agricultural activity 2 (cotton associated with the millet), the price of the millet (Lprixmil) and the price of the cotton (Lpricotb) have opposite and significant sign (-0.140 and 2.62e+75) at the level of 5%. This relation reveals according to the monetary income that cotton and millet constitute complementary products in the cotton zones of Benin. This result explains the incomes from the selling of cotton are partially reinvested in the production of the millet which constitutes a

speculation of major foodstuff in this cotton zone. In the agricultural activity 3 (cotton associated with manioc), the price of manioc (Lprixman) and the price of cotton (Lpricotb) have negative and significant sign at level of 5% (-1.5739.23 and 2.90e+71). The cotton and thus manioc are positioned as competitive cultures in the monetary report during the agricultural campaigns of 2013 and 2014. The negative relation between this agricultural activity and the cotton and manioc prices reveals the incomes from cotton and manioc marketing seem to be approximate. This result explains that in spite of manioc sector does not benefit from government supports, its production marketed especially toward the south of Benin and Nigeria leads important currencies for cotton producers. In the agricultural activity 4 (Associated cotton with others), the cotton price (Lpricotb) has a positive and significant coefficient at level of 5% (1.91e+80). This positive relation shows the cotton price to producers stimulates this agricultural activity and the non-significativity of price factors of the other speculations indicates that the cotton dominate this agricultural activity and the other activities are very non-existent in selection and adoption of producers. In the agricultural activity 5 (cotton associated with yam) show that the cotton's price (Lpricotb) and the yam's price (Lprignam) have respectively negative and positive coefficients. Only the cotton price's coefficient is significant at level of 5% (5.08e+73). The yam's price (5.77e-40) has a positive coefficient but is not significant. This last result indicates the existence of socio-cultural behavior in the cotton zones where the production of the yam is centred on endogenous criteria and dedicated to a bracket of old producers. The presence of the opposite signs explain that the yam and the cotton are positioned as complementary cultures in the monetary report during the agricultural campaign of 2013 2014.Incomes from the yam's selling are partially reinvested in the cotton culture for the purchase of inputs for cotton; the extension of cotton cultivated surfaces; The debts solvency to micro-credits structures.

3.6.5 Relations between expenses in education, accommodation and health and agricultural activities selections and adoptions

Considering cotton production as unique activity, coefficients of expenses variables in education (Ldepeducat = 1.000242), in health (Ldépsanté = 3.322704) and in accommodation (Lndéplogmet = 0.0078028) have negative and significant impacts. In other agricultural activities of cotton associated with other speculations, the impacts of expenses coefficients in education; in health and in accommodation are positive and significant at level of 5%. This result indicates the weaknesses in cotton sector. The cotton thus assures the well-being of producers. The producers who only opt cotton are subject in enormous financial difficulties. This unique activity of cotton seems not to improve producers' well-being. The prevailing cottons-cereal association of cultures practices ((actctomls (Ldepeducat = 1.000285, Ldépsanté =3.1869, Lndéplogmet = 0.0024); actctomac (Ldepeducat = 1.000, Ldépsanté =2.858, Lndéplogmet =0.0028); (actctonontrs (Ldepeducat = 1.0004, Ldépsanté =2.06255, Lndéplogmet = 1.72e-07); actctoigme (Ldepeducat = 1.0002, Ldépsanté = 126.167, Lndéplogmet = 4.54e-09)) infer positive response on agricultural activities. The immaterial investments such as health and education impact positively and significantly the cotton-cereal practice. These cereal seem to benefit thus from previous effects of cotton and infer additional income.

3.6.6 Relation between breeding, agricultural income payment delay and agricultural activities selections and adoptions

The relation between agricultural activities and the breeding is not clearly established, because empirical results on this question are often shaded. Some conclude in dissociation between the agriculture and breeding. In Bolivia for example the system of production which prevails is the one based on the association of agriculture and cattle's breeding. The evolution of exploitations confirms the general trend in the region, [47]; in opposite, another authors show the dissociation between breeding and agricultural activities. This dissociation often results from financial, technical and organizational means (veterinary treatment; diseases; the pasturage and conflicts between producers and breeder). [48] shows that the intensive systems of animal production produce high levels of residues of nitrogen and phosphor and the concentrated pouring of toxic materials. In this article, the breeding has a non-significant impact on the various agricultural activities (cotcton (0.0315469); actctomls (0.1144); actctomac (0.21392); actctontrs (0.02129); actctoigme (0.0019)) in spite of the potentialities of cattle and goats available in cotton zones of

Benin. This result shows a dissociation between the agriculture and the breeding. The latest is intended to a part of the population (Fulani). The delay in payment of the agricultural income is a factor which slows down the desire of producers for increasing productions and surfaces. The factor delay in payment of the cotton income (retard) affects negatively and significantly of 258.265 the unique agricultural activity of cotton (actcton). This result explains partially the state and administrative slowness of the structures in charge of the cotton marketing in Benin. Other agricultural activities such as the associations of cotton with food-producing (cotton and millet (298.592); cotton and manioc (399.0246); cotton and yam (1.68e+10) and cotton and the other non- selected cultures (12.15628)) have a positive and significant relation with the factor delay in payment of the agricultural income. This result confirms the income of the food-producing speculations is received before cotton income and allow to finance the food needs and the cotton production.

Table 3. Multilogit model estimations and marginal effects

Mltinomial logistic regression Number of obs = 702
LR chi2 (-2) = 2429.75 Prob> chi2 = 0.005
Log likelihood = 0 Pseudo R2 = 0.045

Agricultural activities	Variables actagrc	RRR	Probabil	Marginal effects after mlogit y = Pr (actagrc==2) (predict, p outcome (2)) = 0.69248938		
				dy/dx	z	P>|z|
	actcton	8.47e+60	0.003	-0.999	0.601*	0.901
	actcmas	.-0.000879	0.347	0.508	-0.003**	0.008
	actctomls	6.65e+09	0.676	-0.213	-0.412**	0.087
	actctomac	0.953015	0.67	-0.131	-0.023	0.000
	actctontrs	4.344638	0.543	-0.010	-0.003	0.065
	actctoigme	0.1014463	0.231	0.802	0.005	0.430
	assv	-0..010485	0.002**	0.146	0.516**	0.434
	mbrec	3.808169	0.421	-0.007	-0.004**	0.110
	acces	2.53798	0.001**	-0.701	-0.007**	0.240
	acesint	13.4025	0.043**	-0.022	-0.503*	0.700
	elvag	-0..031546	0.12	0.002	0.001**	0.21
				dy/dx	z	P>|z|
	actcton	1.08e+29	0.765	-0.623	0.052*	0.357
	actcmas	-0.004225	0.0034	0.328	-0.038**	0.0014
	actctomls	1.29e+10	0/0432	-0.365	-0.011**	0.042
	actctomac	3.48e+15	0.0045	-0.2178	-0.0024	0.231
	actctontrs	2.944351	0.0098	-0.0217	-0.0022	0.013
	actctoigme	0.976396	0.9854	0.428	0.012	0.235
	assv	.-0.026670	0.0321**	0.216	0.0016**	0.323
	mbrec	- 2.227513	0.0324	-0.0016	-0.0023**	0.114
	acces	-4.398148	0.0045**	-0.356	-0.0211**	0.246
	acesint	- 3.40569	0.123**	-0.0154	-0.0015*	0.367
	elvag	-0.21392	0.064	0.098	0.0223**	0.567
	retard	399.0246	0.002**	-2.0023	-0.0218**	0.0216
Agricultural	asurace	-13.5119	0.34	-7.010	-0.018**	0.0254
activity 4	deteinsc	188.6191	0.349	0.012	-0.0525*	0.015
cotton	nivea	.-0.111923	0.0021	-2.3412	-0.3210*	0.123
associated	lpricotb	-2.90e+71	0.0065**	-5.245	-0.0018**	0.0267
with Manioc	lprimais	2.96e-12	0.0045	0.560e-67	0.2671	0.125
	lprixigme	5.59e-09	0.468	0.0423	0.0333*	0.0432
	lprixman	-1.5739.23	0.0025**	-2.0342	-0.024**	0.016
	lprixsmil	0.634313	0.6754	-1.224	-2.0321*	0.011
	lnages	-0.10512.	0.004	-3.210	0.3786	0.0043
	lnages2	(omitted)	0.984	0.017	0.0125	0.029
	ldepeducat	1.00028	0.0230**	-2.3721	-0.0032**	0.023
	lndép_santé	2.858442	0.0067**	-3.013	-0.015**	0.029
	lndéplogmt	0.0028932	0.0086**	2.450	0.010**	0.1862

Agricultural activities	Variables actagrc	RRR	Probabil	Marginal effects a ftermlogit y = Pr (actagrc==2) (predict, p outcome (2)) = 0 .6 9248938		
				dy/dx	z	P>|z|
	actcton	2.78e-15	0.0087	-0.123	0.042*	0.367
	actcmas	5.10e-28	0.0315	0.348	-0.026**	0.00187
	actctomls	-0..000468	0.8754	-0.565	-0.0091**	0.063
	actctomac	-0..000117	0.00432	-0.117	-0.0016	0.255
	actctontrs	1.04e+13	0.0005	-0.037	-0.0143	0.0156
	actctoigme	-0..416120	0.0984	0.442	0.0187	0.2410
	assv	-3.59e-27	0.6732	0.236	0.0119**	0.3542
	mbrec	.-0.162228	0.0043	-0.011	-0.00343**	0.1153
	acces	-0..000031	0.008	-0.456	-0.01121**	0.2553
	acesint	-0..019012	0.021	-0.0124	-0.02145*	0.3490
	elvag	.-0.02129	0.985	0.095	0.0363**	0.5543
	retard	12.15628	0.321	-2.0029	-0.0222**	0.02145
Agricultural	asurace	-4.609887	0.0045	-7.0165	-0.0132**	0.02538
activity 5	deteinsc	2.79e-07	0.0032	0.0154	-0.0543*	0.0111
cotton	nivea	-0..00004	0.9864	-2.3498	-0.32321*	0.1223
associated	lpricotb	1.91e+80	0.023**	-5.2543	-0.00165**	0.02656
with other	lprimais	1.31e-45	0.6243	1.560e-77	0.26320	0.12234
cultures	lprixigme	3.37e-56	0.5219	0.04543	0.03376*	0.04388
	lprixman	0.64093.32	0.8643	-2.03332	-0.0219**	0.01378
	lprixsmil	4.14e+32	0.6065	-1.2532	-2.03288*	0.01199
	lnages	-5.96e-06	0.0023	-3.2223	0.377420	0.00442
	lnages2	(omitted)	0.0125	0.01765	0.012345	0.02854
	ldepeducat	1.000469	0.045**	-2.35421	-0.00346**	0.022180
	lndép_santé	2.062556	0.021**	-3.01432	-0.01218**	0.02435
	lndéplogmt	1.72e-07	0.0321**	2.44430	0.0111**	0.18210
			(*) dy/dx is for discrete change of dummy variable from 0 to 1			

*Source: author, from the data of survey, 2013-2014. * 10% level and ** 5% level*

Table 4. Test of wald: Modalities grouping

(1) [1]actcton = 0	(13) [1]actctomls = 0	(25) [1]actctontrs = 0
(2) [2].actcton = 0	14) [2].actctomls = 0	(26) [2].actctontrs = 0
(3) [3]actcton = 0	(15) [3]actctomls = 0	(27) [3]actctontrs = 0
(4) [4]actcton = 0	(16) [4]actctomls = 0	(28) [4]actctontrs = 0
(5) [5]actcton = 0	(17) [5]actctomls = 0	(29) [5]actctontrs = 0
(6) [6]actcton = 0	(18) [6]actctomls = 0	(30) [6]actctontrs = 0
(7) [1]actcmas = 0	(19) [1]actctomac = 0	(31) [1]actctoigme = 0
(8) [2].actcmas = 0	(20) [2].actctomac = 0	(32) [2].actctoigme = 0
(9) [3]actcmas = 0	(21) [3]actctomac = 0	(33) [3]actctoigme = 0
10) [4]actcmas = 0	(22) [4]actctomac = 0	(34) [4]actctoigme = 0
(11) [5]actcmas = 0	(23) [5]actctomac = 0	(35) [5]actctoigme = 0
(12) [6]actcmas = 0	(24) [6]actctomac = 0	(36) [6]actctoigme = 0

Source: author; from the data of survey, 2013-2014

4. CONCLUSION

In this article, a particular accent is put on the agricultural activities selection and adoption in the cotton zones of Benin. The unique choice of cotton as agricultural activity presents no more considerable socioeconomic stakes for the cotton producers in Benin. The association of cotton production in a food crop brings more well-being in the acquisition and the satisfaction of the food goods, in health, educational and accommodation expenses. Results of the multilogit model estimation show that the prices of the food productions favor and stimulate the investment in the cotton sector. The cotton zones are not exempt of organizational, structural, institutional and political order difficulties. The regression of the systems of culture and the absence of adequate techniques increase the deficit of the food productions. In this situation,

the training and the emergence of the young producers have to infer structural releasing, which, unfortunately, mortgage the green growth in Benin. On the whole, elasticities of the agricultural activities selections and adoptions compared with the significant variables are low. A significant improvement of the agricultural associated activity practice (cotton and/ maize; yam; manioc; millet and other food-producing speculations) requires then actions on several factors in a simultaneous way. Considering the importance of the food-production weight in the auto consumption (more than 78%) and in the marketing (less than 30%) in the cotton zones of Benin, the promotion and the orientation of a diversified agricultural policy generating income and well-being must be undertaken. This could guarantee and assure the food security, expenses in children's education, health, and decent accommodation, as well as organization of food-producing selling. It is also necessary to more encourage the integration agriculture - breeding as effective improvement tool of adoption of the hitched culture and source of fertilizing able to substitute chemical fertilizers, as alternative sources of fertilization. An effort of food-producing agricultural seeds renewal by producing basic seeds for varieties in vulgarization is essential to perpetuate the performance of these improved varieties. There is good reason to promote the implementation of agricultural insurances structures to secure producers and their productions in case of the risks and agricultural uncertainties.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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