Selling at the farmgate immediately after harvest

Joachim De Weerdt[*], Brian Dillon[†], Bjorn Van Campenhout[‡]

January 10, 2022

Motivation

It is often observed that smallholder farmers sell most—if not all—of their marketable surplus immediately after the harvest to itinerant traders at the farm gate. For example, in a survey among maize farmers in Uganda, more than 75 percent of farmers that sold maize sold everything in a single transaction, 77 percent sold to a middlemen and 50 percent immediately after harvest.

The time when these farmers sell is not particularly good. Thin and poorly integrated markets mean that immediately post harvest, prices in excess supply areas drop. Later, during the lean season when some of the farmers run out of stock, prices have recovered, or even increase further since farmers start to buy back. This lead to the "sell low buy high" puzzle (Stephens and Barrett, 2011).

In this study, we zoom in on two potential explanations for the sell low buy high puzzle. A first is related to budget neglect, whereby farmers underestimate expenses later in the season and as a result sell too much of their harvest too soon. To test this hypothesis, we implement a field experiment in which

Warehousing is a solution to both of these problems. It provides a safe location where agricultural commodities can be aggregated and stored for longer periods. However, even when warehouses are available, farmers seem reluctant to bulk significant amounts of agricultural commodities and store for longer periods.

In this paper, we focus mainly on the question: Why do farmers not store for longer periods?

Literature

Why do farmers sell low and buy high?

[*]Development Strategy and Governance Division, International Food Policy Research Institute, Lilongwe, Malawi

[†]Dyson School, Cornell University, Ithaca, United States

[‡]Development Strategy and Governance Division, International Food Policy Research Institute, Leuven, Belgium

One of the most obvious, is related to credit constraints. Using observational data, Stephens and Barrett (2011) find that to meet consumption needs later in the year, many farmers end up buying back grain from the market a few months after selling it, in effect using the maize market as a high-interest lender of last resort. Burke, Bergquist, and Miguel (2018) show that in a field experiment in Kenya, credit market imperfections limit farmers' abilities to move grain intertemporally. Providing timely access to credit allows farmers to buy at lower prices and sell at higher prices, increasing farm revenues and generating a return on investment of 29% . Dillon (2021) uses the fact that primary school began 3 months earlier in 2010 than in 2009 to demonstrate that this prompted households with children to sell maize when prices are particularly low. I think this is pretty much established so I would not focus on this one. Still, I would argue that this is only a partial explanations that leaves many other questions unanswered. Like for instance why sell everything instead of only enough to meet urgent demand and store the rest until there is a better price.

Risk averse farmers may also fail to delay sales if there is considerable uncertainty about the price in the future.

- farmers have nowhere to store, so they just sell. This is a reason that is frequently mentioned by farmers themselves (Omotilewa et al., 2018) I tried to look if there are impact evaluations on eg PICS bags on intertemporal arbitrage but did not find anything. Maybe Brian knows because of his work in Niger?
  - social taxing: if I have a lot of maize in my house, this is visible for family and neighbours and it will be very hard to deny if they come and ask for it. Therefore, I sell everything now; I can hide the money. and it also seems seems to be a reason why households do not buy in bulk "paying more for less" paper. You find that
  - I would be particularly interested in individuals that are frequently taxed by friends and relatives. In this context, Dupas and Robinson (2013) find that adding an earmarking feature was effective.
  - lack of self control: seems less plausible as it is money is probably burning a bigger hole in your pocket than the bags of maize you have stored. You can only eat so much. This includes failure to resist temptation to extract themselves or social taxation. There is a solid literature on this for savings (Ashraf, Karlan, and Yin, 2006; Dupas and Robinson, 2013),
  - budget neglect (which leads to an overoptimistic view of the future) - how does this fit in the sell low buy high puzzle? But do people really see the future better than it is? I think the term overoptimistic future is very misleading in this article. Towards the end, they speculate on why budget neglect persists. They find that rosy memories dampen ability to learn from the past. This seems to contradict research that claim bad experiences (rejections) tend to stick much more than positive outcomes (acceptance) .

- The recent Cardell and Michelson article argues that the "sell low buy high" puzzle is not a puzzle at all by arguing that price movements are insufficient for farmers to engage in inter-temporal arbitrage. But are they using appropriate prices (regional market prices are not a good proxy for farm gate prices)? Also, if farmers are indeed rational to sell everything immediately post harvest, then I am still surprised to see the predictable and recurrent consumption cycles (Kaur).
- trust issues: I think this is a big reason why farmers do not want to aggregate. It requires one to have sufficient trust in the store manager.

model

$$\underset{c_1,c_2,e_3}{max}\ U_1(c_1) + \delta U_2(c_2, e_2) \tag{1}$$

$$st\ c_1 + c_2 + \gamma e_2 = p.h_1 + (p+\theta).(H - h_1)$$

What is left is sold at time 2, when the price has changed by θ.

Intervention

We assume that farmers suffer from budget neglect—the left side of the budget constraint.

A second intervention is related to the right side of the budget constraint. Here, the hypothesis is that farmers are too pessimistic about the future price. Farmers typically rely on experience an anchoring to attach probabilities to the price distribution. There is some evidence that people provide more weight to negative experiences in the past than to positive experiences.

Marketing can be approached in a similar way as technology adoption. Can we use the insights from budget neglect here, like Brian and Jenny think that inability of farmers to incorporate all costs and benefits leads farmers to choose an inferior storage technology?

In one treatment, we can show farmers a video that details all costs involved? But this seems somewhat lame.

Here is another explanation that uses the budget neglect idea: Consider a very simple 2 period model where a farmer gets two opportunities to sell. Once immediately after the harvest and once during the lean season. The farmer has a total harvest of H<=q1 + q2 and so needs to decide in period 1 how much to sell, given his price expectation for p2 and how much they expect to need in the future.

Budget neglect leads farmers to sell too much immediately after harvest. In a first intervention, we do something similar to Kaur et al based on segmentation and recall, but in the context of intertemporal arbitrage. For instance, we ask the farmer to give the expected price

Pessimistic price expectations also lead to higher sales immediately post harvest. A second intervention looks at anchoring/framing where we ask some farmers to give the lowest/ highest expected price. We can than look at a quadratic loss function compared to the control group the was asked about the expected price, but also look at asymmetry.

Experimental design and power calculations

The proportion of farmers that sold immediately after the harvest. We use the IHS 2019/2020 to run power simulations.

Outcomes

The proportion of farmers that sold immediately after the harvest.

In this section, we register the outcomes that will be used to assess impact and investigate impact pathways.

Key outcomes: - sales of commodity (proportion, quantities) - prices fetched - aggregation (sales to warehouse) - disrespecting contract/side selling - farmer welfare - time between harvest and sales

-anchoring: ask the farmer to write down what the price was last season and stick it on the bag.

-self-serving bias in how people interpret their past performance: rosy experience?

References

Stephens, Emma C. and Christopher B. Barrett (2011). "Incomplete Credit Markets and Commodity Marketing Behaviour". In: *Journal of Agricultural Economics* 62.1, pp. 1–24. DOI: https://doi.org/10.1111/j.1477-9552.2010.00274.x. eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1477-9552.2010.00274.x. URL: https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1477-9552.2010.00274.x.

Omotilewa, Oluwatoba J. et al. (2018). "Does improved storage technology promote modern input use and food security? Evidence from a randomized trial in Uganda". In: *Journal of Development Economics* 135, pp. 176–198. ISSN: 0304-3878. DOI: https://doi.org/10.1016/j.jdeveco.2018.07.006. URL: https://www.sciencedirect.com/science/article/pii/S030438781830926X.

Dillon, Brian (2021). "Selling Crops Early to Pay for School: A Large-Scale Natural Experiment in Malawi". In: *Journal of Human Resources* 56.4, pp. 1296–1325. DOI: 10.3368/jhr.56.4.0617-8899R1. eprint: http://jhr.uwpress.org/content/56/4/1296.full.pdf+html. URL: http://jhr.uwpress.org/content/56/4/1296.abstract.

Burke, Marshall, Lauren Falcao Bergquist, and Edward Miguel (Dec. 2018). "Sell Low and Buy High: Arbitrage and Local Price Effects in Kenyan Markets*". In: *The Quarterly Journal of Economics* 134.2, pp. 785–842. ISSN: 0033-5533. DOI: 10.1093/qje/qjy034. eprint: https://academic.oup.com/qje/article-pdf/134/2/785/28289352/qjy034.pdf. URL: https://doi.org/10.1093/qje/qjy034.

Dupas, Pascaline and Jonathan Robinson (2013). "Why Don't the Poor Save More? Evidence from Health Savings Experiments". In: *American Economic Review* 103.4, pp. 1138–71. DOI: 10.1257/aer.103.4.1138. URL: https://www.aeaweb.org/articles?id=10.1257/aer.103.4.1138.

Ashraf, Nava, Dean Karlan, and Wesley Yin (May 2006). "Tying Odysseus to the Mast: Evidence From a Commitment Savings Product in the Philippines*". In: *The Quarterly Journal of Economics* 121.2, pp. 635–672. ISSN: 0033-5533. DOI: 10.1162/qjec.2006.121.2.635. eprint: https://academic.oup.com/qje/article-pdf/121/2/635/5324429/121-2-635.pdf. URL: https://doi.org/10.1162/qjec.2006.121.2.635.