

## Impacts of agricultural activities on land degradation in a context of climate change: case of agricultural land deployed alongside the Bomboré river in Burkina Faso

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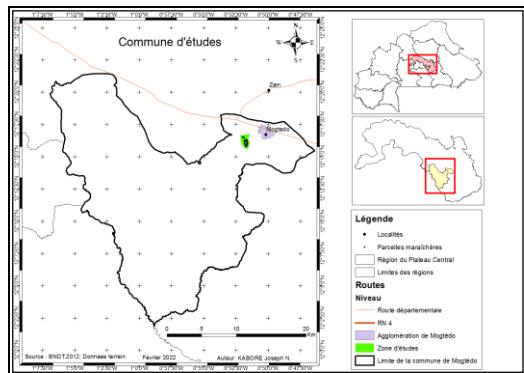


Figure 1. Localization of study area

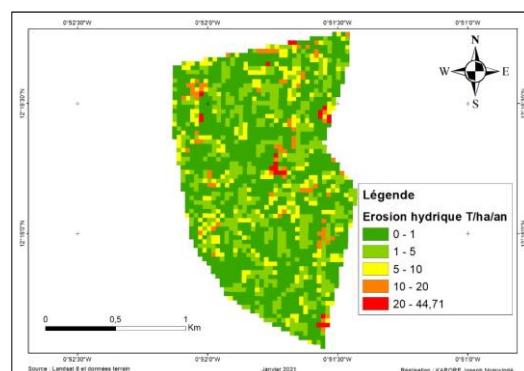


Figure 2. Potential land loss along the Bomboré River

### Main issue and study area

The land along the Bomboré River in the rural commune of Mogtédô in Burkina Faso is experiencing degradation. The Nakanbé-Bomboré sub-watershed, where the Bomboré River is located (figure 1), has been experiencing intense surface water withdrawal for several decades in order to intensify agricultural production. These agricultural practices contribute to the degradation of the land, such as the silting up of the river, the decrease in soil fertility and cause water pollution. This is also due to poor agricultural practices linked to the abusive use of fertilizers and pesticides by some farmers in market gardening. With increasing the number of market gardeners and their growing interest in market garden production in a context of variability and climate change, it is important to measure the impact of intensive agricultural activities on soil and water resources.

### Objective

this study aims to assess the level of land degradation alongside a river exploited for the market gardening in a context of climate change.

### Methodology

For the data collection in the field (number of motor pumps used, daily operating time of the motor pump, daily fuel consumption, irrigation time, area farmed, quantity of fertilizers and composts used) a questionnaire was developed and submitted to each producer.

The soil survey method used is the toposequence. Profils were opened and described for each soil. The soil sample analysis was concerned NPK, C, OM, pH, granulometry. CO<sub>2</sub> emission is calculated par using EX-ACT. The RUSLE model is used to estimate the rate of land loss.

### Result and discussion

The soil along the Bomboré River is vertisol and the texture in the first horizon is clay-silt and become clay in the dept. The color of the horizons ranges from 5YR4/2 (reddish gray-black) on the central area to 7.5YR3/2 (brown-black) on the left bank and 5YR3/2 (reddish gray) on the right bank. The soil on the left bank is strongly acidic ( $pH_{eau} = 5.57$ ) while the soils in the central area and on the left bank are moderately acidic as their pH is between 5.6 and 6. The measured electrical conductivity (EC) shows that the soil along the river does not present any risk of salinity for the crops grown because the EC is less than 1000 uS/cm (Table 1).

	N (mg/kg)	Pa (mg/kg)	Kd (mg/kg)	T(°C)	H (%)	EC (uS/cm)	Clay (%)	Silt (%)	Sand (%)	pH	C (%)	MO (%)
Left bank	6	9	22	35	31	131	39,50	46,76	13,74	5,57	0,42	0,72
Right bank	33	45	106	37,9	21,7	636	27,50	65,82	6,68	5,65	0,95	1,64
Central area	19	26	61	33,9	34,2	364	43,75	46,37	9,88	5,86	1,22	2,10

Table 1. Soil analysis results for the 0-30 cm depth

According to the dewatering means, 26 producers use 41 moto pumps to irrigate 17 ha. The number of polyvinyl chloride (PVC) used by producers varies from ten (10) PVCs to eighty (80) PVCs with an average of 44 PVCs per operator. The total is 1133 PVC used, which corresponds to an irrigation network of 6800 meters long. So, the surplus of the dose of fertilizer used in the dry season is 168.52 kg/ha of NPK and 112.15 kg/ha of urea. In the wet season, the surplus is 62.54 kg/ha of NPK and 8.96 kg/ha of urea. In the dry season, producers used more than 28 liters of herbicides and 91 liters of pesticides to treat vegetable crops, i.e., 1.56 L/ha and 5.08 L/ha respectively. By cons during the wet season, the quantities of herbicides and pesticides used were 23 liters and 52 liters respectively, with a gross treatment dose of 1.28 L/ha for herbicides and 2.90 L/ha for pesticides. The results show that more than 222,437 kgCO<sub>2</sub> eq are emitted by the use of motor pumps and inputs. The fertilizers emitted approximately 14.48% CO<sub>2</sub> eq compared to 84.52% CO<sub>2</sub> eq from the use of motor pumps. The soil loss map was developed by multiplying the various factors of the revised universal soil loss equation. Within the study site right-of-way, the annual loss is estimated to be 481.22 t/yr with an average loss rate that is 2.30t/ha/yr. Of the 209.23 ha study site area, 58.93% of the area has a water erosion rate of less than one (01) ton/ha/yr. The highest erosion potential (20- 44.17) covers an area of 1.90 ha or 0.91% of the study area (figure 2). Land degradation along the Bomboré river is linked to the poor cultivation practices of producers. So the spontaneous habitation in the vicinity of the area and upstream of the river would also be the source of the tortuous flow paths that would increase the velocity of runoff in the study area. The excessive use of fertilizers and motor pumps would be also the source of the high emission of CO<sub>2</sub> into the atmosphere (Gomgnimbou A.P.K and al. 2009).

**Conclusion:** The results of this study show that the producers use excessive mineral fertilizers and phytosanitary products which contribute to land degradation. The practices carried out by the producers are also a source of soil and surface water degradation with acidification and eutrophication of the river. This study is then a call for more monitoring/vigilance actions to sustainably safeguard the soil and water resources of this river that contribute to the food security of a population of 73,214 inhabitants of the town.

### Bibliography

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