# GHANA'S CHILI MARKET

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*Chili pepper (Capsicum spp.) is an important spice and condiment used in many Ghanaian dishes. Alongside tomato and onion, chili ranks as one of Ghana's three most important vegetable crops in terms of hectarage and crop value with significant potential for generating income, creating jobs, and contributing to foreign exchange through exports (Gonzalez et al. 2014). As is the case with other vegetable crops, chili production in Ghana is more profitable than producing traditional staple crops, such as maize and rice (van Asselt et al. 2018). However, supply is highly seasonal as most production is rainfed. Chili yields in Ghana are also well below their potential. The government of Ghana has recognized this underexploited potential by designating chili as a priority crop under the Planting for Food Jobs (PFJ) initiative.*

## POLICY ENVIRONMENT

The second Food and Agriculture Sector Development Policy (FASDEP II), adopted in 2007, provides the general implementation framework for agricultural policies in Ghana. The vision is a sector developed on the principles of sustainable production and market-driven growth. An explicit policy goal of FASDEP II is diversification of high-value horticultural exports.

Ghana's industrialization strategy of 2012 promotes exports and import substitution, with horticulture identified as a driver of export diversification. Notable export programs include the African Growth and Opportunity Act, the Economic Partnership Agreement, and the National Export Strategy (NES). These ensure the existence of an appropriate business environment and facilitate access to markets in the United States and the European Union (Osei-Assibey 2015). Chili pepper is afforded priority in the NES (MoTI 2013).

Regulatory bodies, such as the Ghana Standards Authority, support horticultural exporters to comply with international safety and phytosanitary requirements, such as those required to meet the GLOBALG.A.P. standards for good agricultural practices. Domestically, the Ghana Green Label (GGL) was instituted to certify farms which adopt production and distribution systems that guarantee safe foods and environmental sustainability. Although GGL currently focuses on the domestic market, these types of initiatives could eventually facilitate access to international markets.

The most explicit support for the chili sector is provided through the Planting for Food and Jobs (PFJ) initiative launched by government in 2017. PFJ targets several crops, including chili pepper, supplying subsidized fertilizer and improved seeds to farmers at half the commercial cost of these inputs. In 2018, PFJ supplied 1.46 metric tons of chili pepper seed, which at recommended seeding rates is enough to plant around 5,200 hectares or 38 percent of the current chili cropland (MoFA 2020a).

## CONSUMPTION

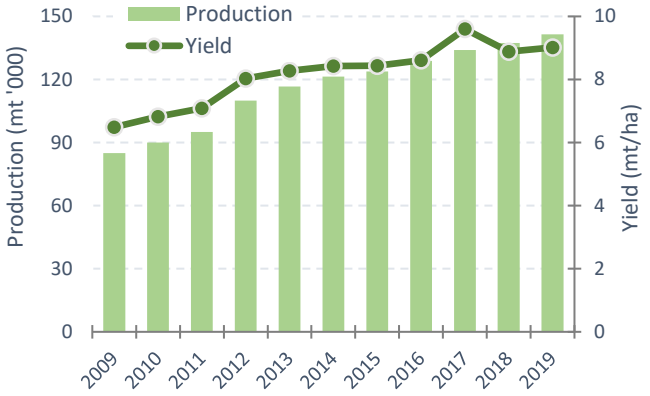
Undernutrition and household food insecurity in Ghana declined significantly during the last three decades (Ecker and Fang 2016). Along with rising incomes, Ghana has also seen improvements in diet quality as households consume relatively more proteins and vegetables. A household dietary preference study found that chili is one of a handful of vegetable that are highly sought after throughout Ghana, alongside tomatoes, eggplant, and okra. Roughly one-third of chili consumption is from own production, with the remaining coming from markets. This suggests that many chili growers are market oriented.

## PRODUCTION

The three most-commonly produced vegetables in Ghana are tomatoes, chili pepper, and onion. Tomato is the largest both in terms of land allocation (48,000 hectares) and crop value – estimated at GH¢ 2.3 billion in 2017. Chili is second, with a cropland allocation of 13,700 hectares and a crop value of GH¢ 919 million, while onion was grown on 8,300 hectares and was valued at GH¢ 597 million in 2017 (FAO 2019; MoFA 2020a, 2020b). The most common chili variety in Ghana is Legon 18, a green chili variety. Other common varieties include Scotch bonnet and Bird's eye.

Despite being a major vegetable crop, current fresh chili production of about 140,000 metric tons annually is about half the quantity produced in the early to mid-1990s. Production fell sharply in the late-2000s to 90,000 tons due to a sharp decline in dry season irrigated chili production (Gonzalez et al. 2014). Production has since recovered somewhat (Figure 1). Official data shows yields increased from 6.5 to 9.0 tons per hectare between 2009 and 2019 (growth of 3.3 percent per annum), but this is still low when compared against the 15 to 30-ton range considered achievable (MoFA 2018). Official yield estimates have also been challenged, with studies reporting wide yield ranges for different chili varieties and under different production systems (Vigneri et al. 2020; van Asselt et al. 2018).

*Figure 1: Chili production, area harvested, and yields, Ghana, 2009-2019*




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

It is too early to assess whether PFJ, launched in 2017, has influenced chili production. Information on fertilizer application by crop is not known, i.e., it is not clear to what extent the sub-sector benefits from increased fertilizer supply. Supplies of subsidized chili seed, on the other hand, are enough to cover between 30 and 40 percent of the total area under chili cultivation. Yet, despite this, yield and output increases appear to be following a steady long-term growth trend – the apparent yield spike in 2017 (Figure 1) may relate to the land area being underreported rather than to a structural break in the growth trend.

## Domestic and International Trade

A thriving local and international market for chili exists in Ghana with great potential for growth. Chili is used in many Ghanaian dishes. Significant quantities also are exported to the European Union. Furthermore, growth in the food and hospitality industry and modern retail outlets has led to large end-users entering the market and driving growth in demand (DAI 2014). While chili is mainly exported in its fresh form, in local markets it is sold in various forms, including fresh, dried, powdered, as a paste, or as an ingredient in a traditional condiment sauce called *shito*. Demand for processed chili products is rising as urban consumers increasingly prefer the convenience of processed foods (DAI 2014).

Chili is a non-traditional export commodity for Ghana. The main export variety is green chili. With the European Union being a major export destination, the stability and growth in chili demand in Europe is crucial for the future viability of the Ghanaian chili sector (Gonzalez et al. 2014). The United Kingdom is the main destination for Ghanaian chili. Ghana is also the largest chili exporter to the United Kingdom outside of the European Union. This apparent comparative advantage is attributed to Ghana having a favorable seasonal marketing window to export to the United Kingdom as it coincides with the dry season in India, a major competitor in the chili export market (Gonzalez et al. 2014).

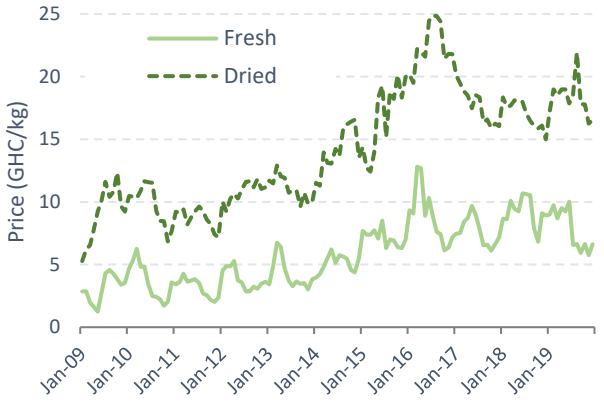
Unfortunately, chili exports to the European Union were banned in 2015 due to non-compliance with sanitary and phytosanitary measures (van Asselt et al. 2018). The ban was finally lifted in 2018 following an improvement in technical competence, inspection, and traceability, as well as installation of pest detection equipment at Kotoka International Airport (GEPA 2017). Nevertheless, the ban exposed persistent challenges with vegetable production in Ghana. To build a robust chili export industry, it is imperative to maintain measures that ensure food safety, including the use of safe crop protection products, phytosanitary compliance, and adoption of appropriate post-harvest management methods.

There are some exports of chili from Ghana to neighboring countries. However, most of this regional trade is informal, so data is scant due to underreporting and weak enforcement of trade regulations at the border (van Asselt et al. 2018). Chili imports appear to be insignificant, constituting less than 2 percent of domestic consumption by some estimates (Gonzalez et al. 2016; van Asselt et al. 2018), although a slight increase in imports in recent years has been attributed to demand from supermarkets in urban areas which serve middle-income consumers. Given the seasonal nature of production in Ghana, chili imports in the off-season mainly come from Burkina Faso, Togo, and Cote d'Ivoire.

## Price Trends

The Statistics, Research, and Information Directorate (SRID) of the Ministry of Food and Agriculture (MoFA) regularly collects price data from selected wholesale and retail markets across Ghana. These have been analyzed to understand chili market price movements over the past decade.

*Figure 2: Fresh and dried chili prices (nominal) in Ghana, wholesale, 2009 to 2019*




Source: MoFA (2020b)

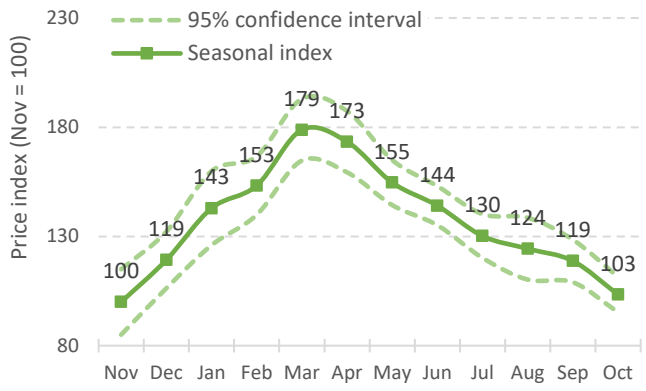
Domestically, most chili is consumed in its dried form. Traditional boiling and drying methods add value, improve shelf life, and allow year-round trade. Figure 2 shows that dried chili prices are about twice those of fresh chilies. Better storability also means dried chili prices exhibit less seasonal variability during the year. Accordingly, the correlation between fresh and dried chili prices is relatively low ($r = 0.13$). Fresh chili pepper – like many other crops produced under rainfed conditions in Ghana –

has a strongly seasonal price pattern. Rain-fed chili production takes place from May to November. Therefore, fresh chili prices tend to be low from August through December as the new crop reaches the market. Irrigated production takes place during the dry season from November through May. However, since quantities are small, the supply of irrigated chili does little to temper the strong seasonal price pattern of high prices between March and July.

To better understand price movements in Ghana's chili market, we use a multiplicative model where 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). We apply this model with two objectives: firstly, to isolate the short-term seasonal pattern ($S_t$) in chili prices, which gives an indication of the anticipated price increase over the course of a season; and, secondly, to see whether fresh chili price patterns deviated from the expected trend after the introduction of PFJ in 2017.

Figure 3 plots the seasonal price index ($S_t$) and its associated 95 percent confidence interval. The confidence interval is estimated from the unpredictable price component ($R_t$). On average, fresh chili prices are lowest at the peak of the harvest in November (in the figure, the November index value is arbitrarily set at 100). Prices rise rapidly as the supply of new stocks of chili to the market dwindles, peaking at an index value of 179 in March (i.e., 79 percent above the November low). The interpretation of the 95 percent confidence interval is that there is a 5 percent chance that the price in May will fall outside of the confidence interval range [165, 193].

*Figure 3: Short-term seasonal fresh chili price expectations ($S_t$)*



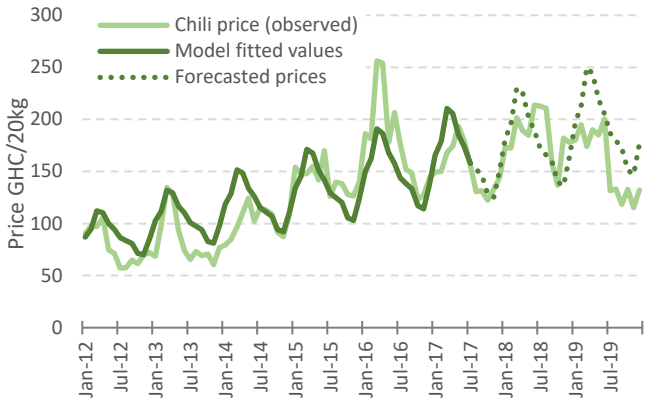

Source: Analysis of MoFA (2020b)

The implication of these results is that farmers who invest in irrigation facilities and cultivate during the dry season could potentially achieve a price premium of 79 percent on the chili they produce. More analysis is needed to understand why more farmers are not shifting to irrigated production of chili (or why they shifted away from irrigated production in the first place in the mid-2000s). Recent analysis reveals that irrigated Scotch bonnet production is profitable, with gross margins of GH¢ 3,500 to GH¢ 15,000 per hectare for average-performing chili farmers in the Tolon and Kassena districts, respectively. Of course, if more farmers start producing in the off-season, the seasonal price spread – and hence profits – will decline as more chili enters the market.

Limited off-season production may also simply be due to lack of demand for fresh chili. Domestically, most households consume dried chili products for which prices are more stable throughout the season. These consumers may not be willing to pay even a small premium for fresh chili in the off-season. Consumption of fresh chili during the harvest period may be encouraged by low prices rather than by consumer preferences. International demand for Ghanaian chili may also be limited during Ghana's off-season since other international producers, such as India, start marketing their chili production at that time. The competitiveness of Ghana's fresh produce within international markets is generally a concern, and chili is no exception (van Asselt et al. 2018).

A useful feature of the multiplicative seasonality model is that it can be used to forecast prices. In Figure 4 we plot fitted values for the period 2012 to mid-2017 in order to demonstrate the goodness of fit of our model on historical data, as well as the forecasted prices for the "future" period of mid-2017 to 2019 (recall the model was calibrated against fresh chili prices from 2009 to 2017).

*Figure 4: Forecasted fresh chili prices against observed*




Source: Analysis of MoFA (2020b)

A few observations can be made. First, the fitted values track historical prices closely, which suggests the model is a good fit and that chili prices tend to behave in a predictable manner. The price spike in April 2016 is an obvious outlier which may have biased our estimate of seasonal price variation upwards.

Second, since the introduction of PFJ, chili prices have maintained the familiar seasonal pattern, but the price trend appears to have leveled off. Observed prices during this period are around 8 percent lower than our forecasted values. The difference is especially obvious in the 2019 season. However, rather than a supply-effect, this likely reflects the effect of PFJ on production costs and hence

wholesale prices. However, these price savings are apparently not passed on to consumers in the form of lower retail prices – the retail markup over wholesale prices increased from around 11 percent prior to 2017 to 19 percent during the 2017-2019 PFJ era.

## Conclusions

Chili pepper is the second most important vegetable crop in Ghana in value terms, serving not only as a key emerging non-traditional export commodity, but also as an important item in the diets of most Ghanaian households.

Although chili cultivation has been touted as having tremendous potential for increasing farm incomes and generating foreign exchange revenues, farmers are confronted with several challenges. First, with the exception perhaps of the Planting for Food and Jobs (PFJ) initiative, very few agricultural policies have specifically targeted or promoted chili production. As a product with a short shelf life and many processing opportunities, dedicated technical support to chili value chain actors may help unlock opportunities which cannot be unlocked by generic agricultural sector policies.

Second, although chili production is profitable, average yields reported by MoFA appear to be far below their achievable levels. This has been linked to the limited use of improved seeds (or inefficient recycling of seeds) and poor agronomic practices, such as limited fertilizer use (van Asselt et al. 2018). PFJ has the potential to address these issues directly, although early evidence suggests the program, thus far, has not had a significant effect on production. The decline in wholesale chili prices may be discouraging chili cultivation, while the fact that retail prices have not declined alongside wholesale prices may be inhibiting demand.

Last, the lack of adequate irrigation facilities has confined chili production mainly to the rainy season. This contributes to a large seasonal price spread, while Ghana may also be potentially losing out on export opportunities during the off-season. While consumers are seemingly content with consuming dried chili products during the off-season, the potential to expand irrigation and compete in international fresh chili markets during the off-season should be investigated further.

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