

# Characterization of the Sweet Potato Production System in the Kou Valley in the Western Zone of Burkina Faso

OUEDRAOGO A Nadège<sup>1\*</sup>, BAZONGO Pascal<sup>2</sup>, TRAORE Karim<sup>3</sup>, PARE J Léande<sup>4</sup>

<sup>1,2</sup>University of Fada N’Gourma, Higher School of Engineering, BP: 54 Fada N’Gourma, Burkina Faso

<sup>3,4</sup>Institute of the Environment and Agricultural Research (INERA), Department of Natural Resources Management and Production System, INERA-Farako-Ba, soil-water-plant laboratory, BP 910 Bobo-Dioulasso, Burkina Faso

**Abstract**— *In the search for diversification of sources of income, producers have adopted the cultivation of sweet potato in their rotation, especially in irrigated plains. Despite the growing interest of producers for this crop, few results exist on the production systems as practiced by producers with a view to the sustainability of the activity.*

*The present study aims to characterize the sweet potato production system on the developed perimeter of the Kou valley. To this end, surveys were carried out in the farming community on 30 farms. The results showed that sweet potato is cultivated in rotation with rice in the plain. One hundred percent (100%) of the producers surveyed practice rotation on their agricultural plot. Fertilization is a common practice, growers use NPK and Urea. Labor remains a concern for the crop for more than 80% of producers. Strengthening the technical capacities of producers would be beneficial through appropriate training.*

**Keywords**— *Sweet potato, sustainability, system, production, Kou valley, Burkina Faso.*

## I. INTRODUCTION

Agriculture of Burkina Faso is less and less productive and can no longer meet the basic needs of a growing population. The tubers which constitute the main edible part of the plant are rich in vitamins A, C, B and mineral salts (Low *et al.*, 2007; Burri, 2011). They are also used in many culinary preparations, and food industry uses it as a source of starch, or, in the form of flour, as a substitute for cereal flour (Sihachakr *et al.*, 1997; INSD, 2013; Koussoubé *et al.*, 2018). The leaves are eaten as a condiment or in the form of leafy vegetables, or as fodder for livestock (DGESS, 2014). In Burkina Faso, sweet potato cultivation has experienced increasing success over the past ten years, increasing from a production of 27,000 tons in 2001 to 141,000 tons in 2011, an increase of 400% (Traoré, 2014). Despite this relative importance of the plant, very few scientific results are available in Burkina Faso on the characterization of the crop as practiced by farmers with a view to improving its productivity. In a context of the impoverishment of rural populations, it is urgent to propose solutions in order to ensure the sustainability of production. This study is a contribution to a better knowledge of production systems based on sweet potato in order to ensure the sustainability of production systems in Burkina Faso. Specifically, our activities aimed to characterize the sweet potato-based cropping system on farms in the rice-growing plain of the Kou valley. This study was conducted under the assumption that the sweet potato cropping system varies depending on the availability of soil and the grower's knowledge of the plant.

## II. MATERIALS AND METHODS

### 2.1. Study sites

The works were carried out in the developed perimeter of the valley. The perimeter is located 25 km northwest of the city of Bobo-Dioulasso on the Bobo-Faramana axis, border of Mali in the watershed of the Kou river between latitudes 11.35 ° and 11.41 ° North and longitudes 4.36 ° and 4.50 ° West with an altitude of 300 m.

### 2.2. Methods

#### 2.2.1. Choice of experimental producers

Producers' perception of sweet potato production was collected through opinion surveys conducted in farming communities on the developed plain of the Kou valley, between January and May 2020. For this study, producers of both sexes were taken into account to constitute the basic sample.

The producers to be surveyed were selected in collaboration with the agent of the regional agricultural directorate in charge of the plain. Of the 200 sweet potato producers on the plain, a sample of 30 producers including 26 men and 4 women was selected to form the basis of our work. The database used for the selection of farms was obtained with the agricultural agents of the plain. The selection of producers to be surveyed was made in collaboration with producer groups and agricultural agents. This choice took into account two (02) criteria: (i) be a sweet potato producer, and (ii) be available for the investigation. The selected producers spread over the whole plain without any particular choice for part of the area.

### 2.2.2. Study procedure

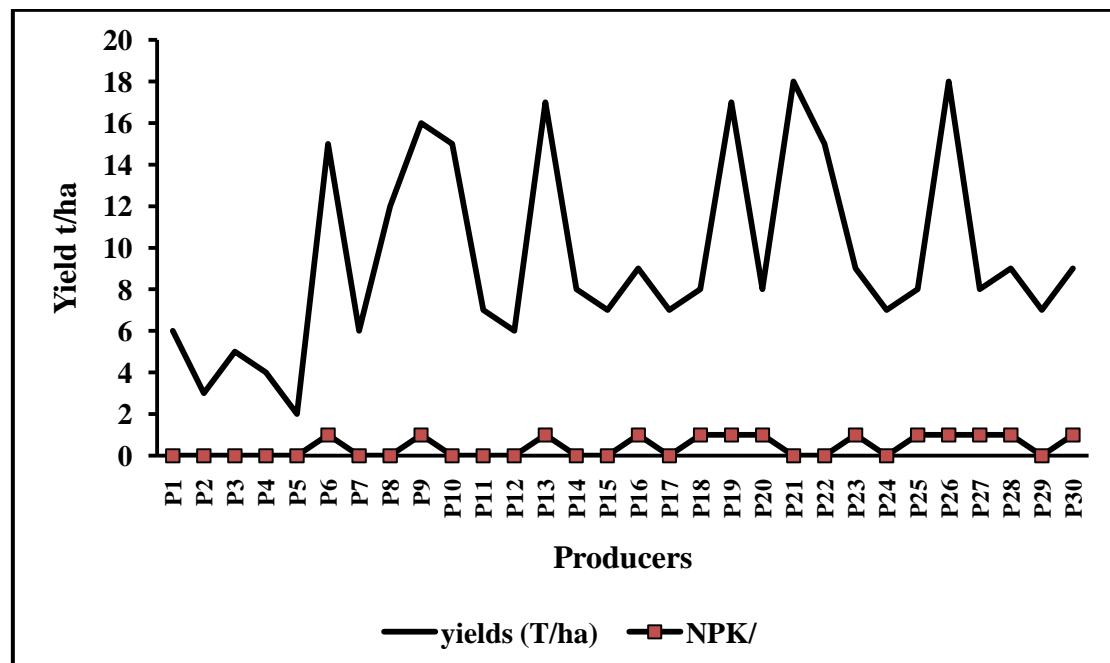
A semi-structured questionnaire was tested beforehand with 5 producers of the developed plain of the Kou valley before its administration to the entire sample. The main aspects discussed focused on the farmer's knowledge of sweet potato production, variety acquisition, planting method, cropping system, fertilization, phytosanitary treatment, yields and use of post-harvest production. The administration of the questionnaire consisted of an interview with all members of the farm under the direction of the farm manager and a field visit to the sweet potato plot. The data collected were entered into the Excel 2007 spreadsheet, the analysis of variance carried out with the software XLSTAT-pro 7.5.2, version 2007. The means of the variables were compared using the Newman-Keuls test at the probability threshold. 5%.

**TABLE 1**  
**DOSE OF FERTILIZERS**

Mineral Manure	0-50kg/ha	51-100kg/ha	101-150kg/ha	More than 150kg/ha
NPK	37	3	0	3
Urée	43	30	7	10

*Source: Survey result*

The results in Figure 1 show that the addition of NPK significantly increases yields. These results are identical to those in the literature which indicate that the addition of a compound fertilizer improves productivity.



**FIGURE 1: Interaction between yields and area of sweet potato fields**

### 2.2.3. Dose of organic manure used

In order to improve the fertility of their soil, the majority of producers use organic manure, in this case, animal excrement, during soil preparation (Table 2). The quantities used vary according to the producers but would be greater than 1ton for 67%

of the respondents. The use of compost is rare and is limited to 3% of respondents. The use of raw manure could be a constraint because it could lead to more grassing or burns of the seedlings by excess potassium or ammonia.

**TABLE 2**  
**USE OF ORGANIC MANURE ON SWEET POTATO**

Organic Manure	0,1-0,5 t	0,5-1 t	1-5 t	5-10 t
Compost	0	0	0	3%
Animal waste	6%	7%	37%	30%

*Source : Survey result*

### 2.3. Harvest

#### 2.3.1. Harvest times

The results of the survey showed that the harvest periods are between 90 (for 70%) and 120 days after planting (for 30% of growers). The harvest is manual and is done using the daba.

#### 2.3.2. Harvest destination

Only 4% of producers consume their production. In general, producers indicate that they package the harvest in part in 100 kg bags which are sold on site at the field level. The rest of the production is sold on the local market in small heaps at a price of 100 to 500 CFA. The proceeds from the sale allow producers to meet the needs of the family (education, health, nutrition, and clothing).

#### 2.3.3. Constraints on sweet potato production

The results of the survey show that 100% of respondents are faced with a lack of financial means for the acquisition of inputs (Table 3). It should be noted the absence of supervision of producers on the technical itineraries of the cultivation of sweet potatoes. Labor remains a concern for the crop for more than 80% of producers. All (100%) of the producers are confronted with a lack of storage warehouse for harvested products. Producers point to the strong fluctuation in prices as one of the major constraints and a slump in the market of the village.

**TABLE 3**  
**CONSTRAINTS LINKED TO SWEET POTATO PRODUCTION**

Constraints	Constraints frequency (%)
Acquisition of inputs	100
Harvest / labor	80
Potato storage	100
Potato sale	100

*Source : Survey result*

### 2.4. Suggestions and Proposed solutions

Producers need a reduction in the cost of inputs and their physical availability (Table 4). They think it would be essential for cooperatives to get involved in the management of inputs. In addition, producers seek agricultural loans to purchase inputs and subsidize the construction of storage warehouses. Suggestions were made on strengthening the technical capacities of producers through appropriate training, including conservation of sweet potato, soil fertility management, production of organic manure and the organization of producers into groups.

**TABLE 4**  
**SUGGESTIONS AND PROPOSED SOLUTIONS**

Suggestions	Frequency of producers %
Reduction of input costs	80
Availability of inputs	14
Involvement of cooperatives in input management	06
Facilitate loans to producers	10
Subsidize the construction of storage warehouses	60
Sweet potato Conservation Training	30
Training on soil fertility management	40
Production of organic manure	10
Organization of producers	50

*Source : Survey result*

### III. DISCUSSION

All of the producers surveyed practice rotation on their plot. This could be explained by crop productivity and soil fertility management. The added mineral fertilizer present on the potato crop which follows the rice cultivation has a positive rear effect. According to Bado, (2002), the lack of rotation in cropping systems leads to a monocultural practice with multiple drawbacks on the absorption of some mineral elements. Crop rotation is cited as a method of controlling the main enemies of sweet potato (Koussoubé et al, 2018). The period of planting sweet potato varies according to the season and the producers. According to the producers, various doses of fertilization are adopted at the level of the plain according to the poverty of the soils. These results are in agreement with those obtained by (Ebregt *et al.*, 2004a). Proportion of producers who use organic and inorganic fertilizers is high in areas where soils are poor. On the other hand, in the opinion of some authors, the sweet potato grows well on poor soils and does not require a significant input of organic and / or inorganic fertilizer (Ebregt *et al.*, 2004b) and (Stathers *et al.*, 2013). Improving potato yields would be linked to the addition of mineral or organic manure. These results are identical to those of (Koussoubé et al, 2018) and Stathers *et al.*, (2013) which indicate that the addition of a compound fertilizer improves the productivity of the sweet potato. The use of compost is rare in the production of sweet potato. The use of raw manure could be a constraint because it would lead to more grassing or burns of the seedlings by excess potassium or ammonia. The lack of supervision of producers on the technical itineraries of sweet potato cultivation could be justified by a lack of organization of producers in groups or cooperatives. Moreover, this could be justified by a lack of monitoring of agricultural development services. This situation could be improved by strengthening the technical capacities of producers through appropriate training. The results indicate a single maintenance for the most part during the plant cycle. Our results are in agreement with those obtained by Baziemo (2016) and Kpangnané (2016) which has shown that the control of grass cover is an element of the technical itinerary, reasoned by the farmer according to his production objectives.

### IV. CONCLUSION

This study aims to characterize the sweet potato production system and propose improvement options to producers. The sweet potato appears as a crop of the future and is part of the development strategies of the Burkinabè government for achieving food security and improving the incomes of rural populations. Despite the efforts made by the development, research and production services of this speculation remains limited. The cultivation of sweet potato is confronted with several difficulties which result in a drop in its productivity. This study is a contribution to a better knowledge of sweet potato production systems capable of promoting its cultivation and increasing its production at the national level. The results of our work from the investigations carried out at the level of the developed perimeter of the Kou valley show that the sweet potato is cultivated in rotation with rice and the sweet potato plants receive fertilizers. In perspective, it will be necessary to continue work on the characterization of sweet potato production systems in other climatic zones in order to provide accessible and inexpensive options for rural populations.

### ACKNOWLEDGMENT

The authors also express their gratitude to the University of Fada N’Gourma and the Institute for the Environment and Agricultural Research (Farako-Bâ Research Station) for their multifaceted support in carrying out this study.

### REFERENCES

- [1] Baziemo A. 2016. Contraintes liées à la culture du sésame dans la zone sud soudanienne du Burkina Faso : cas du terroir de Mangodara. Rapport de fin de cycle d’Agent Technique d’Agriculture, Centre Agricole Polyvalent de Matourkou (CAP/M) 27 p.
- [2] Burri BJ. 2011. Evaluating sweet potatoes as an intervention food to prevent vitamin A deficiency. *ComprRev Food Sci Food Saf* 10:118 – 130.
- [3] DGESS, 2014 Résultats définitifs de la campagne agricole et de la situation alimentaire et nutritionnelle en 2013/2014. MASA.77p
- [4] Ebregt, E., P.C. Struik, P.E. Abidin et B. Odongo, 2004a. Farmers' information on sweet potato production and millipede infestation in north-eastern Uganda. I. Associations between spatial and temporal crop diversity and the level of pest infestation. *NJAS Wageningen Journal of Life Sciences* 52: 47-68.
- [5] Ebregt, E., Struik P.c., Abidin P.E et Odongo B., 2004b. Farmers' information on sweet potato production and millipede infestation in north-eastern Uganda II. Pest incidence and indigenous control strategies. *NJAS - Wageningen Journal of Life Sciences* 52: 69-84.
- [6] INSD, 2013. Annuaire statistique 2011. Ministère de l’Économie et des finances. 420p
- [7] Kpangnané S. P. G. 2016. Diagnostic de la production du fonio dans la zone sud soudanienne du Burkina Faso. Rapport de fin de cycle d’Agent Technique d’Agriculture, Centre Agricole Polyvalent de Matourkou (CAP/M) 36 p.
- [8] Low J.W., Arimond M., Osman N., Cunguara B., Zano F., Tschirley D., 2007. A food-based approach introducing orange-fleshed sweet potatoes increased vitamin A intake and serum retinol concentrations in young children in rural Mozambique. *J Nutr* 137:1320–1327.
- [9] S.Koussoube, F. Traore, K. Some, C. B. Dabire, A.Sanon, 2018. Perception paysanne des principales contraintes et pratiques culturelles en production de patate douce au Burkina Faso. *Journal of Applied Biosciences* 126: 12638-12647. DOI: 10.4314/jab.v126i1.2
- [10] Sihachakr D, Haïcour R, Cavalcante Alves JM, Umboh I, Nzoghé D, Servaes A et Ducreux G., 1997. Plant regeneration in sweet potato (*Ipomoea batatas* L., Convolvulaceae). *Euphytica* 96: 143-152.
- [11] Stathers T., Low, J., Mwanga, R., Carey, T., David, S., Gibson, R., Namanda, S., McEwan, M., Bechoff, A., Malinga, J., Benjamin, M., Katcher, H., Blakenship, J., Andrade, M., Agili, S., Njoku, J., Sindi, K., Mulongo, G., Tumwegamire, S., Njoku, A., Abidin, E., Mbabu, A. 2013. Tout ce que vous avez toujours voulu savoir à propos de la patate douce : Atteindre les agents du changement, manuel de formation des formateurs (FdF). Centre International de la Pomme de Terre, Nairobi, Kenya. 7 vols. xviii, 454 p.
- [12] Traoré S, 2014. La promotion de la patate douce à chair orange au Burkina Faso, *Chronique Agriculture et pêche*, Podcast. 6 p.