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### Mali Food Security Policy Research Program

#### Causes and Consequences of Increasing Herbicide Use in Mali

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##### Changing herbicide markets

Herbicide use has grown rapidly in Mali over the past decade and a half. Quantities imported have more than doubled since the year 2000, while unit prices have fallen by 50% in CFAF francs (Table 1). Unlike fertilizer, which receives a 50% government-financed price subsidy, herbicide users pay full commercial price. While large-scale government subsidies have fueled recent increases in fertilizer availability, rapid growth in herbicide use has emerged as a result of purely private sector supply systems meeting growing on-farm demand.

Glyphosate, the world's top selling herbicide, accounts for the majority of herbicide sales in Mali as well. Developed by Monsanto and first released commercially in 1976 under the trade name Roundup, glyphosate is a broad-spectrum herbicide that kills both grasses and broad-leaf weeds. Farm survey data from southern Mali suggest that glyphosate accounts for about two-thirds of herbicide volumes used, while selective herbicides (used primarily on cotton, maize and rice) account for the remaining one-third.

Over time, the number of herbicide products registered for sale in Mali has expanded rapidly. While suppliers had registered only 4 cotton-selective herbicides for sale in 1995, they significantly expanded the number and range of herbicide products available to 49 as of December 2015 (Haggblade et al. 2016). The period since 2010 has witnessed an unusually large jump in the herbicide brands registered for sale in Mali.

Today, over two-thirds of agro-dealers in Mali supply herbicides to farmers, about the same share that sell fertilizer and significantly more than sell seeds (Table 2).

##### Key Findings

- Herbicide markets have grown rapidly in Mali without any public subsidies.
- Since 2000, quantities imported have doubled, while prices have fallen in half.
- Herbicides control weeds at half the cost of hand weeding, leading to high rates of adoption by both men and women farmers.
- Three key policy findings emerge:
  1. Importance of regional input standards (eg. pesticide regulation through the Comité Sahélien des Pesticides)
  2. Rethinking input subsidies: highly productive, profitable inputs don't necessarily require subsidy.
  3. High rates of herbicide counterfeiting require improved monitoring of quality, safety and environmental impact.

Table 1. Trends in herbicide prices and imports

	2000	2005	2010	2014
Price ('000 CFAF/liter)	3.9	2.9	2.1	1.9
Imports ('000 tons)	1,132	1,037	1,420	2,660

Source: Haggblade et al. (2016)

Table 2. Input sales in 16 markets across Mali  
(% retailers selling specific inputs)

herbicides	fertilizer	seeds
68%	66%	51%

Source: Haggblade et al. (2016)

## Causes

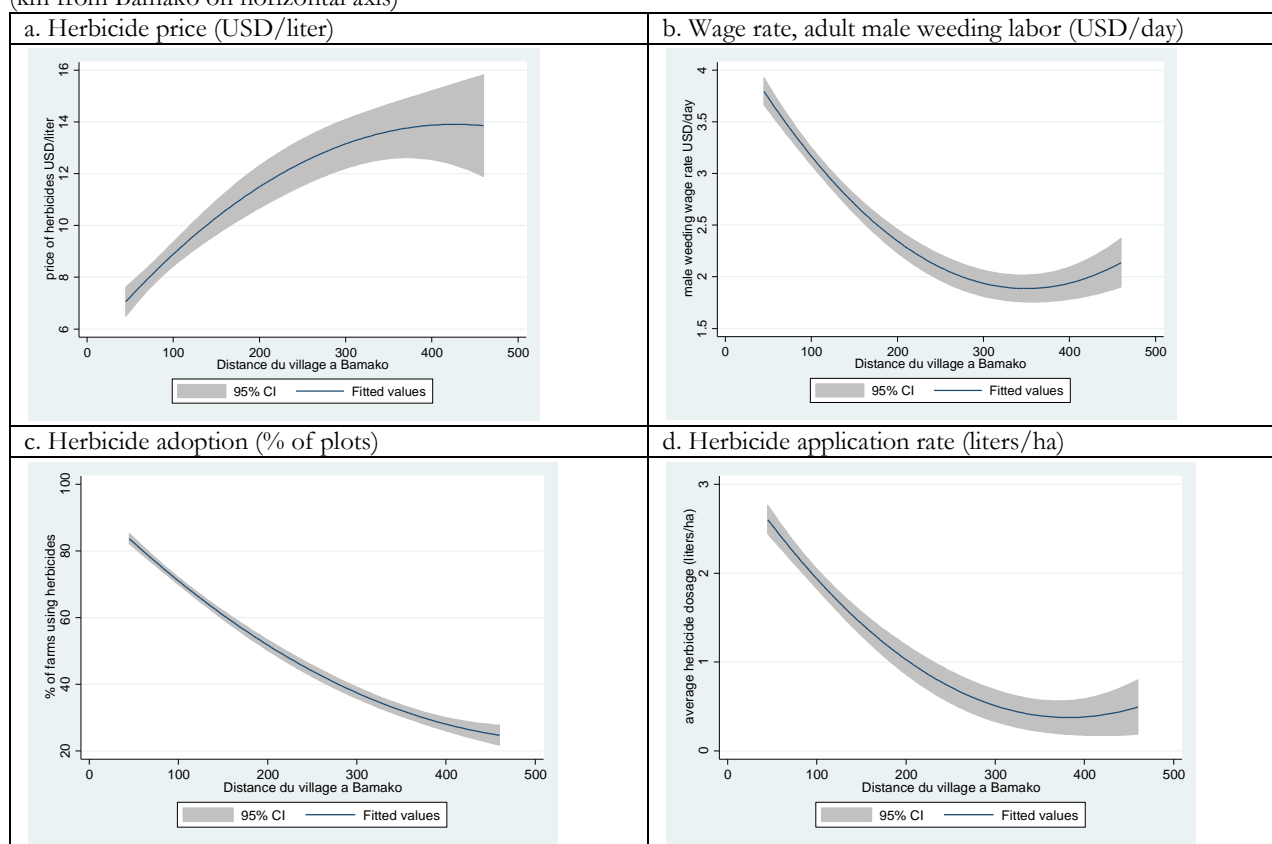
Rapid changes in private sector supply systems are driving growth in herbicide use among Malian farmers. Since Monsanto's Roundup went off patent in 2000, international agrochemical firms and regional commodity traders have released a series of new glyphosate brands accompanied by new packaging, branding and marketing efforts. Increased competition, coupled with a move to new low-cost production sites in China and India, has resulted in declining herbicide prices.

Peak-season labor shortages, likewise, contribute to growing farmer demand for herbicides. Despite widespread concerns about population growth and youth unemployment, Malian farmers appear to be coping, instead, with labor shortages, particularly during the peak agricultural season (Foltz 2010). Rapid urbanization has fueled outmigration to urban areas, while gold mining has attracted growing numbers of young laborers. Overall, roughly 20% of

rural males aged 25-34, work outside of rural areas, giving rise to growing rural labor shortages.

Two key prices – rural wage rates and herbicide prices – influence levels of herbicide use by Malian farmers (Figure 1). In general, herbicide prices increase in remote areas because of high transport costs and limited competition (Figure 1a). Wage rates move in the opposite direction. Given greater opportunities for nonfarm earnings in peri-urban areas, wage rates necessary to attract farm labor increase near large cities (Figure 1b). The combined effect – of lower herbicide prices and higher farm wages in nearby zones – leads to higher use of herbicides in more accessible rural zones. In farming areas within 100 kilometers of Bamako, over 75% of farmers apply herbicides on their sorghum and maize plots, while in communities 400 kilometers away, only 25% apply herbicides (Figure 1c). Application rates likewise increase with proximity to major urban centers (Figure 1d).

Figure 1. Spatial difference in herbicide prices, wage rates and herbicide adoption (km from Bamako on horizontal axis)





## Consequences

Steady increases in herbicide availability in Mali, over the past decade and a half, have dramatically altered farmer options for managing weeds. Falling herbicide prices have made weed control via herbicides increasingly viable compared to hand weeding. Profitability of herbicide use varies spatially, depending critically on the unit price of herbicides (which increases with distance from the major import depots in Bamako) and the opportunity cost of labor (which increases with proximity to major urban centers). Across a broad swath of southern Mali, our survey results suggest that farmers using herbicides can control weeds at roughly 50% of the cost of hiring weeding labor. As a result, rather than hand weeding, a majority of sorghum and maize farmers in southern Mali have begun to use herbicides to control weeds. Both women and men farmers are adopting herbicides (Table 3).

Plot manager	Percent of sorghum and maize plots using herbicides
Male, collective plots	58%
Male, individual plots	80%
Women, individual plots	79%
All plots	61%

Source: Haggblade et al. (2016)

Commercially, the number of herbicide brands registered for sale in Mali by the Comité Sahélien des Pesticides (CSP) has grown rapidly, particularly in the period since September of 2000 when Monsanto's patent protection for Roundup expired. Expiration of the Roundup patent has unleashed a parade of new glyphosate brands – worldwide as well as in Mali. Major international agro-chemical companies (including Syngenta, Dow, Bayer and Arysta) have introduced their own glyphosate brands, sold in Mali under trade names such as Kalach, Finish, Mamba Dominator and Touchdown.

More recently, West Africa-based traders have entered the herbicide product branding game. In 2008, a Guinean firm registered a new brand of glyphosate, called Glycel, for sale across the CILSS member countries. The Guinean firm, Topex Agro

Elevage, commissions Glycel production through an Indian manufacturer based in Mumbai. In a stark departure from the early Roundup imitators, Glycel shifted packaging from the standard Roundup white and green colors to a yellow bottle with a red cap (Figure 2). Marketed as the “Red Beret” – with tough-guy, Special Forces power – Glycel has become one of the dominant glyphosate brands sold in Mali.

Figure 1. Registered and Unregistered Brands of Glyphosate Sold in Mali, June 2016



a. Roundup and imitators (above)



b. Glycel and imitators (above)

A rash of imitators has copied Glycel's Red Beret packaging by enlisting an array of low-cost manufacturers in China and India to manufacture and package similar-looking glyphosate products (Figure 1). In June 2016, our survey teams identified a total of 25 brands of glyphosate for sale on the Malian market. Of these, roughly half have received regulatory approval (11 by the CSP, 1 by Ghana and 1 from Guinea) while the remaining half have not.

The explosion of newly registered regional brands – with its welter of unregistered imitators – has led to widespread smuggling, customs and regulatory evasion. As a result, regulators and registered importers have raised increasing concerns about product quality and safety.

## Policy implications

### 1. Importance of regional input standards

Since 1994, the Comité Permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel (CILSS) has established a regional regulatory body, the Comité sahélien des pesticides (CSP), to review and certify all pesticide products sold in throughout the original CILSS member countries. Under these rules, any pesticide passing CSP efficacy and safety reviews and registered (homologated) for sale in one member country become automatically authorized for sale throughout all nine member countries. By centralizing this regulatory review process, the CSP provides a one-stop-shop for manufacturers and importers, facilitating the review process and enabling suppliers to reduce bureaucratic costs by standardizing and centralizing review procedures. This model economizes on scarce technical manpower and laboratory facilities by pooling talent from across the member countries. While Mali has embraced the CSP model for regulating pesticides, national implementation of regional fertilizer and seed regulations continues to lag.

### 2. Rethinking input subsidies

The purely private sector driven herbicide growth stands in stark contrast with Mali's fertilizer policy, which relies on public procurement tenders and 50% price subsidies. In 2015, fertilizer subsidies accounted for a quarter of Mali's annual agricultural budget (Thériault et al. 2015). Given tepid productivity results reported to date from Mali's large-scale fertilizer subsidies, the counter-example provided by Mali's private-led herbicide surge offers a possible opportunity for discussing less costly models for promoting input intensification. Like Mali's experience with herbicides, Kenya's fertilizer

policy offers evidence of an alternative model for enabling large increases in input use, without reliance on subsidies (Ariga and Jayne 2009).

### 3. Quality, safety and environmental monitoring

The growing numbers of unregistered and counterfeit herbicide products available on the market lead to mounting concerns about product quality and safety. Yet the environmental impacts of herbicide use remain largely unmonitored in Mali. Looking forward, policy makers will increasingly require better monitoring of pesticide product quality and environmental impact. The CILSS model of regional regulatory review, which economizes on scarce scientific personnel and laboratory facilities, has proven efficient in vetting herbicide products prior to release. Regional sampling and studies across common Sahelian agro-ecological zones could perhaps offer parallel economies in environmental monitoring.

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