GHANA'S TOMATO MARKET

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Tomatoes are a key component in the diets of Ghanaian households. Approximately 440,000 tons of tomato are consumed annually, equivalent to 40 percent of household vegetable expenditure (van Asselt et al. 2018). Despite government support for the sector, national production has not increased much in the last decade, resulting in domestic supply falling far short of demand. While UN Comtrade (2019) trade statistics for 2007 to 2017 indicate that the country imported only around 8,000 tons of tomato annually, mainly from neighboring Burkina Faso, van Asselt et al. (2018) put this figure at closer to 100,000 tons or one-quarter of domestic supply. Evidently, large quantities of tomato enter the country informally, making it difficult to estimate actual supply and demand patterns and devise appropriate marketing policies. The perishability of tomato is a major challenge and imparts significant risk on producers and traders. As such, post-harvest handling, transport, storage, and processing losses have been estimated at between 20 and 65 percent of production (Vowotor et al. 2012).

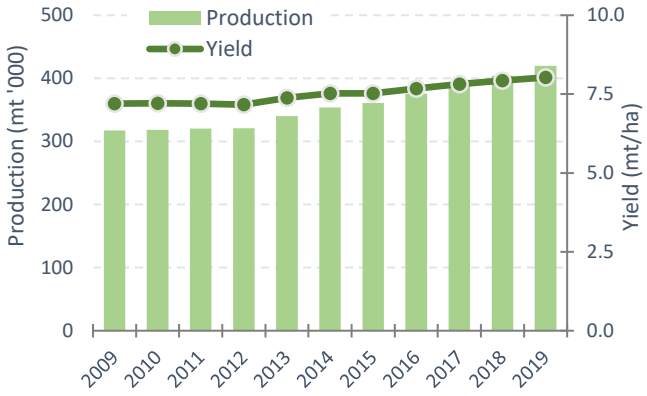
PRODUCTION CHARACTERISTICS

Ghana's principal tomato producing areas stretch across the central forest (or Transition) zone to the northern Savannah zone. The tomato calendar varies according to the producing region and the type of production system used. Irrigated production takes place in the northernmost regions from December to April. In the months that follow, rainfed tomato from the forest zone enters the market. Irrigated production in the Volta and Greater Accra regions takes place during the last quarter of the calendar year. Despite a year-round supply, there are periods of deficit when traders turn to neighboring markets, especially Burkina Faso, which supplies the Ghanaian market particularly during the first half of the year (Gonzalez et al. 2016; Robinson & Kolavalli 2010).

Tomato consumption has increased steadily in the last decade from around 280,000 tons in 2005 to more than 450,000 tons in 2013 (FAO 2019; van Asselt et al. 2018). However, domestic production has not kept up with demand, despite expanding from 318,000 tons in 2009 to 420,000 tons in 2019 (MoFA 2020a; FAO 2019) – an average annual output growth rate of 2.8 percent (Figure 1). These production increases are largely attributable to yield gains, which grew at a modest 2.7 percent, as opposed to area expansion. The area under tomato averaged around 47,000 hectares over this period.

The Ministry of Food and Agriculture (MoFA) estimates tomato yield potential in Ghana at 20 tons per hectare given improved seed use, adoption of good agricultural practices, and reliable rainfall – about two-and-a-half times the current average yield of 7.5 tons under irrigated and rainfed systems combined (MoFA 2017). Tomato yields in Burkina Faso are significantly higher at about 10 tons per hectare (FAO 2019). If Ghanaian farmers achieved these yields, they would add 100,000 tons to annual output, the quantity of tomato estimated as now being imported.

Figure 1: Tomato production and yields, Ghana, 2009-2019



Source: MoFA (2020a); FAO (2019)

As with agricultural production generally, tomato farmers in Ghana face various structural challenges, including the absence of improved seed, a lack of credit, and high transaction costs associated with poor infrastructure (Arah et al. 2015). Moreover, due to the fragility and perishability of tomato, losses in post-harvest handling, transport, storage, and processing pose significant challenges to value chain agents. These losses potentially comprise up to half of total production (Ridolfi et al. 2018; Snels et al. 2018).

VALUE CHAIN

Linking tomato producers to consumers are traders. These traders – typically women, the so-called 'market queens' that dominate retail market trade in Ghana – bring produce from farms to markets or to other retailers in both rural and urban centers. Markets in Accra (e.g., Agbogbloshie and Makola) and Ashanti and Bono East Regions (e.g., Techiman and Abinkyi) serve as important trading hubs for tomato (Gonzalez et al. 2016). These traders are considered the most powerful actors in the tomato value chain, capturing the largest margin share. Their position is further strengthened by collective action

mechanisms designed to protect their interests within the markets in which they are active, including controlling the volume of tomato in the market to deal with price fluctuations (Robinson & Kolavalli 2010).

Despite relatively low yields, tomato cultivation in Ghana is profitable. Van Asselt et al. (2018) estimate average gross margins ranging from GH¢ 2,339 per hectare in Keta in the Volta region under irrigation to GH¢ 9,565 per hectare in Ashanti under rainfed conditions. High input costs in part explain the lower margins achieved by the irrigating farmers, although van Asselt et al. (2018) did not account for all factors.

Tomato processing offers a possible solution to the challenge of high post-harvest losses associated with the perishability of tomato, particularly when transported over long distances (Anang et al. 2013). The question of whether to invest in processing has been a subject of public debate for some time. The few tomato processing facilities in the North operate intermittently. Large and mid-sized facilities seem unable to compete with imported tomato paste. A major challenge for domestic processing firms is accessing a steady supply of tomato year-round, as the market for fresh produce usually offers higher margins (Snels et al. 2018; Robinson & Kolavalli 2010).

The Ghanaian government recently reconditioned the main processing factories in the north. However, given the kinds of tomatoes it processes and the relatively low price of imported paste, it is still uncertain whether Ghana can develop a sustainable tomato processing industry. What is more evident is the need to bolster the smaller facilities scattered around the country that employ more basic processing technologies. These currently operate without standardized procedures (Snels et al. 2018).

Domestic and International Trade

Most imported tomato in Ghana originates from Burkina Faso. Burkinabé tomatoes form an important part of the supply chain, especially in the first half of the calendar year. Higher yields, competitive transportation costs, a well-established supplier network, and a good reputation explain the popularity of Burkinabé tomatoes (Robinson & Kolavalli 2010). Estimates of the total amount of tomato imported into Ghana varies according to data source. UN Comtrade, for example, reports tomato imports to Ghana averaged 9,400 tons per year between 2010 and 2016, mostly originating from Burkina Faso. However, Ghana's own estimates supplied to UN Comtrade and FAOSTAT estimate that 7,000 tons was imported annually over the same period. (UN Comtrade 2019; FAO 2019). These international statistical agencies do not routinely reconcile trade statistics.

In sharp contrast to these official estimates, the Ghana National Tomato Trader and Transport Association estimates that informal tomato imports are around 100,000 tons per year (cited by van Asselt et al. 2018), an estimate that seems plausible when triangulating information from other sources. Production in 2017 was 370,000 tons. Ridolfi et al. (2018) estimates tomato post-harvest losses to be about 38 percent. This means actual local tomato supply is around 230,000 tons, which, when combined with formal and informal imports, puts the estimate of domestic supply at roughly 340,000 tons. The Ghana Living Standard Survey for 2016/2017 (GSS 2018) suggests aggregate household consumption of fresh tomato is 240,000 tons per annum, which leaves only 100,000 tons for industrial processing. Robinson and Kolavalli (2010) estimate the installed tomato processing capacity in Ghana at 1,200 tons per day – even if these facilities operate at only 25 percent capacity, they would absorb all the remaining tomato in the market.

Apart from fresh tomato imports, Ghana also imports large quantities of tomato paste. From 2010 to 2016, around 92,000 tons of tomato paste was imported annually (UN-Comtrade 2019; FAO 2019). Ghana would need an additional 736,000 tons of fresh tomato and almost double its current processing capacity to fully substitute tomato paste imports. Substituting fresh tomato imports therefore seems a more plausible intermediate goal.

Price Trends

MoFA's Statistics, Research, and Information Directorate (SRID) regularly collects tomato price data from selected retail and wholesale markets. Figure 2 shows the evolution of wholesale and retail prices for the period 2009 to 2019. As expected, the prices are highly correlated (r = 0.76). Retail prices are 12 percent higher, on average, than wholesale prices to compensate for repackaging, storage, and transport costs.

Figure 2: Average tomato prices (nominal) in Ghana, wholesale and retail, 2009 to 2019

Source: MoFA (2019)

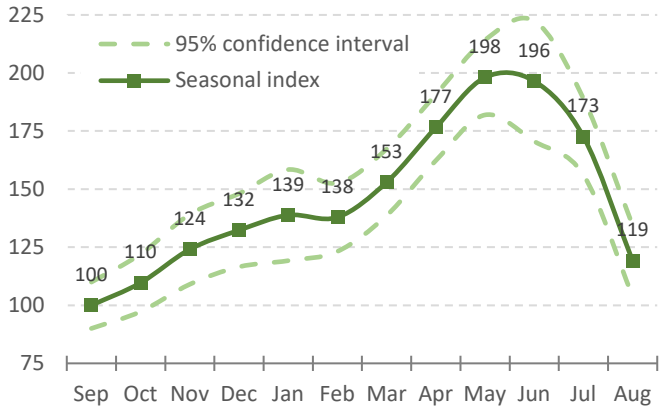
As we elaborate in the policy section below, tomato is one of the priority crops under the Planting for Food and Jobs (PFJ) initiative of the government of Ghana. This involves a substantial fertilizer and seed subsidy that is available to tomato farmers. Although a sharp decline in wholesale relative to retail prices was observed during the latter half of 2018, this was evidently a short-term event

and not linked to declining production costs associated with the subsidy. We investigate this further below.

Although tomato is cultivated all year round in various parts of the country, the amount of produce available in the market varies considerably throughout the year, mainly because the bulk of the tomato produced reaches the market only during the second half of the year. In closed markets, supply fluctuations can give rise to significant price fluctuations over the course of the marketing season.

We apply a multiplicative model to analyze price seasonality in the tomato market during the period from 2007 to mid-2017, i.e., prior to the launch of PFJ. 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). The objective of this analysis is to see whether tomato price patterns deviated from expected trends after the introduction of PFJ in 2017. Our interest is specifically in the short-term predictable (S_t) and unpredictable (R_t) variations in the price. Deviations in R_t represent short-term variations of observed prices around the anticipated seasonal pattern and can be used to construct a confidence interval around a tomato price index (Figure 3).

Figure 3: Short-term seasonal tomato price expectations (S_t)

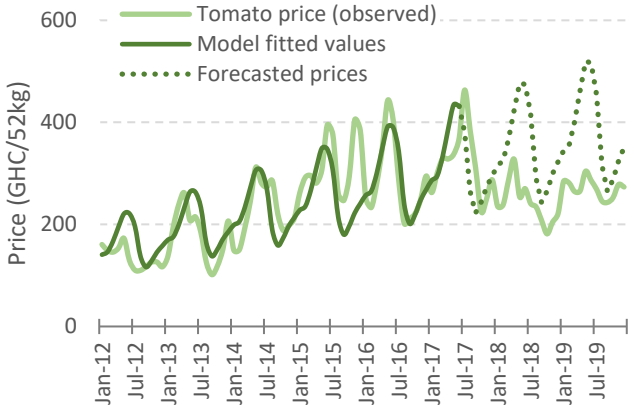


Source: Analysis of MoFA (2019)

Consistent with production patterns, the main marketing season starts in September when prices are lowest due to abundant supply. (In Figure 3, the September price is arbitrarily set at an index value of 100.) Prices rise as supply dwindles, and by May prices tend to be almost double their September low. As early harvest tomatoes start entering the market in July and August, prices fall.

The multiplicative model allows us to forecast prices. In Figure 4 we plot fitted values for the period 2007 to 2017 to demonstrate the goodness of fit of our model on historical tomato price data. Overall, the model tracks actual historical prices closely. The figure also includes a series of forecasted prices for 2017 to 2019, which are compared against observed prices for the same period. It is evident that prices did not behave as expected between 2017 and 2019, with tomato trading lower and exhibiting a lower seasonal spread than anticipated based on historical price trends.

Figure 4: Forecasted tomato prices against observed



Source: Analysis of MoFA (2020a)

POLICY ENVIRONMENT

Over the past decade, policies and programs have been put in place to improve tomato production and marketing in Ghana. Among the main programs was USAID's Trade and Investment Program for a Competitive Export Economy (TIPCEE) (2005-2009), which aimed to increase productivity and to introduce smaller crates and grading of tomatoes (Robinson & Kolavalli 2010). More recently, the government of Ghana launched the Planting for Food and Jobs (PFJ) initiative in 2017 to boost the agricultural sector through the provision of subsidized inputs and value chain interventions. Specifically, PFJ intends to increase the usage of improved vegetable varieties, to improve production through expanding irrigation with dams and solar water pumps for dry season farming, and to provide post-harvest storage facilities. PFJ prioritizes tomato along with several other crops.

Several international strategies and agreements related to horticultural development have been adopted over the years. For example, Ghana and India in 2017 signed a three-year research project to increase tomato production and to promote the use of improved pest-resistant varieties (CSIR 2017).

Finally, these has been an effort to improve processing capacity in the country. Using foreign capital, tomato processing facilities recently have been reestablished or built (GBC 2017; Business World Ghana 2018).

CONCLUSIONS

Tomato is one of the most widely consumed and produced vegetables in Ghana. It is produced across the country in different regions under different production systems throughout the year. As such, tomato is present in the market year-round, but supply fluctuations give rise to significant price volatility over the course of the marketing season. Traders are crucial players in the sector, connecting the farm with retailers, markets, and urban retail shops around the country. While on the one hand

performing an important coordination role, these agents also possess significant market power and can influence the quantities of tomato available in markets.

Despite the scale of production and the profitability of tomato, Ghanaian supply has not been able to keep up with domestic demand. Although official trade statistics are questionable, estimates suggest that up to one-quarter of domestic demand is satisfied through imports. There is tremendous potential for tomato production to expand across Ghana. Current yields are less than half their potential and are only three-quarters of what farmers in Burkina Faso achieve. If Ghanaian farmers can achieve the same yields as their Burkinabé counterparts, imports could be fully substituted. Access to credit, lack of improved varieties, and inadequate post-harvest handling and processing techniques have been identified as being among the main productivity-limiting factors. Ghana also imports substantial quantities of processed tomato products, particularly paste, which suggests there are opportunities to improve processing facilities in the country.

Since the introduction of the Planting for Food and Jobs (PFJ) program, production and yields have increased, but these seem to be following long-term trends rather than a policy-induced effect. However, early indications are that wholesale market prices are trading at lower levels and seasonal price volatility has been reduced, which may be indicative of an increased and steadier supply of fresh tomato throughout the season. If producer incentives remain high, this may signal early progress towards gradually substituting tomato imports into Ghana.

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