

GHANA'S SOYA BEAN MARKET



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Soya bean is an important legume that is both a valuable source of feed for livestock and fish and a good source of protein in human diets. The bean contains around 30 percent cholesterol free oil, 40 percent protein, and essential vitamins (El Agroudy et al. 2011). The soya bean industry provides numerous opportunities for value chain actors from seed and grain production through to processing and marketing. As such, growth and modernization of the soya bean sector has potential to improve livelihoods and reduce poverty. While industrial processing and utilization of soya bean has expanded in Ghana, domestic production has not kept up with demand, resulting in significant growth in imports. Currently around half of soya beans or soya bean products is imported (Eshun et al. 2018; Gage et al. 2012). Average soya bean crop yields are low, ranging from 0.7 to 1.7 metric tons per hectare depending on variety, the environment, and management practices used (SRID 2017).

POLICY ENVIRONMENT

Ghana's agricultural policy interventions are primarily focused on raising the productivity of smallholder farmers with a strong emphasis on grain staples. Prominent interventions have included support for Agricultural Mechanization Services Enterprises Centers (AMSECs), the Fertilizer Subsidy Program (FSP), and the Block Farms Program (Benin et al. 2013). Many of these have now been rolled into the flagship Planting for Food and Jobs (PFJ) initiative (2017–2020), which combines seed and fertilizer subsidies with extension and marketing support across a broad range of priority crops (MoFA 2017).

Soya bean was selected as a priority crop under PFJ owing to its production expansion and import substitution potential and associated socioeconomic benefits. As primarily an industrial crop, soya bean could become an important traded commodity in Ghana. Therefore, alongside PFJ, which focuses on providing production incentives, initiatives that support domestic grain trade – such as the establishment of the Ghana Grains Council in 2015 and the Ghana Commodity Exchange in 2017 – could become important demand-side interventions that further encourage participation in the soya bean value chain. This is in line with Ghana's industrialization strategy adopted in 2010, which prioritizes exports and promotes import substitution (MoTI 2010).

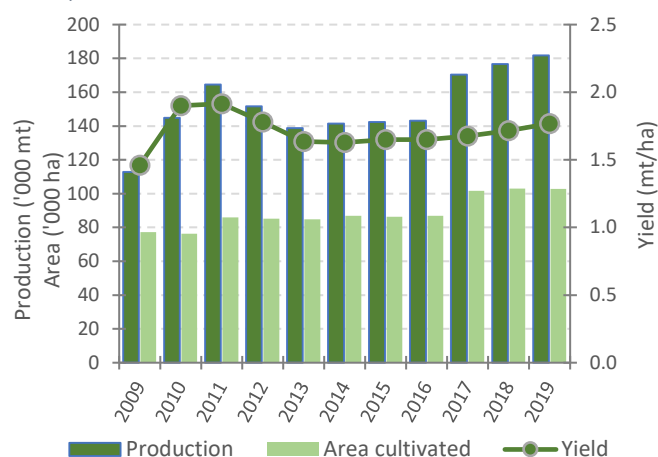
PRODUCTION AND CONSUMPTION

Soya bean is a non-native, non-staple crop in Ghana and is predominantly used as livestock feed (Martey and Goldsmith 2020). Production support initiatives for soya bean in Ghana have been largely donor-initiated in the past, but the crop is gradually attaining commercial status as more producers are becoming aware of the opportunities of growing soya bean as a cash crop (Gage et al. 2012). As is the case for maize, Ghana's northern regions are major producing areas for soya bean. From here soya beans are transported to urban areas in the south for further processing. Around 90 percent of soya bean traded

in Ghana is procured from the north, while the middle-belt accounts for 10 percent (Martey et al. 2020).

Figure 1 shows recent trends in soya bean production, yield, and area cultivated. Compared to the preceding years, yields have seemingly not increased significantly with the introduction of PFJ in 2017. Whereas average yields fluctuated around 1.6 to 1.7 metric tons per hectare (mt/ha) between 2013 and 2016, the PFJ era saw yields rising only to between 1.7 and 1.8 mt/ha. This remains well below what MoFA believes are achievable yields of 3.0 mt/ha (MoFA 2017). Gage et al. (2012) estimate the yield potential at a more conservative 2.5 mt/ha under assumptions of adequate fertilizer use, increased plant density, and adoption of improved seed.

Figure 1: Soya bean production, area cultivated, and yields in Ghana, 2009-2019



Source: MoFA (2020)

PFJ did seemingly encourage significant expansion of the area of land under soya bean cultivation. After initially supplying 180 and 339 mt of soya bean seed in 2017 and 2018, respectively, PFJ reported supplying 2,729 mt in 2019 (MoFA 2020). At recommended seeding rates this quantity of seed is enough to supply the total area of land under soya bean cultivation (i.e., around 100,000 ha). While the

large increase in seed supply is not reflected in production numbers for 2019, the average area cultivated did increase from around 85,000 ha in the years before PFJ to over 100,000 ha after 2017, i.e., by around 18 percent.

PROCESSING AND DEMAND

On the demand-side there is a thriving market for soya bean in Ghana, with domestic demand consistently outstripping domestic supply (Martey et al. 2020). Soya bean is a key ingredient in poultry and fish feed and is also used in the production of edible vegetable oil. Soya bean production is also being promoted in rural areas as a nutritious crop by training women especially in production and food preparation methods. Its diverse consumer segments demonstrate both its versatility as a food or cash crop and the significant market potential that exists.

Soya bean requires considerable processing. In the case of small-scale producers, threshing is typically done manually. This involves piling soya bean plants on a tarpaulin or putting soya bean pods in sacks and gently beating them with a stick. Mechanical threshers are used in large-scale production. The bean is then processed into various forms; the principal product, oil, makes up 14 to 18 percent of the processed output, while the cake is used to manufacture animal feed. Processing capacity in Ghana is low, which reflects the low level of domestic soya bean production. This has resulted in high dependence on processed soya bean imports to meet local demand (Gage et al. 2012; Martey et al. 2020). Local promotion of soya bean processing – for example, under the USAID Feed the Future Soybean Innovation Lab (SIL) – may result in the kind of demand stimulus needed to encourage increased domestic production.

Ghana's poultry and aquaculture sectors are both growing rapidly. Both are also major demanders of soya bean meal, a key ingredient in animal feed. The poultry industry alone demands about 75 percent of the total soya bean demanded annually in Ghana (Gage et al. 2012). With increased urbanization and rising income levels, consumers are increasingly consuming poultry, meat, and fish, as well as higher-quality soya bean-based vegetable oils, which will further increase direct and indirect demand for soya bean (Andam et al. 2019; Gage et al. 2012).

Both the poultry and aquaculture sectors identify high feed costs as a major constraint to production expansion. Feed costs are estimated to contribute over 60 percent of production costs (Andam et al. 2017; Ragasa et al. 2018). Although poultry farmers, the main users of soya bean meal, complain about the low quality of locally produced meal (Agbato 2011), significant opportunities exist for local feed mills and soya bean producers to supply a high-quality product at competitive prices. This will allow poultry and aquaculture firms to substitute imported feeds with a local alternative. Beyond exploiting domestic demand potential, local feed companies would likely be well-positioned also

to supply regional markets in West Africa (Andam et al. 2019; Andam et al. 2017).

Soya bean demand is not limited to industries. MoFA, through its Women in Agriculture Development (WIAD) Directorate, is promoting household consumption of soya bean through the training of school teachers, nutrition officers at the Ghana Health Service, and community health nurses at child or maternal health centers, and through household-level demonstrations for farm families on the use of soya bean in preparing local dishes. The Food Research Institute (FRI) has also developed technologies to produce soya bean-based weaning foods. These sensitization initiatives help demonstrate simple but cost-effective ways of utilizing soya bean to improve nutrition in children. Although household consumption of soya bean remains low in comparison to commercial demand or to household demand for other cereals, roots, or pulses, there is potential for increased consumer demand.

DOMESTIC AND INTERNATIONAL TRADE

Ghana reportedly relies on imports for between 40 and 50 percent of its domestic needs (Gage et al. 2012; Eshun et al. 2018). The product is imported in various forms, including raw beans, processed oils, and soya bean meal for use in animal feed. Thus, although soya bean is produced only during the rainy season, it is usually available to consumers and processors all year round. Domestic prices largely follow the international market, and, as such, local producers are exposed to global price fluctuations (Gage et al. 2012). Martey et al. (2018), concur, showing that soya bean prices in Ghana are well-integrated with international markets. Imported soya bean is subject to regular import duties and value-added taxes, but soya bean meal for poultry feed production enjoys some tax exemptions.

With respect to domestic trade, spatial differences in production and consumption create opportunities for traders and transporters to engage in the value chain. Major production centers include Tamale, Wa, and Bolgatanga in Ghana's north, as well as Kumasi and Techiman in the Middle Belt. The bulk of soya bean produced is sold to institutions through middlemen, aggregators, or large-scale off-takers, such as the Ghana Nuts Company, Savannah Farmers Marketing Company, and government agencies, such as the National Buffer Stock Company. Most of these institutional buyers provide support to farmers during the growing season with an understanding that farmers will sell their produce to them after harvest at a predetermined price (Dogbe et al. 2013). In the local markets, small scale producers and traders sell the beans in small quantities measured in bowls.

Generally, domestic trade is impeded by a lack of adequate storage facilities, inadequate capital, and poor road networks. As mentioned, there are also concerns about the quality of locally produced soya bean products, which constrains demand and trade in local soya bean.

PRICE TRENDS

MoFA’s Statistics, Research, and Information Directorate (SRID) collects soya bean price data from selected retail and wholesale markets across Ghana. Figure 2 shows the movement of wholesale and retail prices for the period 2010 to 2019. Although the retail market is relatively small, wholesale and retail prices are highly correlated ($r = 0.94$). The average mark-up of retail over wholesale prices over this period is 41 percent. Our analysis focuses mostly on wholesale prices.

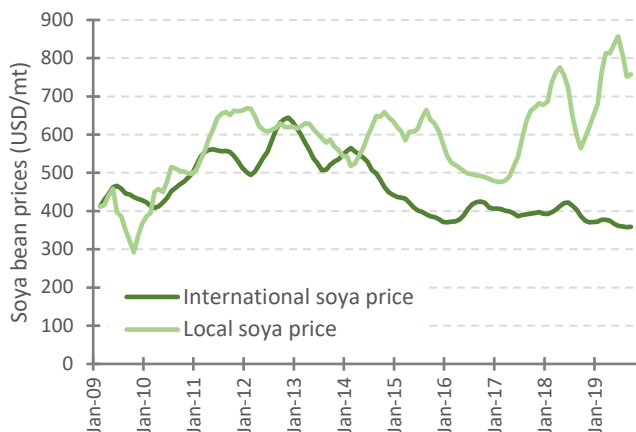
Figure 2: National average soya bean prices in wholesale and retail markets in Ghana, 2010 to 2019



Source: MoFA (2020)

Figure 3 shows that international soya bean prices have been relatively stable and appear to have been on a declining path since 2013. While the local wholesale price, expressed here in USD, broadly follows a similar long-term cyclical pattern as the international price, it is significantly more volatile, even when converting to five-month moving averages, as we do in the figure. It also appears as if the margin between local and international prices has increased in recent years. Despite these visual discrepancies, Martey et al. (2018) apply a vector error correction model and conclude that local markets are integrated with international ones, i.e., Ghanaian markets efficiently transmit price information on soya bean from outside the country and among themselves

Figure 3: International and local market price for soya bean, 2009 to 2019 (five-month moving averages)



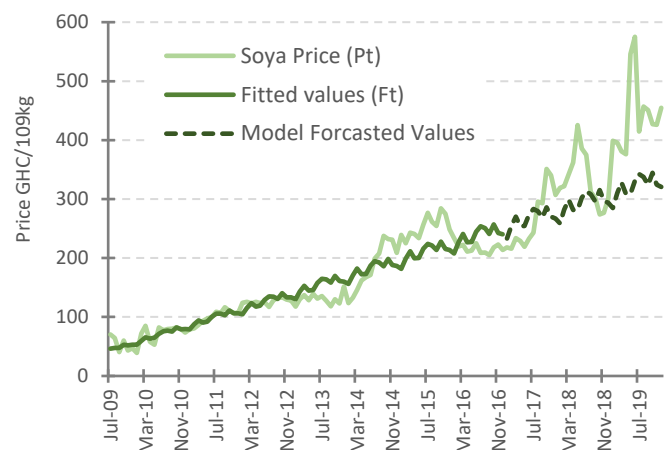
Source: IndexMundi (2020) and (BoG 2020)

To better understand domestic price movements in Ghana’s soya bean market, we employ a multiplicative model to decompose prices into various components. The price (P_t) at time t is defined as $P_t = (T_t \times C_t) \times (S_t \times R_t)$. T_t and C_t are long-term trend and cyclical components, and S_t and R_t are short-term seasonal and random (or unpredictable) components (Tschirley 1995). Beyond isolating these different price components, a useful feature of this model is that it can be used to forecast prices based on information drawn from historical prices.

We apply the model to observed soya bean wholesale prices from 2009 to 2016, i.e., prior to the 2017 launch of PFJ, and then create a predicted price path for 2017 to 2019. The objective is to see whether price patterns after 2017 deviate from expected trends.

Figure 4 plots forecasted prices $F_t = T_t \times S_t$ against observed prices P_t . Since the model was calibrated against 2009 to 2016 prices, the forecasted values over this period give an indication of the goodness-of-fit of the model, while the comparison of the forecasted and observed prices for 2017 to 2019 reveal how the observed price deviated from the expected price path since the introduction of PFJ.

Figure 4: Forecasted soya bean prices against observed prices



Source: Analysis of MoFA (2020)

From the figure we can conclude that domestic soya bean prices for 2017 to 2019 have indeed behaved erratically compared to the predicted price path. It is not evident that this can be attributed to interventions under PFJ; if anything, the stimulation of local production under PFJ is expected to be associated with more stability in the domestic market. Rapidly growing or unstable demand from local processors (e.g., feed mills) may therefore explain some of this volatility. More analysis is needed. Nonetheless, soya bean policies should prioritize price stability in the domestic market.

CONCLUSIONS

Soya bean is growing in importance as a cash crop in Ghana. As a major ingredient in poultry and fish feed, it is especially important for the livestock sector. It also serves as a good source of protein for humans.

Although, demand by industries and private consumers has increased in recent years, production and yields remain low. Recent output growth has been driven by an increase in area under cultivation rather than yield growth. While the PFJ program is currently providing almost all seed inputs demanded by the sector, there is still significant scope to raise yields.

Since the bulk of the soya bean produced or imported is processed, efforts are being made to increase its availability especially through local production and mechanization. Given the importance and high demand of soya bean for both humans and industrial use, investments need to be targeted at promoting production through financing, increasing the availability of appropriate and

affordable technologies to improve the competitiveness of its value chain, and mechanized production under irrigation to increase yield.

Soya bean markets in Ghana are regionally and internationally integrated, and farmers in Ghana could become competitive if their productivity is improved. This will in turn lead to an increase in national production of soya bean, import substitution, and lower price volatility. Price stability, alongside productivity growth, should be a major policy focus in the soya bean sub-sector. Structured trading of this commercial crop may be one way to achieve both those goals.

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