DEGRADATION OF THE ENVIRONMENT UNDER DRAUGHT FARMING IN THE SAVANA REGION OF TOGO

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ABSTRACT

We have conducted a survey in 54 farms in the Savana region of Togo, a semi-arid zone with an annual rainfall between 900 and 1100 mm and where are 87 % of the country's draught animals. This study has brought to the fore that non mastery in the selection of farm tools and farming technology such as tillage, bush burning, trees cutting, lack of fertilizer, etc lead to erosion, plough pan, low crop yield, desertification and deforestation. In order to face these serious problems of environment degradation some appropriate solutions concerning soil and water conservation are suggested for sustainable agriculture in the region.

Key words: TOGO - DRAUGHT FARMING - DEGRADATION - ENVIRONMENT

INTRODUCTION

In developed countries, experts, researchers and farmers are improving their farming systems for sustainable agriculture in order to face the problems of soil and environment degradation such as fight against the erosion and pollution, biological agriculture, premiums to the farmers for soil and water conservation [1]. Regarding Togo, a developing country, since 1986 PNUD/FAO and the "Soil Conservation and Improvement Institute" have initiated a project (TOG/83/009 than TOG/89/001) to raise the awareness of farmers about the problem of soil erosion. This study essentially based on climatic, soil, demographic data and crop production had permitted to list 15 priority sites for conservatory action in four economic regions [2]. Besides this, in 1997 Brabant and al have made a plan of degradation map for Togo - a countrywide inventory of human-induced land degradation [3].

All these projects realized in the country did not bring to the fore that intensive agriculture and the improper use of tools in mechanized farming systems could lead to: erosion, runoff, soil compaction and degradation, low yield and deforestation.

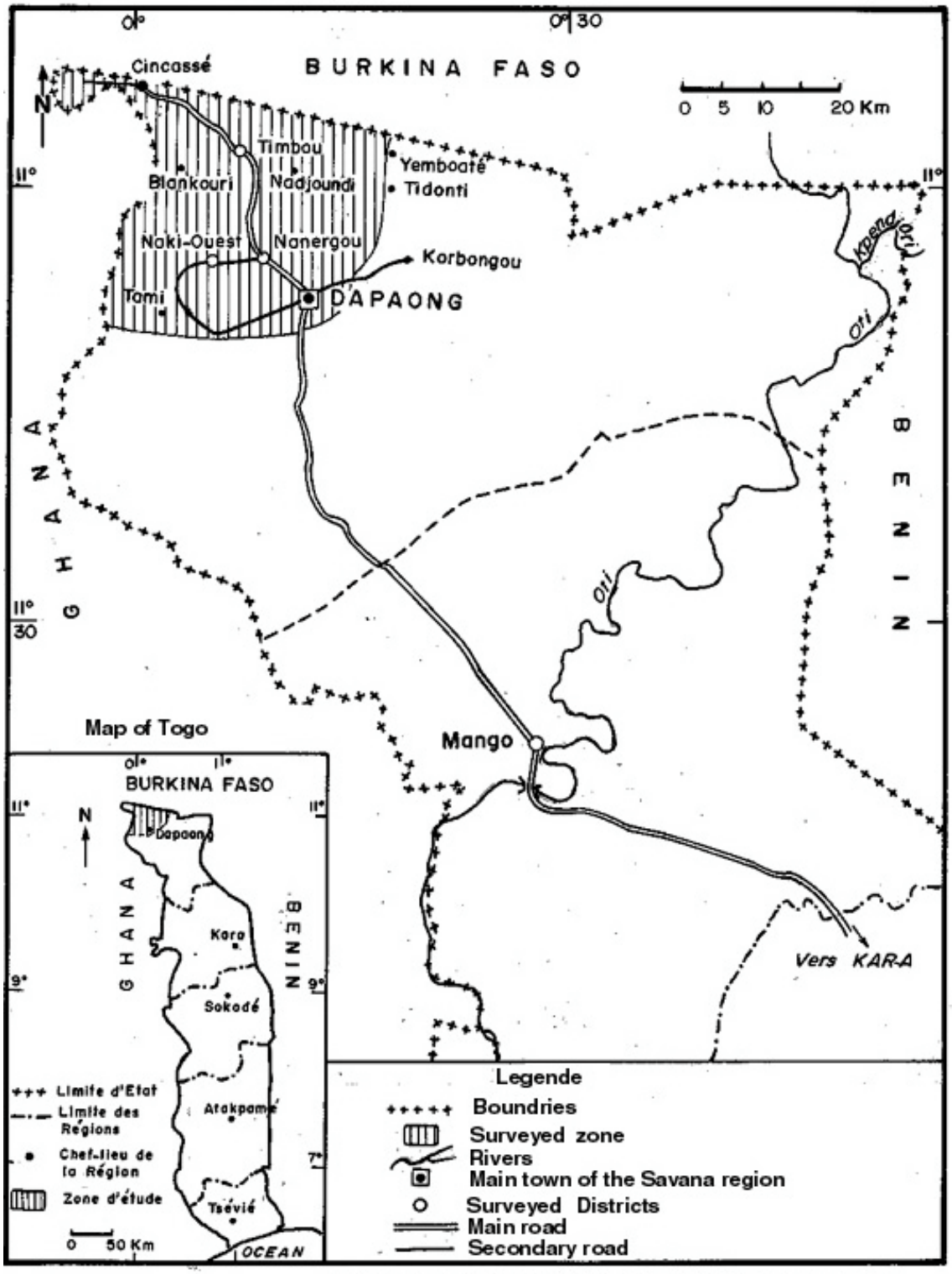
This study was therefore conducted to investigate these problems in the Savana region of Togo where are 87 % of the country's draught animals [4, 5]. It is a contribution of a preceding item that allowed us to treat different questions on soil protection under mechanized farming systems [6].

PRESENTATION OF THE SAVANA REGION

The Savana region covers a total area of 8470 Km^2 [Figure 1] and with a population of about 500 000 people [7]. The main ethnic group living there are: Moba, Tchokossi, Peuhl, Mossi and Gangan. Two rivers, Oti and Kpendjari cross the region. The Savana region [2], a soudanaian semi-arid zone presents the following characteristics : 900 to 1100 mm annual rainfall, temperature range 20 to 34°C, vegetal growing period less of 175 days/year, evapotranspiration more than 500 mm/year, soils are from granite and gneiss, tremendous population pressure, growth rates 2,6%, extensive abandoned fields due to erosion, lack of land, low crop yields, etc.

MATERIALS AND METHODS

Three Agricultural Districts in the Savana region, considered as priority sites for conservatory action in soil protection matter constitute the study zone. These sites were: Timbou, Nanergou and Naki-Ouest [Figure 1]. Data were collected on 54 farmers with at least 3 years of experience in draught farming. The survey conducted on farming areas had permitted to identify different factors of soils and environment degradation involving the effects of mechanized farming.



Source : Carte topographique de la Région des savanres

Figure 1. Map of the Savana region showing the surveyed zone (TOGO-WEST AFRICA)

RESULTS AND DISCUSSION

I. CHARACTERISATION OF FARMS

The average age of the farm bosses [table 1] is at least 50 years. Only 3 to 11% of them have an instruction level superior to the elementary class a. Farmers have access to a sufficient livestock to produce organic fertilizer. Up to 51% of the farmers were trained in draught farming. Less than 15% were producing cotton, the main cash crop in the region. Therefore, the agricultural production is essentially for food crops. The family manpower is important, about 16 persons by farm. The farmers have 2 to 6 farm areas of which the area varies between 0.25 to 5.5 ha [Table 1]. These are small enough cut up farms. Farm equipment were essentially cutlasses, hoes, mouldboard ploughs, cultivators, ridgers and carts [Table 2].

Table 1. CHARACTERISTICS OF FARMS

CHARACTERISTICS		NANERGOU	TIMBOU	NAKI-OUEST
Average age of farms bosses (years)		51	50	53
Family manpower average		13	14	16
Average number of Live-stock	cattle	09	04	06
	sheep and goats	19	17	23
Training in draught farming (%)		51	39	42
Level of instruction superior of elementary class a (%)		03	11	05
Cotton producers (%)		13	09	14
Average number, minimal and maximal farm areas		3,6 min =2 max = 5	3,8 min =2 max = 6	3,3 min = 2 max = 6
Average area, minimal and maximal farm areas (ha)		2,16 min = 0,75 max = 5,5	2,38 min = 0,25 max = 4	1,94 min = 0,5 max = 3,5
Number of surveyed farms		21	16	17
		TOTAL = 54		

Table 2. EQUIPMENT IN PERCENTAGE OF SURVEYED FARMERS

IMPLEMENTS	NANERGOU	TIMBOU	NAKI-OUEST
Plough	98	100	100
Disk plough	00	00	00
Cultivators	100	92	81
Ridgers	100	98	100
Zig-zag harrows	00	00	00
Planters	00	00	00
Carts	40	35	38

II. EFFECTS OF MECHANIZED FARMING

The use of animal traction allowed to double or treble the farm areas [Table 3]. This generates an important growth of the work volume, the destruction on a large scale of the trees and shrubs and the reduction or the suppression of the fallow. The last two phenomena had contributed to increase the impoverishment of the lands and the deforestation.

Table 3. PERCENT INCREASE OF FARM AREA BY DISTRICT

FARM AREAS	NANERGOU	TIMBOU	NAKI-OUEST
Manual farming (ha)	**3,47**	**3,64**	**4,75**
Draught farming (ha)	**6,71**	**9**	**8,73**
Rate of increase (%)	**93 %**	**147 %**	**84 %**

In the Savana region, the method of cultivation is ploughing and especially tillage in ridges. The disk plough is not used because it can generate an excessive soil crumbling and the propagation of the rhizomes [8, 9]. The preparation of the seed-bed is not well done because the zig-zag harrow is not used [8, 10]. This can affect the yields. Sowing constitutes a crucial task despite the increase of the farm areas, it remains a manual operation. Less than 50% of the farmers possess a cart. This raises the problem of manure and other agricultural inputs transportation towards the most remote farm areas (2 to 5 km). The average agricultural production of the different crops decreases from one year to another [Table 4], consequence of the serious soil fertility decrease due to a very weak supply of mineral and organic fertilizers then to the use of crop residues.

Table 4. EVOLUTION OF THE AVERAGE YIELD OF CROPS

CROPS	AVERAGE YIELDS PER YEAR IN Q/ha					
	NANERGOU		TIMBOU		NAKI-OUEST	
	1997	1998	1997	1998	1997	1998
Sorghum	5,18	3,51	2,84	2,49	10,86	5,05
Millet	3,82	2,37	2,94	2,04	6,20	5,23
Maize	3,59	3,15	2,81	3,69	3,21	3,78
Cotton	1,62	1,38	2,32	2,96	4,20	2,49
Rice	2,94	2,39	1,36	1,17	3,13	1,98
Groundnut pea	4,27	3,82	1,07	1,17	0,68	0,68
Groundnut	4,01	2,56	6,52	4,46	6,13	4,76
Cow pea	0,83	0,76	0,72	0,66	1,33	0,72

The erosion of the farm areas is weak but one observes non negligible ravines [Table 5] in Nanergou and Naki-ouest [Figure 2 and 3]. It would be necessary to make waterways if any other technical method within reach of the farmers cannot allow his infiltration. The transportation almost systematic of crop residues from the fields [Table 6] for the use that does not allow the return of the organic matter to the field contributes to the soil impoverishment [Figure 4 and 5]. The needs of soils in fertilizers are very important. The tillage with burying of millet straws and the supply of small quantities of compost are very insufficient. Three investigated farmers have scraped farm areas. It would be necessary to remedy this phenomenon quickly because the humus is indispensable for the conservation of the crop production.

TABLE 5. TYPES OF SOIL DEGRADATION IN PERCENTAGE OF SURVEYED FARMERS

TYPE OF SOIL DEGRADATION		PERCENTAGE OF FARMERS PER DISTRICT		
		NANERGOU	TIMBOU	NAKI-OUEST
Erosion	None	24	00	6
	Weak	62	75	59
	Mean	14	25	35
Decrease of fertility		62	49	54
Ravine		19	00	23
Scraped area		9	6	00

Table 6. USE OF CROP RESIDUES IN PERCENTAGE OF SURVEYED FARMERS

USE OF CROP RESIDUES	PERCENTAGE OF FARMERS PER DISTRICT		
	NANERGOU	TIMBOU	NAKI-OUEST
Burn in the farms (Millet and Rice)	19	00	6
Fire wood (Cotton - Sorghum - Maize)	100	100	100
Tillage with burying straws (Millet)	100	100	88
Used by animals in farms (Cow pea - Maize)	95	100	94
Cut for fodder (Rice - Groundnut)	100	100	100
Used for compost (Rice)	57	25	76

Figure 2. Ravines in a farm area in Nanergou

Figure 3. Beginning of a ravine in a farm area in Timbou

Figure 4. Bared farm area in Timbou

Figure 5. Eroded farm area, abandoned in Nanergou

The Table 7 shows that the majority of farmers understood the necessity to combine the chemical fertilizer and the manure to improve the soil fertility. Nevertheless the crop yields remain weak because the peasants have financial and organisational difficulties to obtain the necessary quantities of fertilizer. An effort in rotation of crops on the same farm area is done but the demographic pressure and important constraints of the tradition prevent certainly to practice the fallow and the multiple cropped rotations. The analysis of the soil profile is not applied and the farmers are unaware of the bad effects of the improper use of agricultural equipment. For example, they plough at the same depth over several successive agricultural seasons that makes plough pan. It reduces the infiltration of water and the aeration of the soil. This increases the runoff that stresses the erosion and the ravines. More than 50% of the surveyed farmers plant trees but the adoption of agroforestry is very weak. The association of trees and the crops [11] allowed the up take of minerals elements from the soil. Besides, this system provides nitrogen (from leguminous trees), shade, fruits, feed, fire wood, etc. In addition, the trees and the shrubs protect the soil, improve the stability of water in the ground, the micro-climate of the environment [12, 13] then constitute an income source for the farmer budget. Ploughing and farming methods that do not protect the environment induced the destruction of trees and shrubs on vast earth ranges [Figure 4]. More than 75% of the farm areas behave 3 to 7 trees each [Table 8] be to the maximum 3,5 trees/ha. The farm areas are nude in dry season and at the beginning of the rainy season. They dry out themselves strongly, become compact and are thus exposed to water and wind erosion. These compact soils necessitate for tillage, important quantities of water while rains are often late. The soils are prepared quickly with little of cares. The activity of

the soil fauna including worms and termites is almost null because of the lack of organic matter on the farm areas. These different phenomena contribute to the degradation of the environment, the soil impoverishment and consequently explain the weakness of crop yields.

The *Acacia albida*, the *Borassus aethiopium*, the *Azadirachta indica*, the *Butyrospermum parkii* and the *Parkia biglobosa* are the trees [Table 9] the most met ones on the farm areas. Some be the interest of the farmers for a certain tree, there is at the more 2 trees/ha. This sad situation shows the extent of the deforestation. The overgrazing due to the important number of cattle reduces the regeneration vegetation capacities.

Table 7. TECHNIQUES FOR SOIL AND WATER CONSERVATION

TECHNIQUES	PERCENTAGE OF FARMERS PER ZONE		
	NANERGOU	TIMBOU	NAKI-OUEST
Rotation	15	50	81
Fallow	10	19	6
Mineral fertilizer only	00	00	00
Manure only	19	00	12
Mineral fertilizer + manure	81	100	88
Wind break	00	00	00
Small dikes	33	12,5	29
Vegetative strips	48	6	65
Plantation of trees	52	62,5	53
Contour tillage	24	56	00
Agroforestry	9	12,5	00
Analysis of soil profile	3	1,5	2
Farmers aware of bad effects due to improper use of farm equipment	7	2	4

Table 8. DISTRIBUTION OF THE PRINCIPAL TYPES OF TREES IN THE FARMS AREAS

NUMBER OF TREES	PERCENTAGE PER DISTRICT		
	NANERGOU	TIMBOU	NAKI-OUEST
[3 - 5[	51	55	44
[5 - 7[	26	22	23
[7 - 9[	11	14	15
[9 - 11[	5	4	8
[11 - 13[	2	3	4
[13 and more[	5	2	6
TOTAL	100 %	100 %	100 %

Table 9. PRINCIPAL TYPES OF TREES IN THE FARMS AREAS

TYPES OF TREES	AVERAGE NUMBER PER FARM AREA		
	NANERGOU	TIMBOU	NAKI-OUEST
Acacia albida	13	14	12
Cassia siamea	5	6	9
Borassus aethiopium (African fan palm)	14	9	13
Azadirachta indica (Neem)	11	7	15
Eucalyptus sp	4	8	3
Butyrospermum parkii (Shea butter tree)	12	6	8
Parkia biglobosa (Locust bean tree)	3	12	4

CONCLUSION

The results of our study show that the farmers practices of draught farming in the Savana region of Togo generate different phenomena such as erosion, runoff, soil compaction and impoverishment, deforestation, decrease of crop yields, etc. Several solutions could allow to resolve these problems, between other:

- information extension and training farmers must be provide on soil and water conservation techniques or methods ;
- make water ways to reduce erosion in the farms that concern especially the ravines ;
- association of agroforestry and draught farming will provide wood, biomass for soils and more feed for animals ; this will reduce the use of crop residues and the overgrazing ;
- produce organic fertilizer (manure and compost) in sufficient quantity added to a few quantity of mineral fertilizer in order to regenerate poor soils ;
- introduction of *Dolichos lablab*, a cover plant that would furnish foods for the men and the animals then would protect the farm areas against the excessive drought and the erosion ;
- subsoiling with a tractor at least at 25 cm will decrease the plough pan, aerate the soil and improve water infiltration ;
- use the coulter in draught farming to facilitate infiltration of the crucial first rain in order to plough and sow precociously ; this prevents from bad effects of lateness of rain on crops.

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