Market participation of smallholder farmers in Malawi: A baseline report

Bjorn Van Campenhout[*], Leocardia Nabwire[†]

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Abstract

Smallholder farmers in low and middle income countries often sell the bulk of their marketable surplus immediately after the harvest, when prices are at their lowest. We pilot several interventions to investigate if this is due to poor planning. In one treatment arm we test if expenditure planning is a main determinant of sub-optimal marketing behaviour, while in a second treatment we look at planning on the income side and ask farmers to commit to timing and sales prices. In this report, we summarize the baseline data that was collected as part of this study.

Introduction

Smallholder farmers in developing countries generally produce for own consumption. However, most farmers also need cash for a variety of non-food expenditures. Some farmers therefore produce more than what they expect they will need and sell a surplus. Other farmers cultivate cash crops. Therefore, most farmers are not strictly subsistence farmers, but also participate in the market, not only as consumers, but also as producers.

When farmers interact with markets, they are also exposed to price risk. In weakly integrated markets where spatial arbitrage is slow and transaction costs to move commodities from low price regions to high price areas are high, prices often exhibit significant variation both in time and space (Van Campenhout, 2007). This generally also means that prices exhibit significant seasonality, with price at their lowest immediately after harvest as supply booms, and prices then gradually increasing until reaching a peak just before the next harvest (Gilbert, Christiaensen, and Kaminski, 2017).

These predictable and recurrent price movements suggests that farmers have an incentive to delay sales of at least part of their marketable surplus until prices

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

[†]Development Strategy and Governance Division, International Food Policy Research Institute, Kampala, Uganda

recover from their post harvest slump. In practice, however, we often see that farmers sell all of their crop immediately after harvest when prices are at their lowest. Often, later in the season, farmers run out of stocks and are forced to turn to the market again, now buying back the same commodities at much higher prices. This has sometimes been referred to as the "sell low buy high" phenomenon (Stephens and Barrett, 2011).

Various reasons have been suggested to explain this behaviour. The most obvious reason would be that farmers simply need the money. For instance Burke, Bergquist, and Miguel (2018) report on a field experiment in Kenya and suggest that credit market imperfections limit farmers' abilities to move grain intertemporally. Dillon (2021) uses the fact that in Malawi, primary school began 3 months earlier in 2010 than in 2009, and notes that this prompted households with children to sell maize when prices are particularly low. To identify the impacts of liquidity during the lean season, (Fink, Jack, and Masiye, 2020) offered subsidized loans in randomly selected villages in rural Zambia and conclude that liquidity constraints contribute to inequality in rural economies. Another often heard reason is that farmers may simply lack sufficient safe storage space for their crops, making it too expensive to store for longer periods of time. If storage is the main reason why farmers do not engage in intertemporal arbitrage, then providing storage technology should delay sales. Omotilewa et al. (2018) indeed find that Ugandan maize farmers that received a low cost, simple, and effective technology for low resource farmers to help them preserve their dry crops after harvest with minimal losses due to storage insects (so called PICS bags) stored maize for a longer period. However, in a study comparing the importance of liquidity constraints and storage limitations, Channa et al. (2022) finds that only the former contains farmers from selling later at higher prices in Tanzania.

While the above factors will be binding for some farmers, many questions remain unanswered. For example, if liquidity constraints are the main problem, it is unclear why farmers generally sell everything at once, instead of just enough to cover the most urgent expenses. If storage is a problem, it seems strange strange that not more farmers form groups to rent storage space, or why in Malawi the Agricultural Commodity Exchange faces difficulties filling their warehouses.

In an ongoing study, we test two behavioural explanations related to the inability of farmers to if this is due to poor planning. In one treatment arm we test if expenditure planning is a main determinant of sub-optimal marketing behaviour, while in a second treatment we look at planning on the income side and ask farmers to commit to timing and sales prices. In this report, we summarize the baseline data that was collected as part of this study.

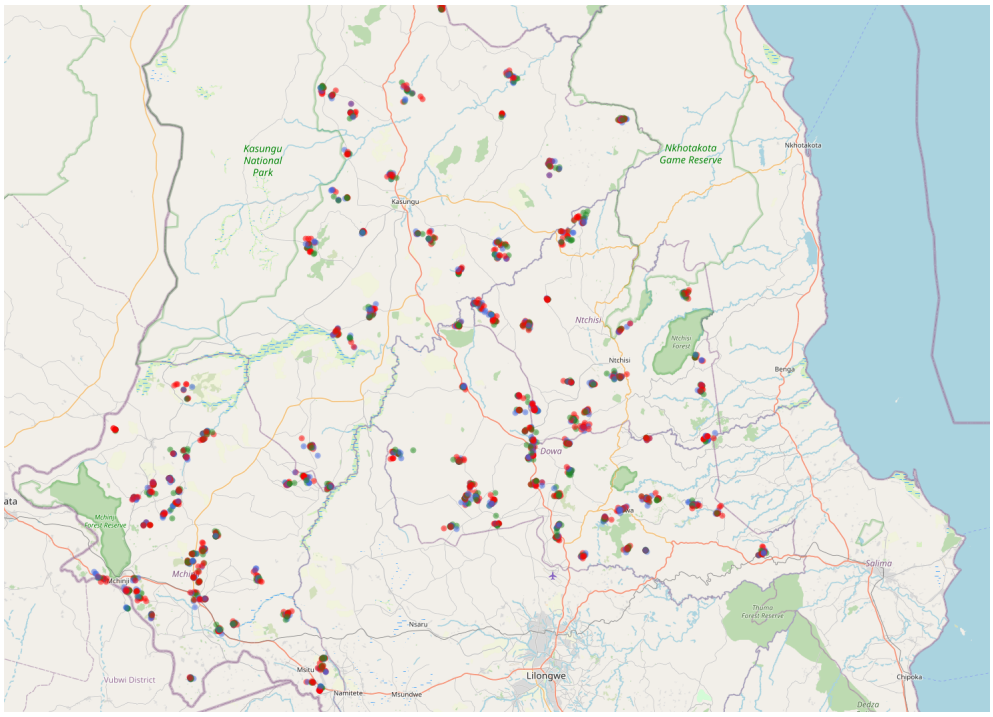

Figure 1: map of study area with sampled villages

Data collection

Farmer characteristics

[Leocardia, please insert here characteristics of the household head like average age of hhhead, proportion of female headed hh, average years of schooling of hhhead,etc and then also characteristics of the household such (q19 - q23). We can also include here proportion of households that report to be holding different assets q33-37. We can here also include a table livestock assets q38.]

Price expectations

As part of baseline data collection, we asked questions about price expectations in the coming year. In particular, we asked what price they expect a farmer to receive for selling maize at the market nearest here, in early September of 2022 (the beginning of the school year). This was asked for maize, soybean and for groundnuts in appropriate units (kg for maize and soybean, debbe for groundnuts). We repeated this question, but for late December of 2022 (at the new year).

Figure 2 shows price expectations for the three crops included in the study (here expressed per kg of the crop). As can be seen, farmers expect that prices increase over time. The increase of the expected price over the course of only a few months is substantial. For example, for maize, the increase in median price is 36 percent. For soybean and groundnuts, this is 25 percent and 40 percent respectively.

In addition to asking about prices of the three crops, we also asked about prices from a few other items. For instance, we asked about the price of a healthy 2-year old female goat. Interestingly, and against our expectations, we also found that the price of a goat increased substantially over time. While a goat was expected to be sold at 25000 Kwatcha in early September, it increased to 30000 Kwatcha towards the end of the year. We further asked farmers to quote expected prices for fertilizer at the end of December, an important input for smallholder maize farmers used at that time. We also asked what they expect to pay for hiring labour to prepare 1 acres of farmland for maize production in September, which is when farmers prepare fields. Median value for the former is 60000 kwatcha, and 20000 kwatcha for the latter.

The fact that farmers do seem to expect a considerable increase in prices over time suggests that farmers are at least aware of the fact that they could make more money by holding on to stocks longer.

At the time of the survey, traders had already started buying soy bean and prices were attractive. As a result we found that many farmers already sold (part of their) soy bean. In particular, of those farmers that already started harvesting soybean, 76 percent indicated that already made at least one sales transaction. We further found that 23 percent of those that already harvest sold more than 80 percent of what they had harvested. For those who already

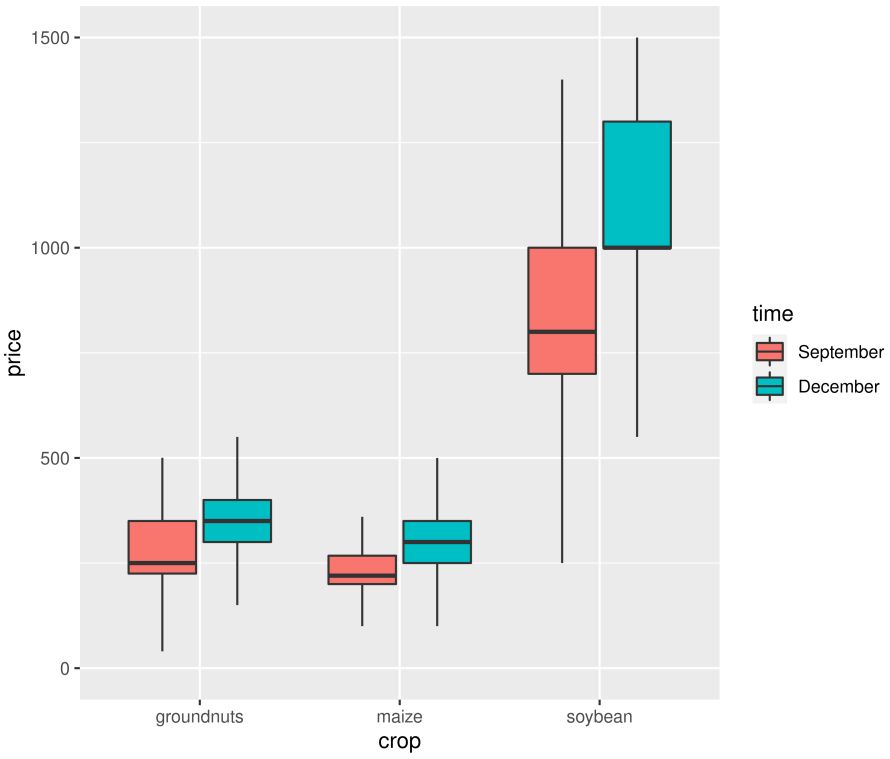

Figure 2: Price expectations for 2022

Table 1: Market participation by crop

	percentage sold	single transaction	immediately post-harvest	single transaction immediately post harves
maize	NA	NA	NA	NA
gnuts	NA	NA	NA	NA
soybean	NA	NA	NA	NA

sold at least once, the median price they received was 600 Kwatcha, which is substantially lower then expected prices in September and January (Figure 2). For those who sold virtually everything already, the median price they got was also 600 Kwatcha.

Crop production

[insert table on crop production]

The average household produced 1328 kg of maize, 152 kg of groundnuts and 292 kg of soybean.

Smallholder market participation

We find reasonable market participation by the farmers in our sample for the three crops. For instance, of the X farmers interviewed, we find that percent reported at least one sales transaction. But there are also signs of sub-optimal sales behaviour. For instance, in the face of uncertainty of price behavior in both directions, it selling everything in one : of all the farmers that reported to report at least one transaction, percent indicated that they sold everything in a single transaction. In addition, of all the farmers that sold, percent sold more than 50 percent of marketed quantities in the first 3 months after harvest (May, June or July 2021). Finally, a fair share of farmers appear to fit in the "sell low" category X percent of the farmers indicate only a single transaction. Table

Price seasonality in the previous season

The top panel of Figure 3 shows the evolution of the median prices that farmers received for their crops in the past. In particular, we asked farmers to report if they sold any of the three crops under consideration. If they reported sales,

we asked how many separate transactions occurred and for each transaction, we recorded details such as the amount sold and price received.[1]

The middle panel of Figure 3 shows price indices with as base the month of May 2021. This is the month following the harvest for most of the crops (although groundnuts is harvested somewhat later) and it also happens to be around the time the survey happened in 2022. The figure show that over the course of the year, prices for all commodities have been increasing. After only 4 months, prices of groundnuts already increased by 50 percent. After 6 months, in November 2021, median prices of all three crops were about 50 percent higher than immediately after the harvest in May. By December, prices of soybean had more than doubled and were still on the rise.

The bottom panel shows price indices with as base the month of September 2021 and is included to facilitate comparison with the price expectations presented in Section . It shows that between September 2021 and January 2022, median soybean prices increased by 100 percent. However, as seen in Section , farmers expect a price increase in 2022 of only 25 percent. For groundnuts, prices increased by 33 percent, while expectations are 40 percent. For maize, prices remained fairly stable, increasing only 15 percent. Farmers expect an increase of 36 percent for maize.

Anchoring

We now investigate the relationship between price expectations and prices received in the past. We first relate the average price that the farmer received in the previous season to price expectations in the next season using OLS models. To enable comparisons across crops, we use natural logarithms of both expected prices and prices received in the past, such that results can be interpreted as elasticities.

Table 2 starts by correlating overall price expectations (defined as simple average over expected price in September and December) to the average price that the farmer reported to have received over the preceding season. We see that there is a significant correlation between prices received in the past and price expectations for maize and for groundnuts, but not for soybean. For example the first column of Table 2 shows that farmers that sold at double the price (100 percent) than other farmers report expected prices that are about 10 percent higher than what other farmers expect. The second column shows that the elasticity is almost double for groundnuts. We do not find that price expectations for soybean are significantly correlated with average price expectations in the next season.

The table also shows correlation at prices at particular points in time in the future (instead of simple averages). For maize, the relationship between past prices and expected prices seems stable over time: farmers that received higher prices in the past expect higher prices in both September and December and the

[1] Prices for groundnuts and maize are in kilograms. For soybean, they are per 250 gram to keep the prices on a comparable scales.

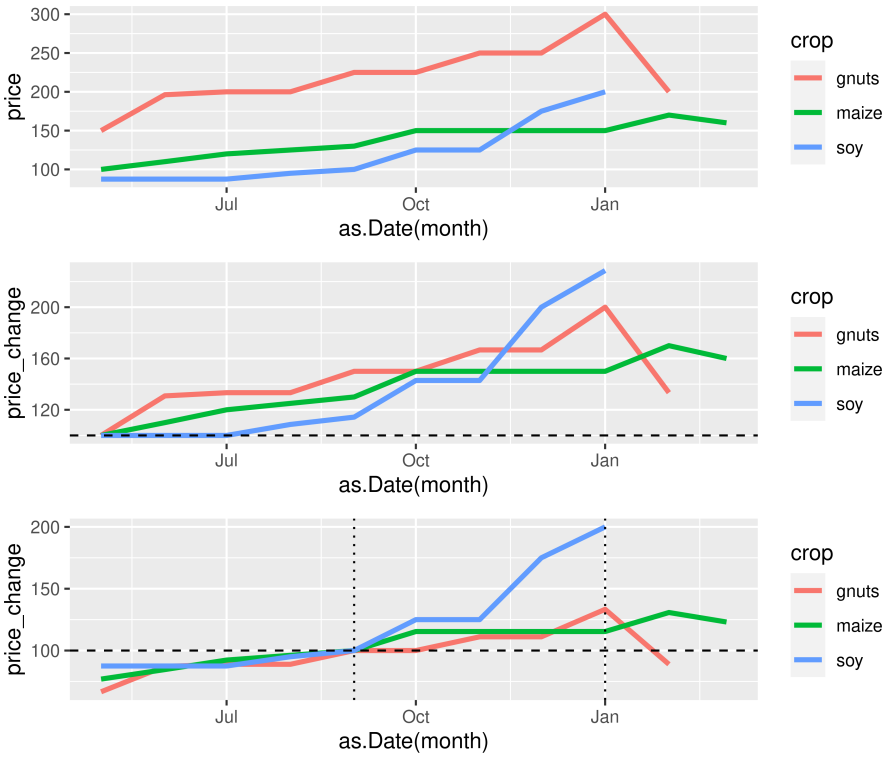

Figure 3: Evolution of prices received by farmers in 2021-2022

Table 2: Correlation with average prices received in the past season

	pooled	maize	groundnuts	soybean
Average expected price	0.076***	0.099***	0.180***	0.008
	(0.014)	(0.023)	(0.026)	(0.017)
Expected price in September 2022	0.083***	0.104***	0.202***	0.010
	(0.015)	(0.024)	(0.027)	(0.018)
Expected price in December 2022	0.073***	0.100***	0.161***	0.010
	(0.015)	(0.025)	(0.026)	(0.018)
Number of observations	4622	1702	1078	1842

Note: Standard errors are clustered at the household level. *** denotes significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

elasticity is the same. For groundnuts, a change in the average price received in the previous season is correlated to a larger price increase in the expected price in September than in December. The independence of price expectations and past prices of soybean is confirmed.

Instead of simply averaging prices received in the previous season, we can also look at price dynamics in the previous season to better understand the formation of expectations. For instance, we can check if expectations of the price evolution in the next season of farmers that experienced a sharp increase in prices they received for their crops in the previous season differ from expectations of farmers that experienced relatively stable prices throughout the previous season. To answer this question, we can exploit the fact that some farmers sold more than once in the previous season and relate changes in past prices to changes in expected future prices.

For each transaction in the previous season, we recorded price obtained and the month in which the transaction took place. To facilitate analysis, we categorize transactions into three periods. First, transactions in May, June or July 2021 are categorizes as early sales. Transactions in August, September and October are referred to as average sales. And finally, sales made in November, December and January are grouped into the third category and are referred to as late sales. We calculate average prices obtained during transactions within each of these three periods at the farmer level and then estimate the following first-differences models:

$$p^e_{i,d} - p^e_{i,s} = \beta \left(p_{i,d} - p_{i,s} \right) + \varepsilon_i \tag{1}$$

Table 3: First differences model

	difference in expected price between Sep and Dec			
	pooled	maize	groundnuts	soybean
p(late) - p(av)	1.390***	1.358***	8.034***	0.238
	(0.325)	(0.195)	(1.942)	(273.000)
	[273]	[210]	[50]	[13]
p(late) - p(early)	1.026***	1.024***	11.820***	0.750***
	(0.222)	(0.238)	(3.376)	(0.192)
	[144]	[91]	[27]	[26]
p(av) - p(early)	1.506***	1.482***	13.766***	1.524***
	(0.189)	(0.170)	(2.224)	(0.231)
	[381]	[209]	[98]	[74]

Note: Standard errors in (), clustered at the household level in the pooled model. Observations in []. *** denotes significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Results are in Table 3. In the first column, we pool all crops, while the remaining three columns provide results for separate regressions for each crop. In the first row, the change in prices received is based on average prices in August, September and October and average prices received in November, December and January. This roughly corresponds to the difference in timing used for the dependent variables (change between September and December).The second row uses the same dependent variable but relates it to prices received early in the season of 2021 and prices received late in the season. The last row relates changes in expected prices to changes between prices early in the season and mid season.

Alternative explanations for price expectations?

The expected harvest of a particular crop may also affect prices farmers expect. Indeed, recent evidence suggests that even before the harvest materialized, traders respond to weather shocks by increasing prices, indicating that the expectation channel accounts for a substantial share of supply side food price shocks (Letta, Montalbano, and Pierre, 2022).

Having access to storage (q75)

Conclusion

We find that prices farmers that received higher prices in the previous season also expect higher prices in the next season. This is especially the case for groundnuts; for soybean, prices in the past are not correlated to prices in the future. Furthermore, we find that farmers that experienced a larger increase in prices over the previous season also expect prices to rise faster. This is especially the case if farmers experienced a price increase early in the season.

We find that prices received in the past are positively correlated to price expectations. If farmers are myopic about inflation, this will mean price expectations are biased downward. With average inflation at around 16 percent, it is likely that farmers prone to anchoring leave substantial amounts of money on the table.

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