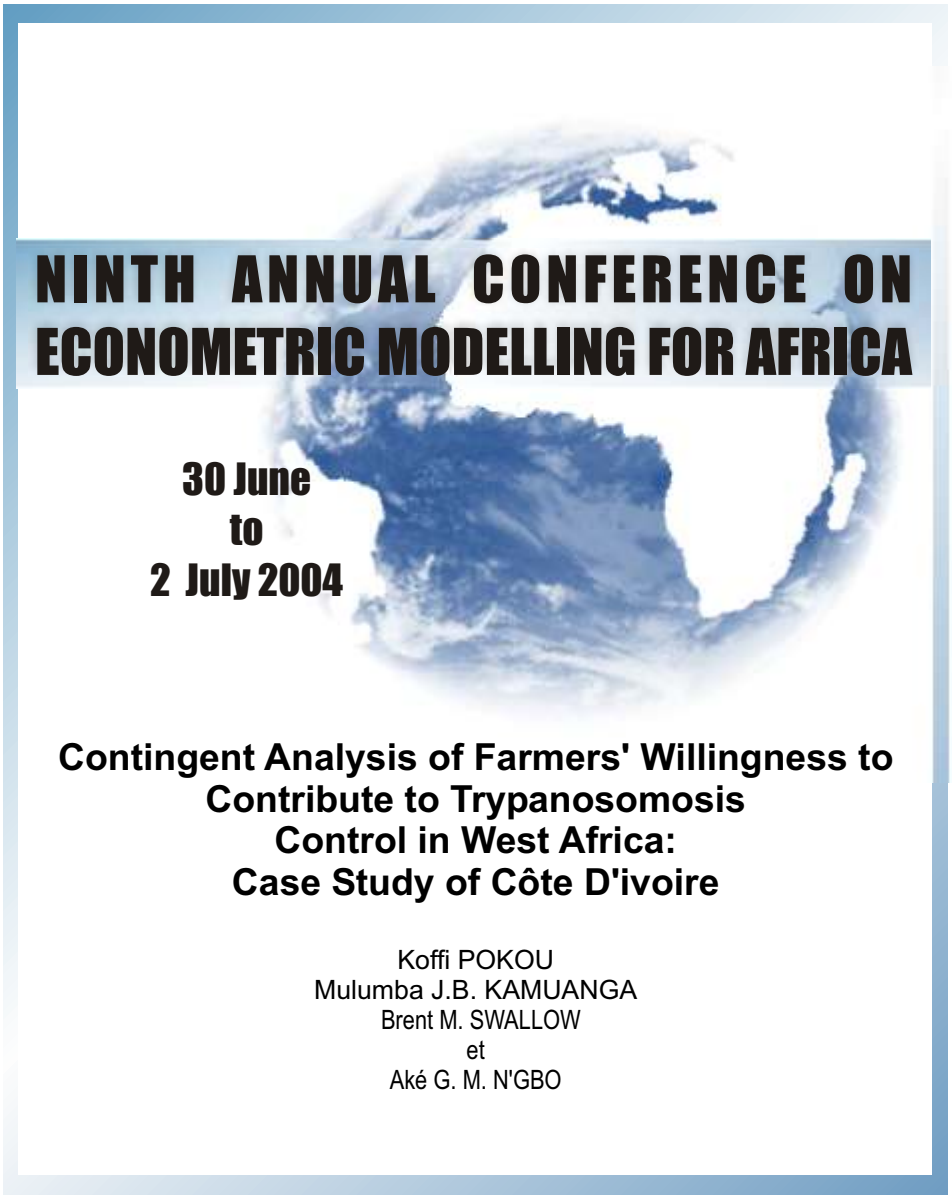

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Contingent Analysis of Farmers' Willingness to Contribute to Trypanosomosis Control in West Africa: Case Study of Côte D'ivoire

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Contingent Analysis of Farmers' Willingness to Contribute to Trypanosomosis Control in West Africa: Case Study of Côte D'ivoire[1]

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ABSTRACT

The study was conducted in 1997 on a sample of 224 livestock farmers in 4 clusters representing the diversity in production systems of northern Côte d'Ivoire, in order to evaluate the willingness of beneficiaries to pay for tsetse control using traps and targets. Results of a contingent valuation survey indicate that 94% of respondents are willing to contribute money, 86% are willing to contribute labour and 81% are willing to contribute in both money and labour. Average contribution proposed is CFA 246 (US$0.46) per head of cattle per year and 8 days per month per farm family with significant differences in the level of resource contributions by production system and breed composition of herds. The estimated model of factors affecting willingness to contribute labour reveals the significance of knowledge of the tsetse fly and trypanosomosis symptoms, location, length of farmer's experience as collective herd manager and the practice of transhumance. Few factors were found to be significantly associated with willing to contribute money. The organization of a scheme for resources contribution to sustain the benefits of control should take into account the differences in production systems, farm location and breed composition of herds.

RESUME

Une étude portant sur 224 éleveurs a été mise en place en 1997 dans 4 sites représentatifs de la diversité des systèmes d'élevage de la région Nord de la Côte d'Ivoire en vue d'évaluer la velléité des éleveurs à contribuer à la lutte par piégeage contre la trypanosomose. Les résultats de l'analyse contingente montrent que 94% des éleveurs acceptent le principe de la participation financière, 86% sont disposés à contribuer en main d'œuvre, et 81% proposent une contribution multiforme. La moyenne proposée est de 236 FCFA (0.45 $US) par tête de bovin par an et de 8 journées de travail par exploitation par mois, avec des variations significatives liées au système de production et à la composition raciale du troupeau. Les résultats de l'analyse économétrique indiquent que la connaissance du vecteur de la trypanosomose, la localisation de l'élevage, l'expérience de l'éleveur en tant que chef de parc et la pratique de la transhumance affectent significativement la velléité des éleveurs à contribuer en main d'œuvre. Très peu de facteurs ont un effet significatif sur le niveau de participation financière. Une approche par modulation est suggérée pour l'organisation d'un système de contributions en vue de pérenniser les acquis de la lutte et la durabilité des bénéfices.

INTRODUCTION

African Animal trypanosomiasis[1] transmitted by the tsetse fly (*Glossina spp*) constrains livestock development in West African sub-humid area characterized by a 800-1200 mm rainfall. About 70% of bovines (12.5 million cattle) in the 12 countries concerned are exposed to the disease. In cattle, trypanosomosis causes weight loss, poor growth, low milk yield, reduced work capacity, infertility, abortion and death (Murray and Gray 1984).

In Côte d'Ivoire, almost all the cattle (1.2 million cattle) is exposed to trypanosomosis whose updated annual cost rose to 5.4 millions dollars in 1991, i. e. 5 dollars per cattle (IRLAD 1993). A trypanosomosis control program launched in 1978 contributed to a breakdown of the glossinas by species group on a map followed by experimentation of disease control (1980-82) which led to the choice of the baited targets (traps and cloths impregnated with an insecticide) as being appropriate. In its execution phase (1983-1994) disease control was extended to the whole northern region which provides about 85% of the ivorian livestock. Results testify to the technical success of tsetse flies control (Yao 1992; DSV 1992) and its economic viability was confirmed by a 23% internal return rate (Shaw 1993). Since 1994, emphasis has been put on sustainable results through an active involvement of the beneficiaries and an integration of farm management. Control the current policy of the Ivorian government encourages the transfer of control skills by trapping to farmers including all relevant charges. This redirecting of the government action leads to a few concerns, regarding farmers willingness to contribute money and labor in the tsetse flies fight, and the key factors showing this ability to contribute, for example.

The present study mainly aims at assessing farmers' willingness to contribute to tsetse flies control in northern Côte d'Ivoire with a view to the setting up of a voluntary contribution system that would ensure result sustainability. Three specific objectives are to be reached, i. e. (1) assess the level of money and labor contribution of farmers to the tsetse flies control; (2) identify and assess the importance of key factors of farmers willingness to contribute to the control; and (3) set up recommendations on the basis of the results for a better work planning that ensured sustainability of the control of the trypanosomosis vector.

[1] Henceforth referred to as trypanosomosis

METHODOLOGICAL APPROACH

Tsetse flies control and application for local public good

The trypanosomosis vector control raises the problem of financing a public good (Cornes and Sanders 1987), because occurring profits and advantages (reduction of the trypanosomosis risk, the cost of drugs, calf death rate and the increasing of animal productivity) are intended to only those who live in the concerned zone.

Since all members of the community simultaneously take advantage of the control as a public good, the optimal Pareto resources allocation cannot be achieved given efficiency conditions for a competitive market and top-level marginality are unsatisfied. Such resources allocation can be analyzed in a non-market context.

Referring to studies by Brookshire and Coursey (1987), one may consider the case of an individual consumer whose preference is expressed through a utility function stated in respect to a range of private goods and a public good. Private goods are represented by a vector $x = (x_k : k \hat{I} X)$ while the public good is represented by a scalar z. Its utility function is then defined by $U = U(x, z)$ in which U is an increasing and quasi – concave ordinal utility function. Private goods are subject to transactions on competitive markets at strictly positive prices $p = (p_k : k \hat{I} X)$. There is no market for the public good z but it can be defined by H levels of attributes $a = (a_h : h \hat{I} H)$. Each attribute is matched with a price q_h that depends on the levels of traits contained in the good. These prices reveal an implicit function that set them linked to the good's characteristics (Ethridge and Davis 1982, Brosen et al 1984).

By assumption, a rational consumer looks forward to maximize his utility function under constraint of his budget given by:

$$px + q(a)z \pounds y; \quad \text{for} \quad y > 0 \qquad (1)$$

where *y* is the exogenous income. In these conditions, this consumer's indirect utility function may be presented as follows:

$$V(p, q(a), y) = \max U(x, a) \qquad (2)$$

$$s.t \qquad px + q(a)z \pounds y$$

Supposing a situation where only the supplying of public good alters, going from $a^0 \quad to \quad a^1$; then, the key question is to know the amount of money required by the consumer

to keep at least his initial level of utility. When $a^0 < a^1$ consumer's willingness to contribute to the supplying of the public good measures his aptitude to pay for this good that is stated as follows :

$$WTP(p^0, q(a^1); p^0, q(a^0), y^0) = \max y \qquad (3)$$

$$\text{s. t. } V(p^0, q(a^1), y) \geq V(p^0, q(a^0), y^0)$$

where *WTP* is the willingness to pay for the public good. In practice, the supplying of a public good is non-optimal since beneficiaries adopt strategies to overestimate their willingness to accept compensations or underestimate their real demand for public goods (Brookshire and Coursey 1987). Several methods of public goods financing have been proposed among which the Nash and Lindahl model, the principles of majority vote, and tax scheme (Cornes and Sandlers, 1987, Malinvaud 1982, Feldman 1980). Empirically and in a non-market context, the contingent analysis has been often used to assess consumers' willingness to pay for a public good.

CONTINGENT ANALYSIS

The contingent analysis (CA) is a method that allows attribution of market value to goods and services (Randall et al 1983, Cummings et al 1986, Mitchell and Carson 1989). This method has previously been used in industrialized countries to state costs of leisure such as competitive fishing and entertainment parks. In developing countries, implementation of the C A has been extended to many other fields such as education support or contribution to health care (Tan et al 1984). The method has also been used to assess the populations' willingness to be involved in water furniture programs (Mc Phail 1993, Boadu 1992, Winttington et al 1990). The contingent analysis has been applied for the timber tarification in Zimbabwe (Campbell et al 1991), the willingness to pay for visiting wildlife in Kenya (Navrud and Mungatana 1994) and the acceptance of a compensation to have access to the forest in Benin (Treiman 1993).

The use of this method to assess the community participation in the tsetse fly control remains a recent practice. Well known studies have been carried out in Ethiopia (Swallow and Woudyalew 1994), Kenya (Echessah et al 1997) and in Burkina Faso (Kamuanga et al 1997).

A major aspect of the contingent analysis is to clear up willingness of individuals to pay to use or enjoy a resource. Many methods of survey are available among which the most used remain the open-ended or closed-ended questionnaire. In the first case, the respondent is required to express his maximal willingness to pay, while he is proposed an amount and asked for his readiness to pay regarding the closed-ended questionnaire. Although both approaches lead to define marginal willingness to pay, it is not obvious for them to give the same contingent values in practice (Boyle and Bishop 1988).

Seller et al (1985) but also Brown et al (1996) argue that the closed-ended questionnaire is more reliable, i. e. people are much more familiar to market situations and make less effort when they have to face yet stated prices, and show their willingness to pay or not for a public good. On the other hand, the open-ended questionnaire bears the risk of an sub-estimation of the contribution since it would further the free-rider phenomenon from the respondent, who argues that the other individuals will bank more (Brown et al 1996). In either case, practically, efforts are being made to reduce the free-ride phenomenon (Brown et al 1996, Kealy and Turner (1993). Owing to practical considerations linked to sampling and lowering of the cost of the study, the open-ended questionnaire approach was applied in farmers' willingness to contribute to tsetse flies control in northern of Côte d'Ivoire.

DATA COLLECTION

This task was been carried out in 1997 through 4 major regions in Northern Côte d'Ivoire (table 1) – Odienné, Boundiali, Korhogo and Bouna according to an argued choice that reflects diversity of the environment and production systems in the region. As a matter of fact, sedentary cattle is much more dominant all around Korhogo and cattle mainly includes Zebu, N'dama and Baoulé, the last two types known as trypanotolerant. Korhogo is also subject to an advanced cross-breeding of Zebu and trypanotolerant breeds. Tsetse flies control started there in 1980.

Transhumant cattle are the most dominant breeds in Boundiali. Herds, mainly made up of Zebu and crossed breed. Tsetse flies control also started there in 1980. Livestock is relatively modern but mainly sedentary in Odienné. Tsetse flies control didn't start there until 1996, before launching the present study. Herds are mostly made up of N'dama. Sedentary cattle represent 76% of the cattle in the region of Bouna where farmers are mostly Lobi. The most widespread breed in the region is the Baoulé that represents more that 60% of the cattle population.

However, we must make a point on a significant increase of the Zebu-Baoulé cross-breeding rate. The zone is not yet concerned by trypanosomosis vectors control since it shelters the Park National of the Comoé and the Volta Noire listed forest that make the control expensive, given the reinfestation risk.

A sample of 224 farmers (table 1) has been selected over 60 km around each of the 4 stated major regions. A preliminary stratification of breeding units, according to the production system (sedentary or transhumant) came before up-dating census bases on each site, thanks to the farmers list held by the parastatal agency for animal productions development (SODEPRA). Each selected farm, was visited at least four times, in order to add the different remaining steps of the contingent analysis survey. The head farmer or his substitute had to face the survey questionnaire.

The respondent, on each site, was previously aware of the nature of public good set by traps and targets and the profits occurring from tsetse flies control, regarding the individual and his community. The respondent is then, required to make proposal (maximum day per month and/or money to be paid per year and per animal) as his affordable contribution.

ANALYSIS OF FARMERS' CONTRIBUTION TO TSETSE FLIES CONTROL

Econometric Model and Hypothesis

Distribution of assessed levels of contribution are censored since about 20% of respondents make no proposal regarding type of contribution. In this case, using ordinary least squares regression method, will give biased estimators. Many approaches have been used to avoid such difficulties. For example, the two stage- estimations method suggested by Heckman (1976), was used by Echessah et al (1997), to identify key factors regarding their willingness to get involved in the glossinas control, as expressed by farmers. This method gives consistent but inefficient estimators (Greene 1993, Kennedy 1993). Swallow and Woudyalew (1994) used the three least square method to identify factors affecting farmers' willingness to get involved in tsetse flies control. This approach leads to more efficient estimators, compared to those obtained by the two least square, when errors are randomly and normally distributed. However, confronted with censored samples, an estimate by the maximum likelihood method yields better estimators and allows to avoid least square asymptotic bias (Kennedy 1993). To this end, determining money and labor contribution has been assessed through a Tobit model.

According to the questionnaire format, the respondent who agrees to contribute in the tsetse flies control, is previously required to propose the level of his labor contribution, followed then, by his money contribution statement. However, the amount is stated only after a deep explanation of advantages linked to tsetse flies control, as argued by whittington (1990). This approach led us from the work of Hayes et al (1997) and Moore et al (1994) to the use of a recursive Tobit model to assess parameters, having in mind that the hypotheses that the farmer's decision to contribute labor is linked to his money contribution. The recursive Tobit model is presented as follows:

$$Y^{*}_{i1} = X_{i1}b_1 + m_{i1}, Y_{i1} = Y^{*}_{i1} \text{ si } Y^{*}_{i1} > 0,\ Y_{i1} = 0 \qquad \text{otherwise} \qquad (4)$$

$$Y^{*}_{i2} = X_{i2}b_2 + Y^{*}_{i1} + m_{i2}, Y_{i2} = Y^{*}_{i2} \text{ si } Y^{*}_{i2} > 0,\ Y_{i2} = 0 \text{ otherwise}$$

where Y^{*}_{i1} is the observed level of labor contribution, assessed in labor days per month; Y^{*}_{i2} is the observed amount of money contribution, assessed in CFA francs per year and per animal; Xi1 is the vector of variables to explain labor contribution and X_{i2} for explanations of money contribution. Parameter vectors to be estimated and error terms are respectively represented as follows: $b_j (j = 1,2) and \quad m_j (j = 1,2)$.

A number of explaining variables relevant to money contribution and labor contribution were retained on the basis of data collected from discussions with focused groups or individuals. Besides, results obtained from similar studies relevant to key factors of involvement in tsetse flies control in East Africa (Swallow and Woudyalew 1994, Echessah et al 1997) allow the setting of other research hypothesis. So, significant variables concern: (1) characteristics of the head of family : age, breeding experience as herd manager, ethnical group, education, knowledge of trypanosomosis symptoms and its wrong effects, (2) features of the household: income, size and composition of the herd, and (3) production system and nature of the environment for transhumant yield, and farm location (region).

RESULTS

Levels of contribution to in the Tsetse flies control

According to respondents proportion, obtained results show that 93. 8% of the farmers volunteer the money contribution while, about 85.7% choose to contribute labor. Those preferring both types of contribution represent 81.2%. This implies that 18.8% of respondents offer no type of contribution. The average amount of involvement in tsetse flies control are shown on table 2. The whole study zone money contribution amounts to 236 CFA franc (i. e. 4.45 US $) per year and per animal, and for 8 working days per month per household. Willingness to contribute money represents only 32% of what the farmers spend to buy drugs. Comparison of contribution levels per region and production system has shown that sedentaries (280 CFA franc) pay twice more, and their proposal labor contribution (8.63 days/month) also drops by 30% transhumants contribution. Levels of rates per region, also reveal a noticeable ($P < 0.05$) difference between Odienné and Bouna one the hand, and between Boundiali and Korhogo on the other hand. Odienné being more willing (416 CFA / year / animal and 11 days / month) to contribute to glossinas control. In this region, the proposed money contribution also represents about 80% of the expenses for drugs purchase. This results seems not to match since herds in Odienné, mainly include the N'dama breed which is a trypanotolerant animal.

Levels of financial contribution in Korhogo and Boundiali (110 CFA franc / year / animal) are known as the lowest, but matching more with expectations. In fact it is started that, transhumant farmers widely settled in this region (41 to 54%) but mainly those who are not landowners, seem reluctant to take part to the area decontamination action. Transhumants money contribution represents only 13% of their annual expenses for drugs needs.

Money contribution proposal in Bouna is higher than Korhogo and Boundiali, but remains lower than Odienné where farmers' contribution amounts to 28% of their annual expenses for drugs needs.

It transpires that farmers paying highest charges for their drugs (transhumants, Boundiali and Korhogo) are also those who make the lowest money contribution proposals, leading to a substitution link between willingness to contribute to financing traps and targets (public local good) and the trypanosomosis therapeutic and prophylactic treatments (private good). Finally, regional disparities may now be summarized as follows: Bouna and Boundiali are not significantly different ($P > 0.05$) regarding money contribution. Against, and considering this level of error risk,

Odienné is noticeably higher than each of the three other regions. In terms of labor contribution, Bouna and Boundiali are not significantly different; on top of being statistically different, Odienné and Korhogo also feature some difference, compared separately to Bouna and Boundiali.

❖ ***Key factors of contribution to Tsetse flies Control***

Results of the Tobit model regarding willingness to contribute labor (dependant variable in working days per month) and money (dependant variable in CFA francs per year and per animal) were generated thanks to the LIMDEP software 7.0 version, by Greene (1995). Estimated models have a widely negative logarithm of likelihood function, with a low basic value. Many variables that help willingness to contribute labor and the rate of such an involvement are significant regarding levels of significant from 5 to 10% as stated on table 3.

The farmer's experience and transhumance practice have a negative impact on the level of labor contribution. Older farmers, being the most experienced as a rule, do not clearly get these personal advantages occurring from a public good, to which they must contribute. Transhumant farmers who are not landowners often seem neither to be interested by the area decontamination, nor concerned by any contribution to the achievement of community works. On the other hand, farmers from Odienné and Bouna, whose herds mostly include trypanotelerant animals are much more willing to contribute labor. For those farmers able to identify the tsetse fly, the variable representing knowledge of the trypanosomosis vector, features the expected sign to stat contribution labor. Being aware of the disease, may on the other hand, urge farmers to deeply contribute to the tsetse flies control.

Size of the household has no effect on willingness to contribute labor ($P < 0.01$), since contribution ability is much more expressed by larger households. Neither the size of the herd initially taken into account through the model, nor the number of trypanotolerant animal, have a significant effect on the herd, having no impact on willingness to contribute labor, has been stated through similar studies in East Africa (Swallon and Woudalew 1994, Echessah et al 1997).

Factors determining money contribution are shown on table 4. Willingness to contribute labor (as independent variable) and farm localization in Odienné, seem to be the only significant factors, the effect of which is noticeable regarding farmers' contribution to glossinas control. Through the above stated assumption relevant to a sequential process of decision, farmers who

firstly choose to contribute labor, show later much more willingness to contribute money. Willingness to contribute is higher in Odienné, compared to other regions.

DISCUSSION AND CONCLUSION

It transpires from the current survey that, more than 80% of the farmers are willing to contribute both money and labor to the animal trypanosomosis control. This large rate, on the one hand, shows that the farmers are aware of the disease to be a major concern for animal care, and then, part of the control charges could be transferred to beneficiaries, a key condition to ensure results sustainability, on the other hand. Proposed levels of contribution remain low regarding cost of traps and targets, their setting and up keeping. In spite of their willingness to contribute money, most farmers lack reliable information about efficiency, cost and sustainability of the tsetse flies control. In this respect, farmers seem to observe prudence and think that would-by community sanctions for their willingness to contribute could be used as tarification base of control return.

Due to the questionnaire format – the farmer deciding to contribute labor first before contributing money - a recursive Tobit model has been used to feature key factors that act up on willingness and contribution types.

The analysis shows the size of households and knowledge of the trypanosomosis symptoms and vector, as factors that positively affect labor contribution. Extension structures are then required to increase their action through a training program intended to farmers in the region of control. Because of their heavy responsibilities in the management of the common herd, farm leaders are less willing to contribute labor for decontamination of the area; so, the information to organize required community tasks should attract more younger farmers in each region. We must note that a few factors were found statistically significant, regarding money contribution, and this result matches with the one Swallow et Woudaylew (1994) and Echessah et al (1997) in East Africa. In Northern Côte d'Ivoire, this result could be linked to strategic behavior of farmers. As a matter of fact, farmers were granted a state support under the form of free supplying of veterinary drugs, more energetic food, building of barrages, together with subsidies for the building of parks and containing corridors, over the period between 1972 and 1992.

In the expectation of new state grants, willingness to contribute money for tsetse flies control may decrease. Of course in the transhumance regions already subject to a control

program, one needs a fund collecting system, the amount of which would not exceed 200 CFA francs / year / animal. As a whole, any wished money contribution should remain below the total cost of drugs considered as the most important for all farmers. This point confirms the result obtained by Kienz (1993) in this region of Côte d'Ivoire and allows here the following conclusion: a charge acceptance, other than symbolic is not conceivable since the cost of tsetse flies control do not exceed farmers' average charge for the animal health care per region and per breed.

Disparity between proposed contribution levels between sedentary and transhumant farmers on the one hand, and between geographic zones, on the other hand, then suggests, an approach by modulation, when it comes to organize a fund raising or tarification or contribution system to keep a common fund that would help financing traps and targets for the control. So, in the region of Odienné, in spite of the settlement of herds mostly trypanotolerant, we can see relatively modern breeding the owners of which are often willing to adopt new technologies supposed to improve yield of their herd. On the other hand, we can make a point on a relatively low money contribution in the region of Bouna relatively where farmers do not pay enough attention to technological innovations. But the high pressure of glossinas, owing to a lack of control and the high rate of sedentary farmers allow to expect the money contribution to be higher than in Boundiali and Korhogo. Il would be the same for the setting of a local institution for community work.

Analysis of the prospective acceptance of the tsetse flies control charges, applies to the providing of a local good, the value assessment of which, is tried through the contingent analysis, by stating levels of contribution wished by beneficiaries for financing it. Contrary to difficulties linked to assessing leisure type public goods, costs of tsetse flies control may be assessed in advance. Levels of contribution occurring from the contingent evaluation as carried out through the present study, cannot be interpreted as an approximation of the money value of the glossinas control, to serve the cost-profit analysis. But they provide objective data on the subsidy still required in the short term to make the investment profitable regarding the trypanosomosis vectors control, having in mind to raise farmers' incomes, thanks to the increase of animal production.

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Table 1 Structure of the sample

Region	Sedentary farmers		Transhumant farmers		Total
	N	%	N	%	
Odienné	50	88	7	12	57
Boundiali	25	46	30	54	55
Korhogo	33	59	24	41	57
Bouna	42	76	13	24	55
Total	150	67.3	74	32.7	224

Table 2 Average contribution for tsetse flies control

	Together (combined)	Production System		Region			
		Sedentaries	Transhumants	Odienné	Boundiali	Korhogo	Bouna
Money Contribution (CFA francs / year /animal)	236.36 (327.66)	280.46_a (429.99)	140.06_b (194.69)	416.07_a (407.99)	188.016_b (300.67)	109.67_b (140.44)	238.17_e (493.97)
Contribution Labor (day / month)	7.96 (5.56)	8.63_a (7.21)	6.07_b (4.49)	11.09_a (9.78)	702_b (4.20)	4.86_c (2.31)	8.06_b (5.40)
Drugs cost (CFA francs / year / animal)	745 (680.92)	543_a (404.81)	1053_b (314.41)	538.35_a (708.15)	840.30_b (933.77)	761.27_bb (741.37)	861.02_b (983.46)
Money contribution/ drugs purchase (%)	31.7	51.9	13.3	77.3	22.4	14.4	27.6

Source: Data survey, 1997

Note: In each category (production system or region) the difference between two averages contributions followed by the same letter is not significant at the 5% level.

Table 3 Results of the Tobit model for key factors affecting willingness to contribute labor to the tsetse flies control

Variable	Coefficient	Z = b / s.e.
Constant	4.7276 **	3.16
Size of household	0.069018*	1.705
Knowledge of the vector (0 = no; 1 = yes)	4.0017**	3.455
Trypanotolerant cattle in the herd	0.57390	0.369
Transhumance practice (0 = no; 1 = yes)	-2.5762**	-2.071
Farm leader experience	-0.14609**	-3.620
Household income (CFA francs)	-0.0000001891	-0.631
Education (0 = no; 1 = yes)	-1.3132	-0.682
Region of Bouna (o = no; 1 = yes)	3.4348**	2.533
Region of Boundiali (o = no; 1 = yes)	1.7383	1.238
σ	6.5993**	19.252
Log of the likelihood function = -664.72		

* Significant at 10%

** significant at 5%.

Table 4 Results from the Tobit model of key factors stating willingness to contribute money for tsetse flies control

Variable	Coefficient	Z = b / s.e.
Constant	24.625	0.232
Trypanotolerant cattle in the herd	26.214	0.295
Ethnic group (0 = other; 1 = Ivorian)	38.680	0.475
Transhumance practice (0 = no; 1 = yes)	46.724	0.577
Cotton crop (0 = no; 1 = yes)	30.174	0.494
Adoption of preventive drugs (0 = no; 1 = yes)	-60.940	-0.909
Subjective appreciation about glossary infestation (0 = few; 1 = much)	20.449	0.571
Household income (CFA francs)	-1.3132	-0.682
Region of Bouna (o = no; 1 = yes)	65.989	0.878
Region of Boundiali (o = no; 1 = yes)	62.287	0.857
Region of Odienné (o = no; 1 = yes)	148.96*	1.712
Labor contribution (working day / month)	10.123**	2.549
σ	360.62	20.261
Log of the likelihood function = - 1540.90		

* Significant at 10%

** significant at 5%.