Policy Brief
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Low quality, low returns, low adoption

In brief

- The average quality of hybrid seeds and fertiliser is so poor that their adoption is not profitable at current prices, and this is a major reason why farmers in Uganda are not adopting modern agricultural inputs.
- Urea fertiliser, the most common type on the market, typically has 33% less nitrogen content compared to what is stated on the label.
- The average small bag of hybrid seeds is of the same quality as bag that contains 50% hybrid seeds and 50% (lower quality) farmer seeds. .
- The average return on investment in the sample of fertilizer and seeds purchased is a negative12.2%.
- It remains unclear where the quality deteriorates in the supply chain, and why. Is it flawed production, poor storage, or adulteration, and which interventions can address these problems?

The African agriculture puzzle

The Green Revolution has bypassed Africa. Since 1970, agriculture yields have risen 3-5 fold In Asia and Latin America. In Sub-Saharan Africa, they've stayed the same. There may be good reasons for this. For example, crops may simply not grow as well for biological, geological or climatic reasons. But extension plots across the continent show that high yields are definitely possible. Poor farming practices, including low-yield plant varieties and insufficient fertiliser application, are a more credible explanation. The question, then, is why farmers don't use modern inputs even though demonstration plots suggest that it should be a profitable choice. This research provides an answer.

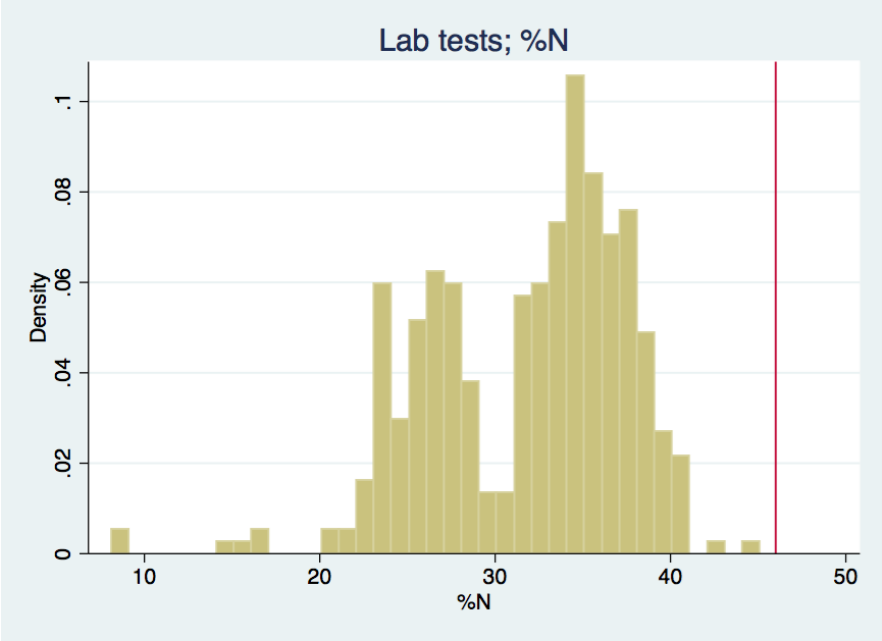
How the study was done

To understand farmers' behaviour, one needs to understand the environment they make choices in. For agricultural inputs, this means learning more about the product quality actually available in the small shops accessible to farmers. To get an unbiased picture, mystery shoppers were sent to 360 randomly selected shops across the country to buy small portions of what are probably the most prevalent modern inputs: urea and improved maize seeds. The fertiliser was then tested three times at a laboratory in Kampala) to determine its nitrogen content, which is the main stimulant of plant growth. The seeds were grown at five National Agricultural Research Organisation (NARO) centres in the five regions of Uganda. Five different fertiliser strengths, ranging from 0% nitrogen to full-strength 46%, were applied to the purchased seeds as well as to genuine hybrids and farmer-retained seed. The average results of the 15 possible combinations planted in 90 trial plots at each of the five NARO stations showed the yield a farmer should obtain for a certain fertiliser and seed quality combination.

Fertiliser test results

Out of all the fertiliser samples tested, not one reached the standard 46% nitrogen that pure urea contains. The average amount of nitrogen in a fertiliser sample was a mere 31.8%. That means that a farmer could expect to buy fertiliser that is only two thirds as potent as advertised. Some samples contained less than 10% nitrogen.

Figure 1:



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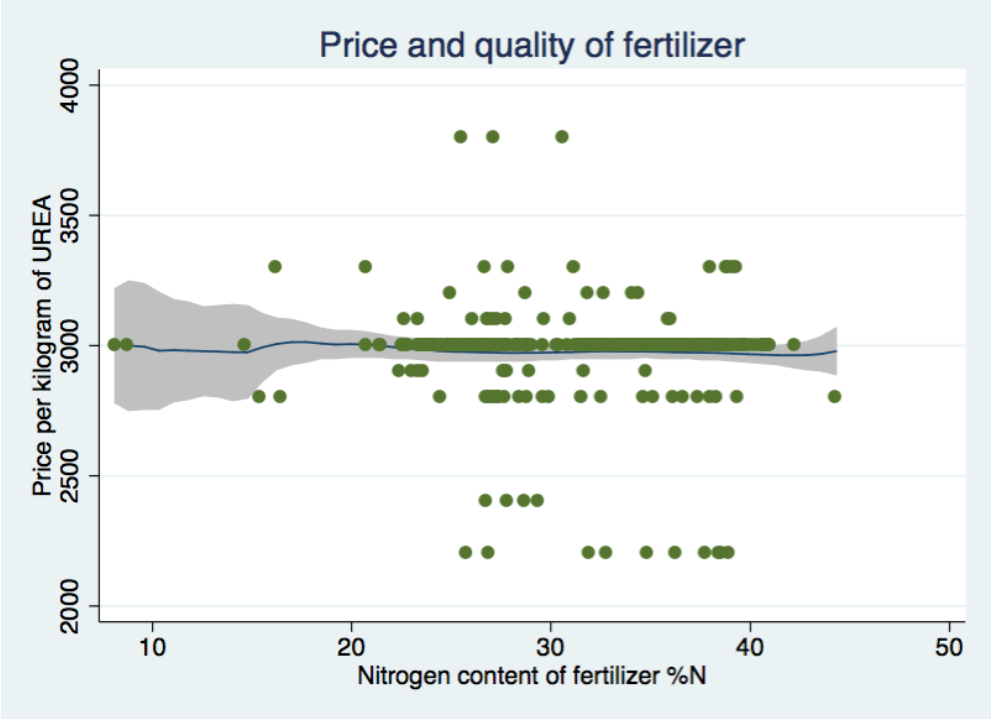
Importantly, the fertiliser testing exercise shows that the retail price demanded for the urea had no relationship with the quality of the product. In other words, farmers could not buy a pricier product and expect to get higher purity in return. With no price signal present, the market becomes dysfunctional as the incentive to supply high quality may vanish if enough potential clients stop trusting price as a quality measure – see Figure 2. The lack of a relationship between price and quality was evident in all parts of Uganda.

Figure 2: Price and quality of fertilizer



Seed test results

The objective here was to estimate the average quality of a bag of hybrid seeds bought by the mystery shoppers. To do so, the yield of the bought seeds was compared with that of genuine hybrids and that of farmer retained seeds. Farmer seeds yielded on average 3.1 tons of maize per hectare, authentic hybrid seeds yielded about 4 tons of maize per hectare and the average yield of hybrid seeds bought from retailers lay almost exactly half way between the two at 3.55 tons of maize per hectare. The implication is that the quality of a bag of hybrid seeds sold in shops is as good as mixing half a bag of genuine hybrid and half a bag of farmer seeds

The returns to investing in hybrid seeds and fertilizer

Using data on the price of maize, inputs and labor costs, the authors could then back out the returns to investing in hybrid seeds and fertilizers bought in local Ugandan retail markets. The results were clear, both the average and the median return on a fertilizer sample growing retail hybrid seeds were negative. Overall, only 20% of fertilizer samples applied to retail hybrid seeds yielded a positive return. If, in contrast, inputs were authentic, returns would be large (50% on average) and positive for all samples.

Figure 3: The returns to investing in fertilizer and hybrid seeds

Source:	Technologies available in the market	Authentic technologies
	(i)	(ii)
Adoption of UREA fertilizers and hybrid seeds		
Mean rate of return	-12,2%	51,3%
Median rate of return	-8,6%	51,0%
Fertilizer samples yielding positive net-return	18,4%	100,0%
Fertilizer samples yielding rate of return > 10%	1,4%	100,0%
Fertilizer samples yielding rate of return > 20%	0,0%	100,0%
Fertilizer samples yielding rate of return > 30%	0,0%	100,0%

Farmer perceptions, actual quality, and returns on input investment

To find out whether farmer have realistic expectations of input quality, an additional survey was conducted that focused on fertiliser. This showed that farmers' suspicions about poor quality matched the survey evidence quite well. Farmers were slightly more pessimistic, expecting nitrogen content to be 37% lower than it should be, versus 33% observed in laboratory tests. Looking at fertilisers alone, nearly three quarters of farmers would not find buying fertiliser in the nearest shop profitable. If genuine fertiliser were available in local shops, the survey suggests that half of farmers would then find buying it profitable. If inputs were genuine instead, the half the farmers would find adoption profitable.

Figure 4: Adoption of UREA fertilizers by farmers

Source:	Market fertilizers	Authentic fertilizers
Mean expected rate of return	-0,2%	67,4%
Median expected rate of return	-52,2%	10,5%
Farmers with expected positive net-return	26,5%	53,0%
Farmers with expected rate of return > 10%	24,4%	50,9%
Farmers with expected rate of return > 20%	22,7%	46,3%
Farmers with expected rate of return > 30%	21,3%	41,1%

Policy implications

The study offers conclusive proof that there's a major quality problem in the agricultural inputs market at retail level. It looks at the problem from the farmer's perspective, hence the mystery shopper approach that investigates what farmers would actually be able to buy in their local shops. But the study goes even further and conducts agricultural trials to estimate the yield response of these inputs. The results shows that farmers are quite rational in relying on their traditional methods, as allegedly modern inputs too often yield poor results. In other words, the study shows that Uganda has a maize seed and fertiliser market problem, and that farmers respond rationally: they refuse to buy bad products. Low agricultural productivity is the logical result.

Now that we have clear evidence that there *is* a problem, the next question is *why* input quality is so low. The root cause could be negligence, or it could be fraud. Careless production and storage may result in poor products. Originally sound products could be diluted, or even faked completely. Input producers, wholesaler, and retailers may be guilty of negligence and fraud. Anecdotal evidence suggests that all of the possible reasons hold some truth. Maize is probably not the only affected crop.

To design effective interventions, we need a more precise understanding of where and why these problems arise. Each factor contributing to the market dysfunctionality might require a different solution. Once the source and scale of the problem has been pinpointed, the next question will be how to intervene effectively. We now know for sure that there's a major problem. The public, private and donor sectors need to work together to pin it down and find solutions.

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