

**EARNING AND LEARNING IN THE RURAL AREA OF  
SUB-SAHARAN AFRICA:**

An inquiry into the cocoa sector

*Guy Blaise NKAMLEU<sup>1</sup>*

C:\ivoiremodel\lab-dakar.doc

---

<sup>1</sup> International Institute of Tropical Agriculture, P.O. Box 5320 Ibadan, Nigeria, Africa.  
E-Mail: [g.b.nkamleu@cgiar.org](mailto:g.b.nkamleu@cgiar.org) or [bnkamleu@yahoo.fr](mailto:bnkamleu@yahoo.fr)

## ***Abstract***

The challenge of a child labor policy is to remove children away from work and toward schooling. To this end, there is a need to better understand the reality of the interplay between work and schooling as well as household's behavior with respect to child's time allocation. This paper investigates child labor issue in the cocoa sector in Cote d'Ivoire, with the aim to identify determinant factors that can help to design a multi-angle policy approach towards the elimination of child labor.

The present study is based on a survey done in 2002, over a representative sample of more than 11000 cocoa-households' members. The paper presents model, which portrays the child labor decision as a three-stage sequential process.

Study reveals that child labor's contribution in cocoa farm as well as non-enrollment in school are considerable. More, numerous children are involved in potentially dangerous and/or injurious tasks.

Results of econometric analysis using sequential probit model show that child Characteristics, parent characteristic as well as household characteristics are all pertinent in explaining the child work/schooling outcome in the cocoa sector of Cote d'Ivoire.

Confirming the need of a multi-angled policy approach towards the elimination of child labor. The important variables highlight in this study should be taken into consideration in efforts to design an array of policy instruments to promote good development of children in the cocoa sector.

*Key words : Child labor, Cocoa, Cote d'Ivoire, Sequential Probit.*

## INTRODUCTION

Cocoa sector of Cote d'Ivoire is of particular interest for the country and for the global chocolate industry. In the course of the last 22 years the sector has tripled in size and now accounts for over 40% of global cocoa production. Even though, the picture that emerges is still of a sector with stagnant technology dominated by smallholder plantations.

Cocoa production is just one component in the rural livelihoods of most households, and nearly all cocoa households also grow food crops for both consumption and the market, and about half of the cocoa producers also grow robusta coffee on small plots. However, cocoa revenues are often the largest source of revenues for many households

Throughout the eighties, the cocoa sector experienced an economic recession as world cocoa market went through a period of extremely low prices. The price received by farmer has often rested below \$0.50 USD per kg<sup>2</sup>. This situation led many households to implement risk-reducing strategies; farmers have been forced to cut costs by reducing expenditures and increasing the use of low cost labor including children.

There is a growing concern that some agricultural goods in developed country markets are being produced under “exploited” forms of labor practices. In particular, since 2001, there has been persistent report that children are being used in cocoa production in Côte d'Ivoire. The problem of child trafficking has been recognized as a problem in West Africa for quite some time and requires action. However, dearth of direct data prevents the establishment of credible approaches and systems in systematically tackling the problems of the worst forms of child labor and the poverty that underpins these problems.

In response to those anecdotal reports of slavery on cocoa plantations in Ivory Coast, International Institute of Tropical Agriculture (IITA) and in close consultation with the Program for the Elimination of Child Labor of the International Labor Organization (ILO/IPEC) undertook investigative surveys of child labor practices on cocoa plantations, to establish the extent of such a practice.

While the medias attention was turned toward child salaried workers and/or children trapped in slavery-like conditions, IITA investigation in Ivory Coast revealed that by far the greatest number of children employed on cocoa farms are children leaving in the household, whether family or foster child (IITA report, 2002).

There are several human development issues associated with this hidden or invisible form of child labor that warrant scrutiny—specifically the hazards posed to children when working in certain tasks and most importantly the compromising of this future generation especially through negative effects on children's schooling.

The challenge of a child labor policy is to remove children away from work and toward schooling. To this end, there is a need to better understand the reality of the interplay

---

<sup>2</sup> In the most recent buying season however, prices rebounded substantially due partly to the insurrectional situation in Cote d'Ivoire.

between work and schooling as well as household's behavior with respect to child's time allocation.

The objective of this paper is to investigate child labor issue in cocoa sector in Cote d'Ivoire, with the aim to identify determinant factors that can help to design a multi-angle policy approach towards the elimination of child labor.

The paper is divided into six sections. Section two presents data source and the survey methods. Section three outlines the sequential probit model, its characteristics and its usefulness. Section four presents the empirical model specification, while section five discusses the results. The paper ends in section six with conclusions and recommendations to address children development issues.

## 2. SURVEY AND DATA

To capture information on the status of abusive forms of child labor in Cote d'Ivoire, an extensive national survey was conducted in 2002. The survey was the first effort towards building a knowledge base on cocoa producing household and its workforce.

A list of producers obtained from a national census of cocoa and coffee producers conducted in 1998 allowed the opportunity of selecting households with known probability of selection. A total of 1501 households and over 250 villages, hamlets and cocoa "camps" across the cocoa belt of Cote d'Ivoire were visited.

All the villages, clusters of households were selected using a stratified random sampling procedure, and randomly selected household heads was interviewed using structured questionnaires<sup>3</sup>. This was complement by a qualitative survey with open interviews conducted at the community level. Detailed information pertaining to labor circumstances and other socioeconomic characteristics of households and their member have been collected. The survey collected detailed information on more than 11.000 household members.

The 1501 households surveyed consisted of 11669 people, of which 1490 (12.8%) were household head, 1910 (16.4%) were spouses, and the rest 8289 (70.8%) were others family member<sup>4</sup>. Of these 'other members' 5263 (45.1%) were children of the head of household, while 2622 (22.5%) were extended family and 384 (3.3%) were member having no family ties to the household head (table 1).

Table 1: Frequency and percentage of household members by categories.

	Frequency	Percentage
Household head	1490	12.8 %
Spouse	1910	16.4 %
Family children	5263	45.1 %
Extended family	2622	22.5 %
Member having no family ties to the household head	384	3.3 %
Total	11669	100 %

<sup>3</sup> The survey is described in more detail in IITA report (2002).

<sup>4</sup> Throughout this paper, this category is designated by 'children'.

For our purpose, we are analyzing in this paper, children (whether family or foster) in the 7-17 years age, at which interval all children should legally be in school, and in conformity with ILO convention 182<sup>5</sup>. This gives an effective sample for analysis of 3621.

Each of these children and their households face the choice of allocating his/her time among four activities.

- 1 - Going to school only,
- 2 - Going to school and working in cocoa farm,
- 3 - Working in cocoa farm only,
- 4 - Not going to school and not working in cocoa farm

The word ‘work’ throughout this paper refers to work on cocoa farm.

### 3. ANALYTICAL FRAMEWORK

Contemporary labor economics employs theories of choice to analyze and predict the behavior of labor market participant (C.R. McConnell and S.L. Brue, 1989). In this study, we attempt to answer such questions as: why do some prospective child labor participant choose to delay their labor force entry to attend school? Why do some parents decide to employ their children in cocoa farm while others do not?

Following Grootaert (1998), a Sequential Probit Model is use to econometrically investigate the child labor supply. As in Becker’s model, household is regarded as an economic unit, which can use the time available to it in different ways. The advantage of the sequential-probit model is that it permits the analysis of the decisions across the various children’s time’s allocation alternatives - allowing the determination of choice probabilities for different choice categories. The sequential approach is most indicated for applications where a clear ordering of option is made.

In the analysis in this study, as suggested by Grootaert (1998), the four categories considered are ranked in the hierarchy of choices given below:

- $P_1$  – Probability to go to school and not to work (School only),
- $P_2$  - Probability to go to school and to work (Work and school),
- $P_3$  - Probability not to go to school and to work (Work only),
- $P_4$  - Probability not to go to school and not to work (residuum).

The above probabilities consist of a series of binary decisions and can be writing as (Maddala, 1983).

$$P_1 = F(\beta_1 X)$$

$$P_2 = [1 - F(\beta_1 X)]F(\beta_2)$$

$$P_3 = [1 - F(\beta_1 X)][1 - F(\beta_2 X)]F(\beta_3)$$

$$P_4 = [1 - F(\beta_1 X)][1 - F(\beta_2 X)][1 - F(\beta_3 X)]$$

---

<sup>5</sup> The International Labor Organization States in the Article 2 of Convention 182 that “The term *child* shall apply to all persons under the age of 18”. Although under some conditions children in the age group 15-17 can be allowed to work.

Where  $X$  is the matrix of the explanatory variables,  $\beta_i$  are the vector of parameters to be estimated. The parameters  $\beta_i$  are estimated from the entire sample by dividing it into two groups: going to school only versus not going to school as only activity. The parameters  $\beta_2$  are estimated over the sample of children excluding those who go to school only, by dividing it into two groups: going to school and work versus not going to school. Parameter  $\beta_3$  are estimated over the sample of children who do not go to school, by dividing it into two groups: work in cocoa farm, versus do not work.

$F$  represents cumulative function of the standard normal distribution given by:

$$F(\beta_j; X_i) = \int_{-\infty}^{\beta_j X_i} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{t^2}{2}\right) dt$$

Several studies have tried to capture the influence of socioeconomic variable on child labor and/or schooling. In most cases, the use of a single binary probit or logit model is applied (Jensen and Nielsen, 1997; Patrinos and Psacharopoulos, 1995, 1997; Mason and Khandker, 1997). Canagarajah and Coulombe (1997) use a bivariate probit model allowing for interdependency between the work and school choice.

The sequential-response models represent an improvement of these approaches. Instead of having dichotomous (0, 1) alternative as in the multi variate Logit or Probit models, the Sequential-Probit has  $S$  possible states or categories -that is  $s = 1, 2, 3, \dots, S$ ,- which are disjunct, exhaustive and put in an hierarchical decision making process.

If we hold that the decision maker in the household considers all options open (simultaneous decision process), a multinomial choice model will be appropriate. But the main drawback of this approach is the assumption of independence of irrelevant alternatives (IIA) (Amemya, 1981; Cramer, 1991)<sup>6</sup>. Thus is less appropriate for empirical studies on child labor supply (Grootaert, 1998)<sup>7</sup>.

#### 4. EMPIRICAL MODEL

The starting point is the household decision making process which must allocate children's time between labor and school, taking into account the perceived private return.

The choice probabilities of each alternative was specified as function of factors at the household level, i.e. those characteristics of the child, parents and the household which can exercise an influence over the household's decision concerning allocation of children's time.

The perceived benefits of allocating children's time as well as the costs of the allocation are likely to vary across farmers that are heterogeneous in the availability of human

---

<sup>6</sup> The multinomial Probit solves this drawback, but the computation is possible only for small number of alternatives.

<sup>7</sup> For comparative purposes, the results of a multinomial model are also presented.

capital and technical skills, and in other socioeconomic characteristics. Therefore, It is important to understand the role of these factors to ensure the development and implementation of more effective programs for elimination of child labor.

It is well recognized that parents' characteristics, household characteristics, and characteristics of the child are important factors in the child labor decision. The magnitude and direction of these importance are however country and/or sector-specific, and determined by cultural factors and socioeconomic environment (labor market opportunities, cost of schooling etc.). Variables pertained to those three groups are included in our models to determine in the case of cocoa sector in Cote d'Ivoire, the factors affecting the child work/schooling status.

The description and descriptive statistics for the variables included in the empirical models are given in table 2.

Those variables are;

*Parent's characteristics*

First year farm operator first began cocoa farming (COCOAEEXP), Age of the head of household (AGEPR), level of education of household head (EDUCPR), marital status (MARITAL), whether the head of the household is migrant from another country or not (MIGRANT), whether the head of the household is native of the village or not (NATIVE),

*Household characteristics*

Average number of food per day in the household (NFOODAY), household size (FHHSIZE), cocoa area cultivated (AREACOA), cocoa productivity level (PTYCLAS), non cocoa area cultivated (AREANCOA), number of family child in the household (FCHILD), number of non family member in the household (NFMEMBER), number of sharecropper working with household head (NSHARECROP), geographic regions (West, East, Center-West).

*Characteristics of the child*

The gender of the children (SEXCH), whether the child is the son/daughter of the household head or not (SON), age of the children (AGECH),

The square of some quantitative variables are included to determine any nonlinearities in the relationship between those variables and the dependent variables.

Table 2. Descriptive Statistics for Variables in Empirical model.

Variable	Description	Mean	Std.Dev.	Minimum	Maximum	Number of Cases
<i>Household characteristics</i>						
FHHSIZE	Household size	10.444	4.577	2	36	3229
FHHSIZESQ	Square of household size	130.021	127.239	4	1296	3229
AREACOA	Cocoa farm size (ha)	5.664	5.261	1	90	3516
AREACOASQ	Square of cocoa farm size	59.751	223.859	1	8100	3516
PTYCLAS	Cocoa productivity class. 1=Low; 2=Average; 3=High	2.003	0.799	1	3	3342
AREANCOA	Non cocoa area cultivated (ha)	5.757	10.686	0	152	3580
FCHILD	Number of family child (6-18years) in the household (son/daughter+other parent)	4.235	2.379	0	15	3229
NFMEMBER	Total number of non family member in the household	0.304	0.911	0	7	3229
NSHARECROP	Number of sharecropper working with household head	0.553	0.957	0	6	3621
NFOODAY	Average number of food per day in the household	2.609	0.615	1	8	3615
WEST	Dummy variable for western region. 1=west; 0=elsewhere	0.097	0.296	0	1	3621
EAST	Dummy variable for eastern region. 1=east; 0=elsewhere	0.202	0.401	0	1	3621
CENTER-WEST	Dummy variable for center-west region. 1=center-west, 0=elsewhere	0.411	0.492	0	1	3621
<i>Parent's characteristics</i>						
COCOAEXP	Years of cocoa farming experience	20.410	10.740	1	77	3563
AGEPR	Age of the household head	52.808	13.588	20	110	3583
AGEPRSQ	Age square	2973.270	1519.460	400	12100	3583
EDUCPR	Farmers' level of education proxy 1 = no formal education. 2=primary school, 3= secondary1, 4= secondary2 5=post secondary.	1.538	0.748	1	5	3599
MARITAL	Marital status. 0=non-married; 1=married	0.920	0.272	0	1	3605
MIGRANT	Whether the head of the household is migrant from another country or not. 0=no; 1=yes	0.222	0.415	0	1	3621
NATIVE	Whether the head of the household is native of the village or not. 0=no; 1=yes	0.525	0.499	0	1	3621
<i>Characteristics of the child</i>						
SEXCH	Gender of the children. 1=male; 2=female	1.440	0.496	1	2	3618
SON	Whether the child is the son/daughter of the household head or not. 0=no; 1=yes	0.733	0.442	0	1	3621
AGECH	Age of the children	10.796	3.395	6	17	3621
AGECHSQ	Square of age of the children	128.084	76.785	36	289	3621



## 5. RESULTS

### *Incidence of child labor and schooling*

Due to missing data, some observations have been dropped out. Table 3 shows the status of child involvement in cocoa farm activities. Among the 3560 children concerned, 54.5% are employed by their parents in cocoa farm. Looking at the relationship between family child labor on a task-by-task basis we find a significantly greater mobilization of this labor type for cocoa pod collection, cocoa pod breaking and field transport. Respectively, 35.5%, 22.1% and 17.8% of family children are employed for those tasks. One of the major concerns with child work is the health and safety threat posed by some tasks. Clearing cocoa plantations with a sharpened cutlass is a potentially hazardous occupation for any worker but especially for children whose muscles may not have adequately developed. Up to 6% of children are employed for weeding of cocoa plantation. Another hazardous task is pesticide application. Only 1% of children performed pesticide application. The children employed in this task may be exposed to inappropriate health risks associated with the mixture of pesticide. When account for the 11% of children involved in all tasks, it appears that child's work in hazardous occupation is considerable. Other potentially injurious tasks include transporting excessively heavy loads, and cocoa pod opening when done using a machete.

It is important to note that 11.6% of children are involved in all the tasks in cocoa farm. Thus the use of family child labor is important and can be considered as a major factor of production.

Table 3: Frequencies and percentages of family child labor participation by task in the cocoa sector of Cote d'Ivoire.

Task	Frequency	Percentage
Weeding	213	6 %
Field preparation	76	2.1 %
Farm upkeep	161	4.5 %
Pesticide application	37	1 %
Fertilizer application	8	0.2 %
Harvesting cocoa pods	249	7 %
Cocoa pod collection	1265	35.5 %
Cocoa Pod breaking	787	22.1 %
Fermentation	156	4.4 %
Field transport	633	17.8 %
Drying	320	9 %
All activities	414	11.6 %
Other activities	19	0.5 %
Participation in at least one task	1940	54.5 %

One of the concerns often raised over the issue of working children is whether or not they are enrolled in school. The question is whether or not working in cocoa farm means the child is unable to attend school.

As we pointed earlier, children can be classified in four mutually exclusive categories. Table 4 shows the distribution of children across the four categories by region and gender of child. The survey data showed that: First, 28.8% of children attend school as their only activity. Second, 27% of children combine schooling with work inside cocoa farm. Third, 27.7% of children work in cocoa farm as only activity. Fourth, 16.5% report no school and no work.

It also appear that non-enrollment in school is much higher in Southwest and Western region. Only 46.7% (25.3+21.4) and 48.1% (25.7+22.4) respectively have been reported attending school. The proportion is greater than 60% in other regions. At the same time we observed that relatively more children in South and West fell in category ‘work only’. 32.5% of children in Southwest and 35.6% in West do not attend school and report work in cocoa farm.

The survey data also showed a distinct gender dimension. In all regions, girls’ school enrollment is lower than boys. Overall, 60.8% (30.3+30.5) of boys are enrolled in school against 49.3% (26.9+22.4) of girls. However, boys are slightly more employed in cocoa farm than girls (55.8% against 53.2% for girls). Thus relatively more girls are in the category ‘no school and no work’. The reason could be that the girls are generally more employed in home care tasks and work in food crop fields.

Tableau 4. Categories of child times’ allocation by region and gender (%).

		<b>South- West</b>	<b>Center -West</b>	<b>East</b>	<b>West</b>	<b>All</b>
School only	Boys	26.7	33.6	29.0	28.4	30.3
	Girls	23.8	26.8	33.9	21.9	26.9
	All	25.3	30.8	31.3	25.7	28.8
School and work in cocoa farm	Boys	25.5	32.5	36.4	23.2	30.5
	Girls	16.9	28.0	20.6	21.2	22.4
	All	21.4	30.6	29.5	22.4	27.0
Work in cocoa farm only	Boys	30.1	23.0	20.5	32.5	25.3
	Girls	35.0	26.2	29.0	40.1	30.8
	All	32.5	24.3	24.2	35.6	27.7
No school and no work	Boys	17.8	11.0	14.1	16.0	13.9
	Girls	24.2	19.0	16.5	16.8	20.0
	All	20.9	14.3	15.1	16.3	16.5
<b>Total</b>		<b>28.7</b>	<b>41.8</b>	<b>20.2</b>	<b>9.3</b>	<b>100</b>

### ***Econometric Model Results***

The results of the sequential probit results are presented in Tables 5a, 5b, and 5c. The first stage results (table 5a) show the determinants of the probability to go to school and not to work. The second stage (table 5b) of the estimation eliminates from the sample the children who go to school and do not work. The probability to be determined is that of combining schooling and work. The third estimation stage (table 5c) looks only the children who are not in school and determines the probability that they work in cocoa farm.

The statistical fits of the three models are all significant at 1%. The predictive abilities are good. The percentages of correct prediction are all greater than 72%. The tables also show derivatives calculated at the mean of the independent variables.

The first stage shows the factors that affect the decision of household to devote the children in school only. Nine variables were significant in explaining this decision.

Measures of households' family size (FHHSIZE) is significant and positive indicating that the larger the family, other things being constant, the higher will be the probability of child to go school and not to work. A large family often has a large number of working members. They may thus prefer to use adult member in cocoa farm. This can explain the fact that children in those households have greater probability to go to school only.

The significance of the coefficients estimate on the quadratic term of family size suggests that this variable is related to dependent variable in a non-linear way: The effect of FHHSIZE on dependent variables decline at higher level of FHHSIZE.

Measure of number of family child (FCHILD) in the household has a negative relationship with the probability to go to school only. Imply that the more family children there are in the household, the more likely it is that child will not attend school as only activity. A common stated proposition is that more children in the household decreases income per capita and increases the dependency ratio, and both factors increase the likelihood that a child will need to be productive.

Parents' characteristics are also relevant in explaining the decision to enroll children in school as only occupation: Years of cocoa farming experience (COCOAEEXP) is significant with a negative sign, suggesting that experienced farmers do not devoted children to school only.

The level of education of household head (EDUCPR) is an important determinant. Probability of children to go to school only is greater if household head is educated, Suggesting that educated farmers better assess the benefits of child education.

The marital status of the household head (MARITAL) also matter. Married farmers have lower probability to devote child in school only. This can be explain by the fact that generally, farmers who are married have more people to feed. Consequently, they have the obligation of high productivity. Thus they have to use more input, particularly child labor input.

Origin of the farmer is important determinant. Migrant farmers have lower likelihood to devote children to school only while native of the village are more likely to do it.

The results also show that age and gender of the child are important determinants of going to school only. Not surprisingly, girls have lower probability to go to school and not to work, while child age are positively related to the likelihood to go to school only,

suggesting that the older the child, the more likely that he will be attending school and not working. The coefficients estimate on the quadratic term of child's age is also significant indicating that the effect of child's age decline at higher level of age.

At the second stage the determinants of the decision of combining schooling and work are identified (table 5b). Fifteen (15) variables are statistically significant in explaining this decision.

Household characteristics that matters are; Measures of households' family size (FHHSIZE), level of cocoa productivity (PTYCLAS), Measure of number of family child (FCHILD), Total number of non family member in the household (NFMEMBER), number of sharecropper working with household head (NSHARECROP), Average number of food per day in the household (NFOODAY), The three dummy variables for the regions (WEST, EAST, CENTER-WEST). For parents' characteristics important factor are education (EDUCPR) and origin (MIGRANT, NATIVE). And all the three characteristics of the child included are significant, that is gender (SEXCH), age (AGECH) of the child, and whether the child is the son/daughter of the household head or not (SON).

The larger the household, the less likely it is that child will combining school and work. The productivity of the producer's cocoa production system has a significant positive relationship with the probability of children to combine school and work. Each additional child in the household increases the probability of children to combine school and work. Also, each additional non-family member in the household increases the probability of combining school and work. The larger the number of sharecropper on the farm, the less likely the child will school and work. Average number of food per day in the household can be view as a proxy of poverty level. Results reveal that the more the number of food per day in the household, the lower the probability to combine school and work, meaning that with poverty children are very much in demand since they have to combine school and work. The coefficients of East and Center-West are positively related to school and work, that is children in those two areas are more likely to combine schooling and work, while the situation is inverse in western region. As in the first stage, parents' education is an important determinant. Probability of children to combine school and work is greater if household head is educated. Also, origin of the household head matters in this stage. Children from migrant farmers household have lower likelihood to combine school and work while native of the village have opposite outcome. Also as before, girls are more likely to be drop out of school and work. Another interesting result is that children from the household who are not son/daughter of the household head (that mean other parent and child with no family link) are less likely to combine school and work. The older the child, the more likely that he will be combining schooling and work. Also, as previous, the effect of child's age on this outcome decline at higher level of age.

At the third stage seven (7) variables are statistically significant in explaining the decision of work versus no work nor schooling (table5c). For household characteristics we have: As in stage two, the number of sharecropper (NSHARECROP) in negatively related to the outcome. The larger the number of sharecropper on the farm, the less likely the child will be devoted to work only. The role played by number of food per day (NFOODAY) is different at this stage. The lower the number of food per day in the

household, the lower the probability to work only. Using NFOODAY as a proxy of poverty, this can be explain by the fact that generally wealthier farmers have more cocoa fields and thus can prevent child from unemployment and leisure.

The relevant Parents' characteristics are Years of cocoa farming experience (COCOAEXP) is significant with a positive sign, contrary to the first stage, experienced farmers are more likely to devoted children in work only.

The level of education of household head (EDUCPR) is an important determinant. But the role played is the inverse of the role in stage 1 and 2. Probability of children to work only is lower if household head is educated.

The marital status of the household head (MARITAL) also matter. Contrary to stage 1, Married farmers have greater probability to devote child in work only option. Again the same explanation in stage one is relevant here. Farmers who are married have more people to feed. Consequently, they have the obligation of high productivity. Thus they have to use more input, particularly child labor input.

The most striking finding here is the negative sign of MIGRANT. Indicating that migrant farmer have lower probability to devote children in work only. This is perhaps a surprising result, given that in stage 1 and 2 we found similar results, implying that children from migrant household are neither working nor enrolled in school. We must consider the possibility of bad quality of information. Due to political situation of migrant farmers in Cote d'Ivoire, they are less likely to provide right information on 'illegal practice'. There are reasons to think that many of those children are slaves leaving inside the household and working on cocoa farm (IITA-CEPRASS report, 2002).

The last relevant variable is child's age. The older the child, the more likely he will be engaged only in work on cocoa farm. Also, as in stage 1 and 2, the effect of child's age decline at higher level of age.

The multinomial results presented in table 6 confirms many of our finding. But globally, as expected, in many points, results of multinomial are different from results of our sequential-model.

Table 5a : First stage Sequential Probit model: Probability to go to school only.

	<b>Coefficients</b>	<b>T-values</b>	<b>Probability derivative</b>
ONE	-0.7860	-1.58	-0.2526
<i>Household characteristics</i>			
FHHSIZE	0.0703	2.29 **	0.0226
FHHSIZESQ	-0.0025	-2.02 **	-0.0008
AREACOA	0.0127	1.10	0.0041
AREACOSQ	-0.0001	-0.40	0.0000
PTYCLAS	-0.0184	-0.53	-0.0059
AREANCOA	0.0023	0.94	0.0007
FCHILD	-0.0505	-2.67 ***	-0.0162
NFMEMBER	0.0097	0.29	0.0031
NSHARECROP	0.0396	1.23	0.0127
NFOODAY	-0.0665	-1.42	-0.0214
WEST	-0.0956	-0.92	-0.0307
EAST	0.0277	0.32	0.0089
CENTER-WEST	0.0466	0.69	0.0150
<i>Parent characteristics</i>			
COCOAEXP	-0.0105	-3.30 ***	-0.0034
AGEPR	0.0155	1.18	0.0050
AGEPRSQ	-0.0001	-0.77	0.0000
EDUCPR	0.1046	2.63 ***	0.0336
MARITAL	-0.2749	-2.65 ***	-0.0884
MIGRANT	-0.1419	-1.69 *	-0.0456
NATIVE	0.4209	5.88 ***	0.1353
<i>Child Characteristics</i>			
SEXCH	-0.1602	-3.02 ***	-0.0515
SON	0.0905	1.33	0.0291
AGECH	0.0991	1.63 *	0.0319
AGECHSQ	-0.0102	-3.64 ***	-0.0033
Number of observations	2925		
Log likelihood function	-1541.99		
Restricted log likelihood	-1759.28		
Chi-squared	434.57		
Significance level	.0000000		
% of correct predictions	72.68 %		

Table 5b: second stage Sequential Probit model: Probability to combine school and work.

	<b>Coefficients</b>	<b>T-values</b>	<b>Probability derivative</b>
ONE	-4.9841	-8.00 ***	-1.8331
<i>Household characteristics</i>			
FHHSIZE	-0.0886	-3.84 ***	-0.0326
FHHSIZESQ	0.0014	2.02 **	0.0005
AREACOA	0.0118	0.70	0.0043
AREACOSQ	-0.0006	-1.16	-0.0002
PTYCLAS	0.0931	2.16 **	0.0342
AREANCOA	0.0011	0.28	0.0004
FCHILD	0.1101	4.81 ***	0.0405
NFMEMBER	0.1057	2.55 ***	0.0389
NSHARECROP	-0.0972	-2.37 ***	-0.0357
NFOODAY	-0.1472	-2.49 ***	-0.0541
WEST	-0.4416	-3.46 ***	-0.1624
EAST	0.1785	1.72 *	0.0657
CENTER-WEST	0.2086	2.62 ***	0.0767
<i>Parent's characteristics</i>			
COCOAEXP	0.0013	0.32	0.0005
AGEPR	0.0022	0.14	0.0008
AGEPRSQ	0.0000	-0.06	0.0000
EDUCPR	0.1889	3.73 ***	0.0695
MARITAL	0.0582	0.43	0.0214
MIGRANT	-0.3000	-3.24 ***	-0.1103
NATIVE	0.5956	7.02 ***	0.2191
<i>Characteristics of the child</i>			
SEXCH	-0.4286	-6.76 ***	-0.1576
SON	0.2268	2.76 ***	0.0834
AGECH	0.9640	12.97 ***	0.3545
AGECHSQ	-0.0438	-13.44 ***	-0.0161
Number of observations	2079		
Log likelihood function	-1074.53		
Restricted log likelihood	-1379.10		
Chi-squared	609.15		
Significance level	.0000000		
% Of correct predictions	74.46 %		

Table 5c : Third stage Sequential Probit model: Probability to work only.

	<b>Coefficients</b>	<b>T-values</b>	<b>Probability derivative</b>
ONE	-3.7943	-4.83 ***	-1.4029
<i>Household characteristics</i>			
FHHSIZE	-0.0163	-0.51	-0.0060
FHHSIZESQ	0.0000	-0.02	0.0000
AREACOA	0.0169	0.92	0.0062
AREACOASQ	-0.0002	-0.64	-0.0001
PTYCLAS	0.0308	0.57	0.0114
AREANCOA	0.0019	0.36	0.0007
FCHILD	0.0062	0.22	0.0023
NFMEMBER	0.0225	0.46	0.0083
NSHARECROP	-0.1135	-2.29 **	-0.0420
NFOODAY	0.1865	2.20 **	0.0690
WEST	0.1204	0.80	0.0445
EAST	0.1286	0.96	0.0476
CENTER-WEST	0.0776	0.79	0.0287
<i>Parent's characteristics</i>			
COCOAEXP	0.0091	1.70 *	0.0034
AGEPR	-0.0305	-1.34	-0.0113
AGEPRSQ	0.0002	1.05	0.0001
EDUCPR	-0.1946	-2.72 ***	-0.0720
MARITAL	0.3975	2.33 ***	0.1470
MIGRANT	-0.2399	-2.25 **	-0.0887
NATIVE	-0.1241	-1.07	-0.0459
<i>Characteristics of the child</i>			
SEXCH	-0.0898	-1.11	-0.0332
SON	0.0163	0.17	0.0060
AGECH	0.6570	7.58 ***	0.2429
AGECHSQ	-0.0204	-5.39 ***	-0.0075
Number of observations	1292		
Log likelihood function	-644.05		
Restricted log likelihood	-852.41		
Chi-squared	416.71		
Significance level	.0000000		
% of correct predictions	77.01 %		



Table 6 : Multinomial Logit Model of work/school choices.

	School only		School and work		Work only	
	Coefficients	T-values	Coefficients	T-values	Coefficients	T-values
ONE	-5.4281	-4.68 ***	-9.8448	-7.86 ***	-6.2435	-5.00 ***
<i>Household characteristics</i>						
FHHSIZE	0.0406	0.64	-0.1913	-3.96 ***	-0.0496	-1.02
FHHSIZESQ	-0.0033	-1.34	0.0032	2.17 **	0.0010	0.64
AREACOA	0.0522	1.87 *	0.0483	1.46	0.0453	1.58
AREACOASQ	-0.0008	-1.15	-0.0015	-1.41	-0.0008	-1.26
PTYCLAS	0.0785	0.96	0.2484	2.86 ***	0.0537	0.62
AREANCOA	0.0019	0.29	-0.0012	-0.17	-0.0038	-0.47
FCHILD	-0.0056	-0.13	0.1814	3.89 ***	0.0079	0.17
NFMEMBER	0.0920	1.21	0.1396	1.70 *	-0.0102	-0.13
NSHARECROP	-0.1013	-1.36	-0.2851	-3.50 ***	-0.1734	-2.23 **
NFOODAY	-0.1159	-1.00	-0.1301	-1.07	0.2817	2.15 **
WEST	-0.2471	-1.03	-0.3384	-1.29	0.4184	1.73 *
EAST	0.2680	1.34	0.4580	2.15 **	0.1495	0.70
CENTER-WEST	0.3862	2.49 ***	0.5575	3.39 ***	0.1838	1.15
<i>Parent's characteristics</i>						
COCOAEXP	-0.0113	-1.48	0.0110	1.36	0.0110	1.37
AGEPR	-0.0139	-0.43	-0.0420	-1.22	-0.0661	-1.89 **
AGEPRSQ	0.0002	0.68	0.0004	1.19	0.0006	1.74 *
EDUCPR	0.2245	2.23 **	0.2064	1.95 **	-0.2702	-2.32 **
MARITAL	-0.1625	-0.67	0.2929	1.10	0.5330	1.92 **
MIGRANT	-0.6059	-3.35 ***	-0.8053	-4.18 ***	-0.4789	-2.78 ***
NATIVE	0.9627	5.66 ***	0.7277	4.06 ***	-0.3010	-1.67 *
<i>Characteristics of the child</i>						
SEXCH	-0.6213	-5.00 ***	-0.7607	-5.79 ***	-0.0434	-0.34
SON	0.3135	1.96 **	0.3762	2.23 **	0.0438	0.27
AGECH	1.2980	9.10 ***	2.1155	13.77 ***	1.1629	7.99 ***
AGECHSQ	-0.0603	-9.13 ***	-0.0875	-12.73 ***	-0.0372	-5.87 ***
Number of observations	2925					
Log likelihood function	-3243.028					
Restricted log likelihood	-3990.784					
Chi-squared	1495.512					
Significance level	.0000000					
% of correct predictions	51.25%					

## 6. CONCLUSION

The child labor concern has been recognized as a problem in West Africa for quite some time. Particularly, there is a growing concern that some agricultural goods are being produced under “exploited” forms of labor practices in West Africa. There has been persistent report that children are being used in cocoa production in West Africa and particularly in Côte d’Ivoire. However, the lack of direct data on child labor prevents the built up of appropriate remedial actions.

Base on a survey over a representative sample of more than 1500 household carried out 2002, this paper focus on cocoa sector in Ivory Coast, by investigating the interplay between work and schooling among children at ages 7-17. The main objective being, to identify variables that can help to design an array of usable policy instruments to promote good development of children.

Survey data reveals that numerous children are involved in potentially dangerous and/or injurious tasks like pesticides application, weeding, transport and cocoa pod breaking.

Classifying children into four mutually exclusive categories according to her/his time allocation, the results show that only 28.8% of children in cocoa household attend school as their only activity (do not work in cocoa farm). 27% of children report combining schooling with work inside cocoa farm. Another 27.7% report work in cocoa farm as their only activity (not attending school). And a last residual category of children (16.5%), was those not attending school and reporting no work in cocoa farm.

These findings suggest that child labor’s contribution in cocoa farm as well as non-enrollment in school are considerable.

A sequential probit model was used to capture choice probabilities across these time’s allocation categories.

The results identify fifteen (15) key characteristics, which affect the child labor decision. Results generally indicate that:

1. Children from large family are more likely to attend school exclusively and are less likely to combine school and work.
2. The option of combining work and school is more frequently observed among high productivity producers.
3. The more family children there are in the household, the more likely it is that child will not attend school as only activity, and the more likely the child will combine school and work.
4. The more non-family member there are in the household the more likely the child will combine school and work.
5. The number of sharecropper on the farm matter at the decision stages involving work: The more the number of sharecroppers, the less likely the child will work or combine school and work.
6. Average number of food per day in the household can be view as a proxy of poverty level. Study reveals that children from poorest family (less number of food per day) are more likely to combine school and work. In contrast, those

- children are less likely to work only. Child unemployment is more prevalent among poorest.
7. In East and Center-West, children are more likely to combine schooling and work, while the situation is inverse in western region.
  8. Farmers with more years of cocoa farming experience do not devote children to school only, but are more likely to devote children in cocoa farm as only activity.
  9. Parent's education has a great impact at all stage of decision. Educated farmer are more likely to reject work option and to choose the two schools option (school only and/or combination of school-work) for their children.
  10. Married farmer are more likely to choose 'work only' option and reject 'school only' option for their children.
  11. Native farmers are more likely to choose school only and/or combination of school-work option for their children.
  12. It appear that migrant farmers are more likely to reject all option (no school nor work). We must consider the possibility of wrong information provided by migrant.
  13. There is a gender gap in child's time allocation. Girls are less likely to attend school exclusively, they are less likely to combine school and work.
  14. Children of the head of household are more likely to combine school and work than fostering children in the household.
  15. The older the child, the more likely that he will be work and/or attend the school.

It is frequently more informative to think of the household as the basic decision-making unit rather than the individual. The decision of whether to work is strongly influenced by the socio-economic situation of the household.

This study highlights variables that appear to be usable as targeting variables for policy interventions. There is not a simple, or even a dominant way of approaching the elimination of child labor, and there is necessity for a multi-angle policy approach.

In some cases the total elimination of child labor will be possible and useful. However In other situations, particularly for poorest household, having no children work is not a sustainable strategy. A viable intervention in this case could be to induce children currently work to combine this with school attendance, given that school attendance is not the "inverse" of work.

To this end, there is need to design strategies in line with our findings, for a successful child labor policy in cocoa sector of cote d'Ivoire.

## REFERENCES

**Ameniya, T.** (1981). Qualitative response models: A survey. *Journal of Economic Literature*. Vol XIX (December): 1483-1536.

**Canagarajah, S. and H. Coulombe** (1997). "Child Labor and Schooling in Ghana." Mimeo, Africa Technical Department, Washington, DC : The World Bank.

**Cramer, J.S** (1991). *The Logit Model for Economists*. Edward Arnold: London, New York.

**Grootaert Christian** (1998). "Child Labor in Cote d'Ivoire : Incidence and Determinants". Social Development Department, The world Bank.

**Jensen, P. and H.S. Nielsen** (1997). "Child Labor or School Attendance ? Evidence from Zambia". *Journal of Population Economics*, Vol. 10.

**Madalla, G.S** (1983). *Limited dependent and qualitative variables in econometrics*. Cambridge University Press, New York, 401 p.

**Mason, A. and S. Khandher** (1997). Mimeo, Poverty, Gender and Public Sector Management Department, Washington, DC : The World Bank.

**McConnell, R. Campbell and Stanley L. Brue** (1989). "Contemporary Labor Economics". Mc Graw Hill, Second Edition, 659p.

**Patrinos, H. and G. Psacharopoulos** (1994). "Educational Performance and Child Labor in Paraguay". *International Journal for Educational Development*, Vol. 15(1).