



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

## Mali Food Security Policy Research Program

### **FARMER FEEDBACK REPORT: INPUT USE (SEEDS, FERTILIZERS, AND HERBICIDES) ON SORGHUM AND MAIZE BY FAMILY FARM ENTERPRISES IN THE SUDANIAN SAVANNA OF MALI**

By

Amidou Assima, Naman Keita, and Alpha Oumar Kergna



## **Food Security Policy *Research Papers***

This *Research Paper* series is designed to timely disseminate research and policy analytical outputs generated by the USAID funded Feed the Future Innovation Lab for Food Security Policy (FSP) and its Associate Awards. The FSP project is managed by the Food Security Group (FSG) of the Department of Agricultural, Food, and Resource Economics (AFRE) at Michigan State University (MSU), and implemented in partnership with the International Food Policy Research Institute (IFPRI) and the University of Pretoria (UP). Together, the MSU-IFPRI-UP consortium works with governments, researchers and private sector stakeholders in Feed the Future focus countries in Africa and Asia to increase agricultural productivity, improve dietary diversity and build greater resilience to challenges like climate change that affect livelihoods.

The papers are aimed at researchers, policymakers, donor agencies, educators, and international development practitioners. Selected papers will be translated into French, Portuguese, or other languages.

Copies of all FSP Research Papers and Policy Briefs are freely downloadable in pdf format from the following Web site: [www.foodsecuritylab.msu.edu](http://www.foodsecuritylab.msu.edu)

Copies of all FSP papers and briefs are also submitted to the USAID Development Experience Clearing House (DEC) at: <http://dec.usaid.gov/>

## AUTHORS

**Naman Keïta** ([namankeita2@yahoo.fr](mailto:namankeita2@yahoo.fr)) is a database manager and survey research supervisor. He is based at the Bamako office of the Michigan State University in Mali.

**Amidou Assima** ([amidou.assima@gmail.com](mailto:amidou.assima@gmail.com)) is an economist/statistician based in the Michigan State University office in Bamako, Mali.

**Alpha Kergna** ([akergna@yahoo.fr](mailto:akergna@yahoo.fr)) is a researcher in the Economie des filières (ECOFIL) program of the l'Institut d'Economie Rurale (IER), Bamako, Mali.

**Institut d'Economie Rurale (IER).** Established on November 29, 1960, IER is the main agricultural research institute in Mali with roughly 800 agents including 250 researchers with various expertise. It comprises 6 regional agronomy research centers, 9 stations and 13 sub-stations. The research portfolio includes 17 programs.

**Michigan State University (MSU).** Established in Michigan, MSU is the oldest of the U.S. Land Grant universities and has a long history of agricultural and food policy research in Africa, Asia and Latin America.

**The Permanent Assembly of Chambers of Agriculture [Assemblée permanente des chambres d'agriculture du Mali (APCAM)].** The APCAM is the organism in charge of coordinating activities conducted by the regional Chambers of Agriculture (CRA). Established by the Law n° 93-044/AN-RM of August 4, 1993, the CRA and APCAM are professional organizations with legal status and financial autonomy. Their members include professionals of the agriculture, husbandry, fisheries, and forestry sectors. They are government consultative bodies.

*This study is made possible by the generous support of the American people through the United States Agency for International Development (USAID) under the Feed the Future initiative. The contents are the responsibility of the study authors and do not necessarily reflect the views of USAID or the United States Government*

*Copyright © 2016, Michigan State University. All rights reserved. This material may be reproduced for personal and not-for-profit use without permission from but with acknowledgment to MSU.*

**Published by the Department of Agricultural, Food, and Resource Economics, Michigan State University, Justin S. Morrill Hall of Agriculture, 446 West Circle Dr., Room 202, East Lansing, Michigan 48824, USA**

## **ACKNOWLEDGMENTS**

The baseline research for this study was funded by ICRISAT and Michigan State University through grants from the Bill & Melinda Gates Foundation under the project “Guiding Investments in Sustainable Agriculture in Africa (GISAIA)” and USAID’s Innovation Laboratory for Food Security Policy (Contract AID-OAA-L-13-00001). Special thanks to all village facilitators for their support and guidance during the study and feedback process. The authors express their gratitude to all farmer participants for their willingness to attend the various meetings and their contributions to successful discussions; to farmers in village communities who have kindly agreed to answer the survey questionnaires; and to local government officials for mobilizing a wide range of stakeholders.

## Table of Contents

1. Introduction .....	2
2. Objectives .....	2
3. Methodology.....	3
4. Main Feedback from Farmers.....	5
4.1 Seeds .....	5
4.2 Fertilizers .....	5
4.3 Herbicides .....	6
5. Farmers' Recommendations .....	7
Annex 1: Findings Presented .....	8
Annex 2: Photos .....	18

## **1. Introduction**

To develop sound agricultural policies, policymakers need accurate empirical evidence on the conditions prevailing in the field that will help document the situation and the impact of ongoing programs through the use of data. Farmers who are testing new technologies and are the primary beneficiaries of agricultural subsidies are fundamental sources information for policymakers. Most farm surveys require hours of preparation and implementation but their findings are not always communicated to respondents for validation purposes. We consider this a loss—since the experts who are the most qualified to validate these findings are the farmers themselves. Thus, farmers are not always given the opportunity to ask questions to researchers and assist in the interpretation of survey findings.

This report summarizes farmers’ reactions and observations shared at several feedback workshops following surveys conducted in their villages located in the Sudanian Savanna of Mali.

Through a research consortium involving MSU, ICRISAT, USAID, and IER, a baseline study was conducted in the Dioila, Kati, and Koutiala cercles. The study aimed at collecting reliable data on the intensification of sorghum production in Mali. Following a census of 2430 sorghum farmers (who also grow maize) conducted in 58 villages of the “cercles” included in this study, a sample of 628 family farm enterprises (EAF) was drawn to better understand farming practices related to input use (fertilizers and seeds). The findings of this research study can serve as scientific guidance to Government officials, technical and financial partners as well as donors in their decision-making. In the 2014–2016 period, data were collected and analyzed by a team comprising MSU and IER/Ecofil researchers. A report by Smale et al (2015) summarizes the methodology used and some preliminary findings.

Following the data collection and analysis phases, farmer feedback workshops were organized by MSU in partnership with IER/Ecofil to share some of the highlights with farmers in the study area. The objectives of these workshops were: 1) to ensure farmers’ ownership of the research findings; 2) to collect their feedback; and 3) to incorporate their expectations in our main messages to policymakers.

Following these farmer feedback workshops, representative men and women farmers who had participated also attended the policy workshop organized by the Bamako MSU office on November 17, 2016. The purpose of the policy workshop was to present the findings of Michigan State University’s in-depth studies conducted on herbicides, hybrid seeds of sorghum, and gender, generation and agricultural intensification.

## **2. Objectives**

Farmer feedback workshops aim to:

- Present findings on:
  - the adoption and impact analysis of sorghum varieties;
  - fertilizer use on maize and sorghum plots;
  - herbicide use on maize and sorghum plots;

- Give farmers the opportunity to share their reactions, comments, and feedback on the findings: how true are these research findings?
- Collect farmers' feedback, allowing them to voice their opinions at major national and international fora and workshops.

### 3. Methodology

To facilitate farmers' understanding of the research findings, a participatory approach was used. Researchers started with a slide presentation of key findings from the various studies conducted using simple graphs. In the suggested methodology, the objective was to present and discuss each and every slide one at a time and in the local dialect, Bamanakan. Most farmer were not able to read or write. Very little French was used in the slide presentation and the graphs were explained in Bambara by the facilitator. It is noteworthy that the initial plan was to use padex paper for the presentations but because this proved to be time-consuming and expensive, the decision was made to purchase a small power generator for a slide presentation.

The findings meetings covered three major topics:

- The adoption of improved varieties and hybrids of sorghum and the impact of this adoption on farmers' well-being;
- Fertilizer use on sorghum and maize plots; and
- Herbicide use on sorghum and maize plots.

The meetings convened farmers from 58 villages in the study region. As villages in the study area were dispersed, seven venues were selected. They are summarized in the table below.

Table 1: Village meeting venues

Date	Commune	Village	Date	Commune	Village
11/9/2016	Koutiala	Nitabogoro	11/11/2016	N'golobougou	Téguéré
		Nampossela			Koumabougou
		M'peresso			Nogolon
		Oumarbougou			SehunFulala
		Sougoumba/Ferme El hadj			Kanisoronina
		Sorobasso			Kanfara
		N'togonasso			Farkan
		Sirakele			N'tchibougou



		Zanzoni			Sirakoroni
		Kintieri			Saala
11/12/2016	Nangola	Zéta	11/15/2016	Siby	Makandiana
		Tio			Nafadji
		Tonga			Djissoumana
		N'djifina			Kalaya
		Diarani			Syndala
		Zombougou			Teneya
		Gouloukan			Keniero
		Magnambougou	11/16/2016	Siby	Guena
		Kenié			Kalassa
		Bougoula 1			Tabou
		Bougoula 2			Selenkegny
		Koloko			Kaka
					Sodiankoro
					Djelibani
11/18/2016	Bancoumana	Samako	11/19/2016	Torodo	Bourakebougou
		Nankilabougou			N'tjibougou-
		Dianala			Torodo
		Djiguidala			Zéala
		Madina			Djéfalé
		Siranikoro			
		Gonsolo			

Because of the high number of villages in Siby, villages in this region were organized in two groups to allow more active participation of farmers. All the meetings were facilitated by the IER/ECOFIL researchers based in the Bamako MSU office.

The slides are provided in the Annex section of this report.

## 4. Main Feedback from Farmers

Farmers approved findings from the analyses and highlighted a number of factors that, from their perspective, underpin them. The results of the discussions with farmers on the topics of high quality seeds, fertilizers and herbicides are summarized as follows:

### 4.1 Seeds

- Views on hybrids: in relation to sorghum seeds, farmers from different localities recognize the superiority of sorghum seeds in terms of yields but prefer local varieties because of their accessibility. In other words, it is easier for farmers to purchase local sorghum seeds than improved seeds, and especially hybrid seeds, which must be continuously replaced each planting season. Farmers generally consider sorghum hybrids as attaining higher yields than other sorghum varieties and among the hybrids, the Pablo, Fada (Koutiala), and Lata (Siby) varieties as generating the highest yields.
- But, slow adoption: In their opinion, hybrids adoption is slow because 1) hybrids are less available and more expensive and when they are not planted at the beginning of the season, the risk of losses is significant ; 2) the quality of hybrids does not meet their culinary needs, or rather are not well adapted to their eating habits. Considering the Grinkan variety for instance, farmers indicated that in spite of the higher yields attained by this variety, the husked grain is not appropriate for the preparation of tô. However, it can serve in the preparation of couscous. The Fadda variety which attains higher yields, based on farmers' estimations, produces dark tô that people find tasteless. Conservation of improved varieties and especially sorghum hybrids can be challenging.
- Benefits of hybrids: The benefits of hybrid and improved varieties listed by farmers include, but are not limited to the following:
  - the Pablo and Fadda hybrids are more resistant to striga (weeds) than local varieties;
  - animals prefer the stems of improved and hybrid varieties over local ones;
  - sorghum hybrids attain a surplus output for sale;
  - as rainy seasons become shorter, yields attained by local varieties, that require longer rainy cycles, are decreasing;
- Benefits of local varieties: farmers also indicated some specific reasons related to their strong attachment to their local varieties:
  - local varieties are easier to store and can be preserved for a longer time;
  - seed is easier to supply and most often simply exchanged among farmers.

### 4.2 Fertilizers

- Maize v. sorghum: Fertilizers exclusively applied to maize grown in the CMDT region is subsidized. In the non-cotton area, subsidized fertilizers are supplied through technical services that are 100% decentralized for maize and 33% for sorghum. Because farmers do not have sufficient cash available to pay for their portion of the subsidized amount, they must adjust the amounts of fertilizers allocated to them for maize plots. Part of these fertilizers is applied on sorghum plots, and hence the dosage recommended for maize is not applied.

- farmers are not applying the dosage recommended for their plots: additional reasons behind the failure to apply the recommended dosage are: 1) a portion of the subsidized fertilizers is misused and sold to meet some of the farmers' urgent needs as fertilizer application season coincides with the lean season; 2) a portion is used on garden vegetables plots, in some cases.

- Challenges of purchasing subsidized fertilizers:
  - obtaining subsidized fertilizers can be truly burdensome and cash purchase of subsidized fertilizers leads farmers to buy fertilizers on credit on the supply markets;
  - sale and distribution centers are located far away from production areas.

Farmers have different production goals. Some seek to increase their output over time and others have short-term goals (selling fertilizer to purchase commodities).

- lower dosage: In addition to the above-mentioned challenges, reasons behind the slow adoption involving application rates that are below the recommended rate per ha, include but are not limited to:

- the lack of financial resources to address the low quotas of subsidies allocated to farmers;
- commercial sellers purchase fertilizers that they resell to farmers (situation discussed for Siby and Torodo) and some local government representatives are accused of supporting their actions. Overall, farmers have indicated that fertilizers are mostly used on maize and sorghum hybrids but not on other sorghum varieties. Sorghum, especially in the cotton area, only benefits from the remote effects of cotton production. In these areas, purchase of subsidized fertilizers is linked to cotton production and maize is the only fertilized crop.

#### **4.3 *Herbicides***

- Quality issues: Herbicides are used whether registered or unregistered. As a result, certain types of herbicides can cause crop damage. Farmers were impressed by the slides when they learned that some herbicides were registered while others were not. Unregistered herbicides are more accessible and affordable, which explains why most farmers use herbicides with very limited knowledge of their quality.

- Reasons behind the higher application rates on individual plots: Large amounts of herbicides are applied on individual plots because farmers start the maintenance work on collective plots where the entire household labor is deployed while weeds are growing higher and stronger on individual plots. Because they lack time and equipment, individual plot owners use herbicides in large quantities and more frequently. As a result, late planting on these plots requires application of higher amounts of herbicides.

- Response to labor shortage: herbicides are increasingly being used in crop systems, especially by individual farmers to address labor and equipment shortage. For this reason, women always include the purchase of herbicides in their production costs; hence the high amounts of herbicide applied on individual plots. Farmers apply higher amounts because they do not have the time required for plot maintenance.

- Reasons behind the slow adoption on collective plots: As for collective plots, they are mostly plowed and maintained; which is why less herbicide is applied on these plots.

## **5. Farmers' Recommendations**

A certain number of recommendations were made by farmers in different areas and their implementation could help mitigate or, at least, ease the constraints on sorghum seeds (improved and hybrids) use, seeds supply and herbicide use. Below are the main recommendations made by farmers that could be interesting in the preparation of a potential poster:

- increase inputs distribution centers,
- provide training and farming techniques advice on:
  - herbicide use by focusing on the negative effects of herbicides,
  - fertilizer use to mediate the application of high amounts of fertilizer on plots,
  - use of hybrids and improved sorghum varieties supported by technical packages,
- make prices more affordable to more farmers,
- facilitate the purchase of subsidized fertilizers,
- increase fertilizers supply sources,
- organize exchange trips to acquire knowledge,
- raise awareness on the impact of fertilizer and herbicide use,
- differentiate between registered and unregistered herbicides by circulating a list of registered herbicides at the beginning of the season,
- conduct research on soil regeneration in light of the population growth,
- take into account climate change in agriculture,
- facilitate the supply of improved seeds,
- shorten the deadlines for fertilizer supply,
- publicize centers for registered herbicides.

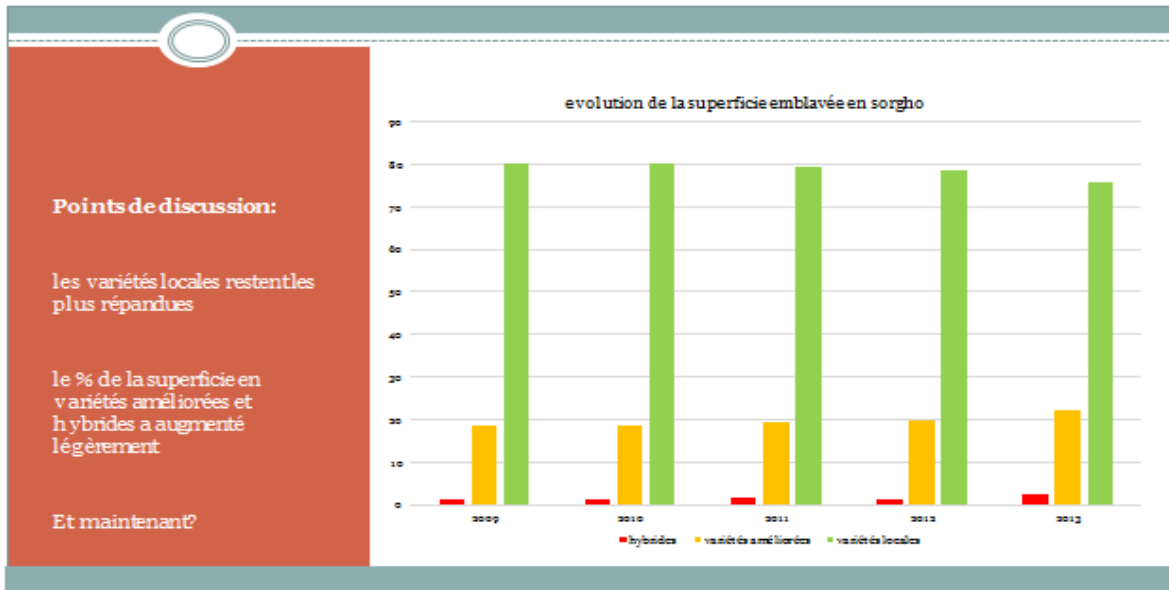
## Annex 1: Presentation of Findings

Restitution au niveau village: Enquête diagnostique  
dans la savane soudanienne

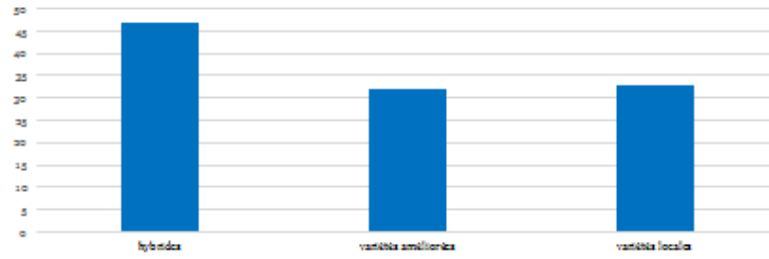
Aperçu

1. Semences
2. Engrais
3. Herbicides

## Semences



### % de gerants utilisant l'engrais (sorgho)



#### Constat

les parcelles de sorgho hybrides ont reçu plus d'engrais que les variétés améliorées et locales

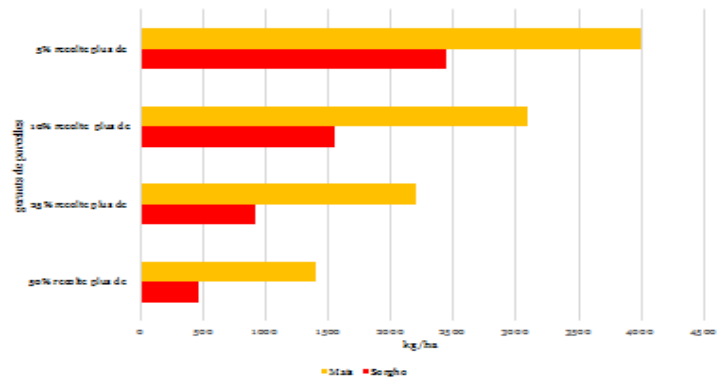
#### Points de discussion

plus que la moitié des gerants ont cité des pertes avant la récolte

les causes les plus souvent citées ont été la sécheresse (2 sur 3 producteurs)

selon les producteurs les rendements auraient été beaucoup plus sans les pertes avant la récolte

### Rendements par culture



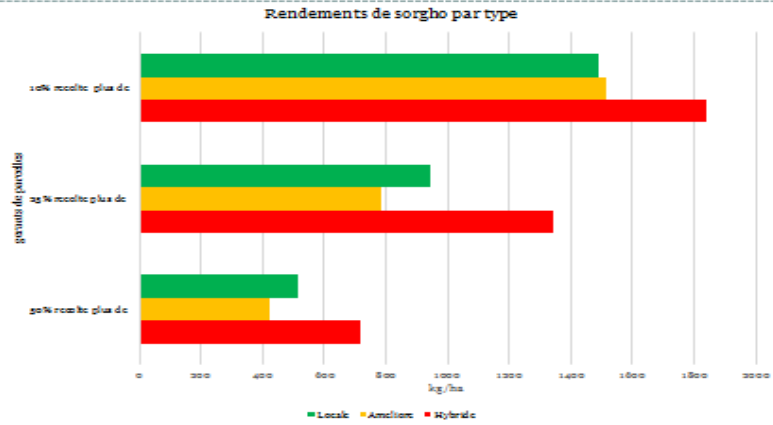
### Points de discussion

Moyen kg/ha

Hybrides: 995

Ameliorees: 875

Locales: 783



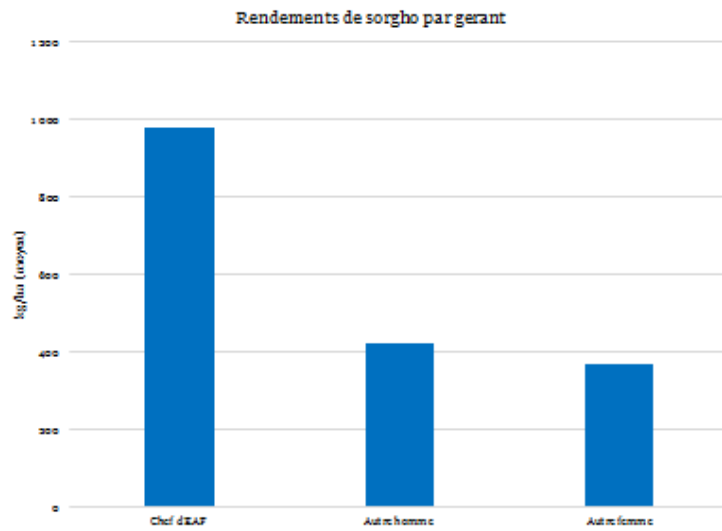
### Points de discussion:

Nous pensons que la famille dedie la plus grande partie des ses ressources, equipments, et main d'oeuvre au grands champs familiale pour satisfaire aux besoins en nourriture

Aussi, les donnees nous demontrent que:

la plupart des parcelles gerees par les femmes sont semees en association

La main d'oeuvre des hommes est beaucoup demande sur les grands champs





## Caractéristiques des adopteurs de semences améliorées



- Les variétés hybrides ou améliorées de sorgho sont cultivées prioritairement sur les parcelles collectives avant d'être cultivées sur les des champs individuels.
- Les ménages équipés disposant de plus de main d'œuvre et d'une grande superficie de coton sont plus aptes à semer des semences améliorées de sorgho.
- L'existence de marché hebdomadaire ou de coopérative dans le village n'a pas une grande influence sur l'accessibilité des paysans aux semences améliorées.

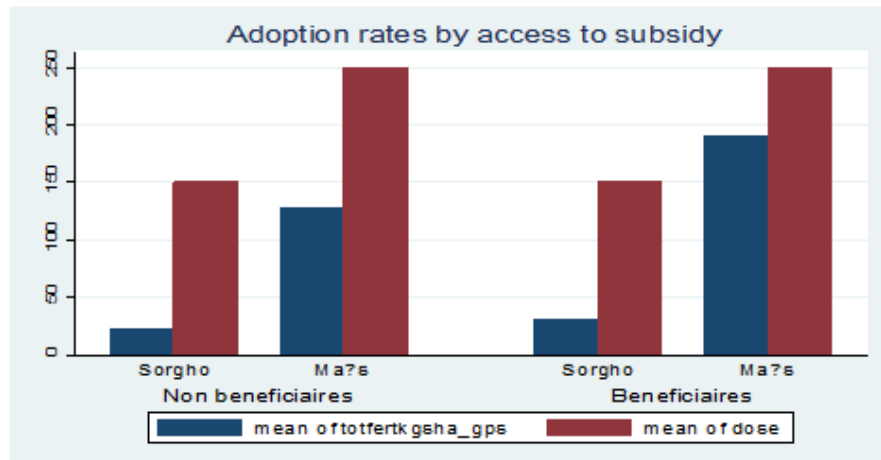
## Impact de l'adoption des variétés améliorées



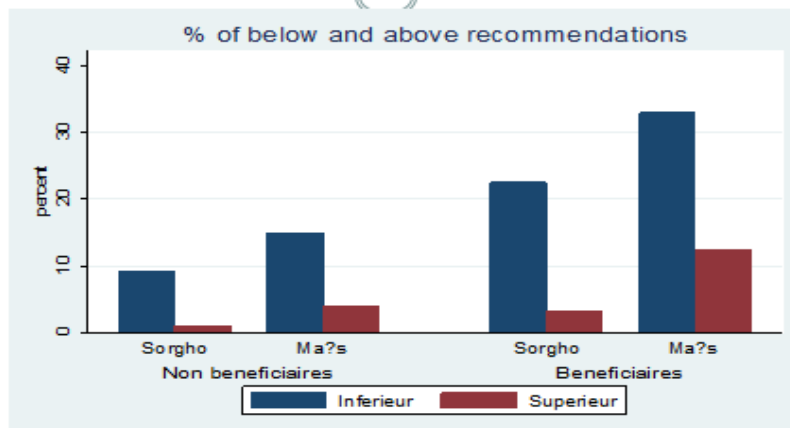
- L'analyse montre
  - Le rendement des hybrides est supérieur à celui des autres variétés
  - Pas de différence significative entre les variétés améliorées et les variétés locales.
  - Une augmentation de la part de la récolte de sorgho vendu (10 à 14%), ce qui permet de diversifier leur alimentation.

## Engrais

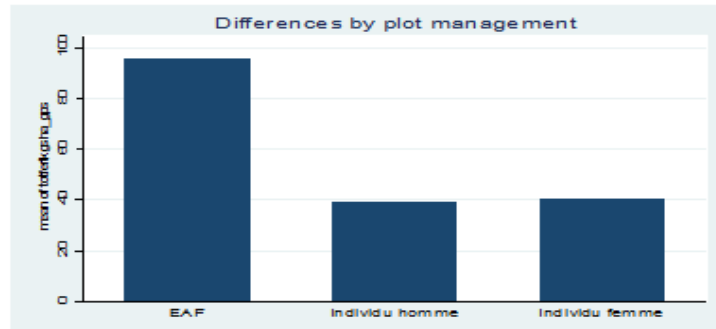
### Taux d'adoption en kg/ha comparé a la dose recommandée



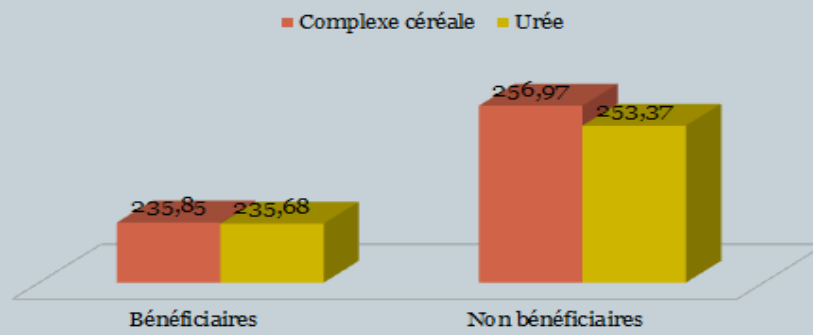
### % des paysans en dessous de la dose recommandée



## Dose d'engrais (kg/ha) par type de gérant



## Prix au kg et subvention



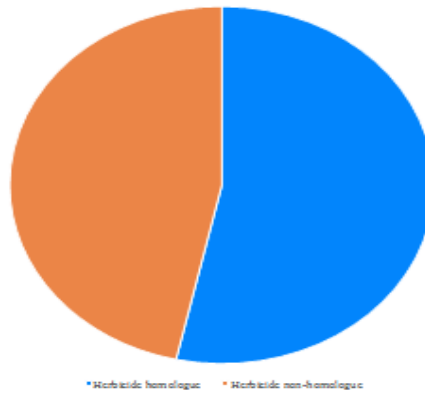
## Herbicides

### Points de discussion

Just over half of the herbicides used by gerants of maize and sorghum plots were registered.

Toutefois, il y a une forte utilisation des herbicides non homologués.

% parcelles de maïs et sorgho



The team will carry examples rather than show these pictures and discuss them

### Roundup et imitations



### Glycel et imitations

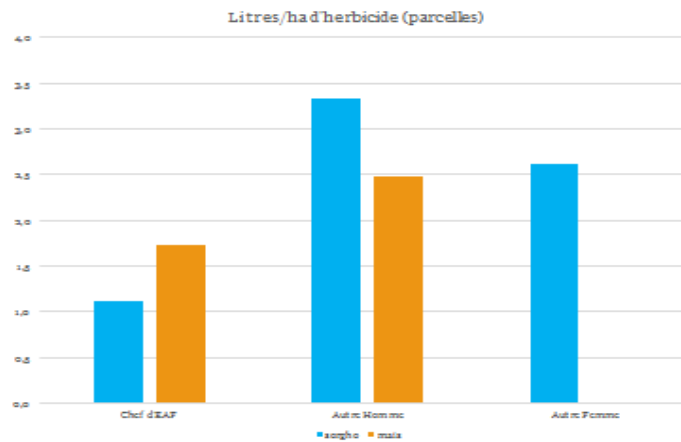


#### Points de discussion:

Le chef d'EAF utilise l'herbicides moins souvent sur les parcelles familiales. Il a plus d'accès à la main d'oeuvre?

Les parcelles individuelles des hommes et femmes sont petites

La plupart de femmes sèment le sorgho en association avec d'autres cultures et particulièrement l'arachide et utilisent beaucoup d'herbicides.

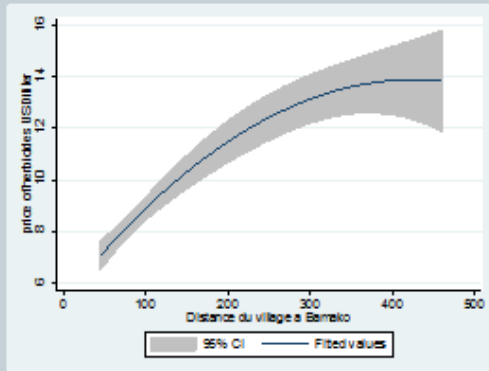


## Characteristics of adopters of herbicides

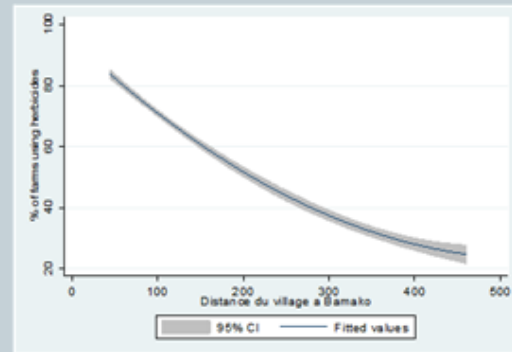
- Plus le prix des herbicides est faible, plus utilisation des herbicides est grande
- Plus le coût journalier du désherbage est élevé, plus grande est l'utilisation des herbicides
- Plus l'EAF est riche, plus elle utilise l'herbicide
- Plus l'EAF reçoit les transferts, plus elle utilise les herbicides

## Variations des prix et de l'adoption en fonction de la distance par rapport à Bamako

### Variations géographiques des prix des herbicides



### Variations géographiques du taux d'adoption



## Annex 2: Photos

Koutiala, in the Koutiala Cercle



Nangola in the Dioila cercle





Siby in the Kati cercle



Farmers and researchers representatives at the national dissemination workshop, Bamako







