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# Grain Cultivation and Its Association Problems: Overview of Ghana

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## **Keywords**

Ghana, Grain, Production, Processing, Post-harvest losses

## **Disciplines**

Agriculture | Bioresource and Agricultural Engineering

## **Comments**

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## **GRAIN CULTIVATION AND ITS ASSOCIATED PROBLEMS: OVERVIEW OF GHANA**

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## Introduction

Humankind has thrived on this planet feeding primarily on the fruits of cultivated grass crops of the family Gramineae for thousands of years. These fruits are from eight principle cereal crops wheat, barley, rice, corn, oat, rye, sorghum, and millet. The production, storage, and distribution of these principal crops are crucial to the survival, and continued progress of human civilization (Sinha, 1992).

Through the centuries, cereal carbohydrate has been the main fuel energy for running the human machine: worldwide averages of energy yield are 460 kJ/ha from wheat, 737 kJ/ha from rice, and 837 kJ/ha from corn (Kent, 1983). It is no wonder that out of the 90% of the world's calorific requirement which is provided by only 30 crops, wheat, maize, and rice alone provide about half the calories consumed globally (MA, 2005b).

Recently, some countries have made progress in growth in national food grain production. The growth is attributable to the application of new technologies, the use of improved varieties, and the use of irrigation, fertilizers, and pesticides. The substantial increase in production has been beneficial to many countries in the developing world, and this curtailed the predicted mass starvation proposed in the mid-1960s (Anderson and Hazell, 1989). The objective of this paper was to review current literature on the major grains cultivated as staple crops, and grain losses experienced in Ghana.

## Grains Cultivated in Ghana

- **Maize (*Zea mays* L.)**

Maize is the principal staple crop produced and consumed in Ghana (Figure 1). It is produced predominantly by smallholder, poorly resourced farmers under rain-fed conditions. The crop is well adapted, and grows in most of the ecological zones of Ghana including the northern savannah (Adu *et al.*, 2014). Maize is grown in most part of Ghana although the middle to southern parts (transitional zone and forest zone) are the most grown areas (Rondon and Ashitey, 2011).

The major source of calories in Ghana is obtained from maize, and has nearly replaced traditional staple crops like sorghum and pearl millet in northern Ghana (SRID-MoFA, 2011). The average maize production per year between 2007 and 2010 was 1.5 million metric tons (Rondon and Ashitey, 2011). An average maize grain yield on farmers' fields is about 1.7 t/ha versus an estimated achievable yield of about 6.0 t/ha (SRID-MoFA, 2011).

In Ghana, maize planting is done in April or May and the harvesting is done in August or September for the major season. Maize accounts for over 50% of total grain output, although yearly yields have been growing meagerly by only 1.1 %. In 2012, Ghana recorded 1.2–1.8 MT/ha of maize yield which was less than the yield of 4–6 MA/ha obtained in on-station trials (IFPRI, 2014).

There are some limiting factors to maize production in Ghana which include drought during critical early stages of crop growth, low soil nutrient levels (particularly nitrogen and phosphorus), striga, and pest and disease infestations. Poor management practices such as low plant populations, inappropriate planting time, inadequate control of weeds, lack of credit, limited use of inputs (especially fertilizer and improved seeds) as well as untimely application of adequate quantities of fertilizers, inadequate drying and storage facilities leading to high post-harvest losses, and poor market access are other limitations to maize production (Adu *et al.*, 2014).

Maize grain is used predominately at domestic or household levels rather than industrial or commercial scale. All kinds of foods are prepared from maize grain, serves as useful component in poultry and livestock feeds, and also in the brewing industry.

- **Rice (*Oryza sativa* L.)**

It was estimated that Africa's rough rice production was 14.6 million tons/year on 7.3 million hectares between 1989 and 1996 (Traore, 2005). Rice production remains at low levels although, West Africa has vast available areas and the largest planted rice area of about 4.1 million hectares. This could probably be attributed to improper crop management procedures, limited research and extension activities, and less use of improved varieties (Badawi, 2004; Anon, 2008a). The average rice production in Ghana is 300000 metric tons, about 30% of the total rice required, and therefore the remaining 70% is imported. In 2013, 640000 metric tons of rice was imported into Ghana.

Rice (Figure 1) now competes with traditional staple foods, and rice consumption increases with population growth since rice continues to be part of the main meal in most homes as rice is relatively convenient to prepare, and has good taste. The fast growing rate of fast food restaurants and vendors in the major cities is a contributing factor to the increased demand for rice. Imported rice is most preferred by urban consumers because of its higher quality, and about 76% of total rice consumed in urban areas is imported rice (MoFA, 2010). The yearly per capita consumption of rice from 1999–2001, and 2010–2011 was between 17.5 kg and 24 kg (IFPRI, 2014). According to MOFA, only 20% of locally grown rice is consumed in urban areas, with the rest consumed in rural

areas.

Domestic rice production, and supply has not increased with the increasing demand for high quality rice and the changing consumer preferences towards imported fragrant, long-grain white rice (Rondon and Ashitey, 2011).

- **Sorghum (*Sorghum bicolor*)**

Sorghum (a 'grass roots') is a traditional crop largely grown by subsistence farmers (Offei *et al.*, 2002). Sorghum (Figure 1) is mostly cultivated in the Guinea and Sudan savannah Zones in the Upper West, Upper East and Northern regions of the Ghana with respective average rainfall of 1000 mm and 990 mm per year. Sorghum is considered a staple crop food in Ghana, and are the baseline crops of farmers in the savannah zones. Sorghum is third in rank after maize and rice in terms of quantity of cereal production, with 12% on total cereal production value. There is averaged increased yield from 0.9 Mt/ha to 1.2 Mt/ha although averaged yields of 2 Mt/ha are attainable (SRID-MoFA, 2004). Sorghum is not grown in large-scale, and only under the mercy of rain, and mostly in mixed cropping and intercropping systems. Limited amount of sorghum are important compared to other crops like maize and tomato grown in the four agro-ecological zones (Diao *et al.*, 2010).

Sorghum cannot be considered a major food security crop or a top-ranked cash crop. The lack of early sorghum varieties, insufficient or delayed rainfall, infertile land, limited seeds, attack by termites during storage, infestation by striga and black ants, insect like mould-causing mirid head bugs (*Eurystylus immaculatus*) attack, and disease like smut are some pertinent reasons (Kudadjie *et al.*, 2004).

The three Northern regions where sorghum is grown has about 40% of the population living below the poverty line (Asenso-Okyere *et al.*, 2000). Sorghum is resilient to drought and high temperatures which makes it crucial for food security in these regions (Kudadjie *et al.*, 2004).

Sorghum consumption per capita started to increase between 2006 and 2007. Majority of farmers (69%) cultivate sorghum for their consumption only, 25% grow sorghum for both consumption and the market, and while very few (6%) grow sorghum for the market only. Sorghum has multiple uses as food, feed, and shelter. Sorghum grains can be milled and used to prepare food ("tuo zaafi", porridge and "masa") as well as a local alcoholic drink ("pito"), and the leaves can be used as fodder for farm animals, and the stalks are used for fencing, staking, roofing, weaving baskets and mats, and also for fuel.

Sorghum can be used as adjunct or as the main ingredient in the brewing of beer. Recently, breweries in Ghana are increasingly using malted sorghum as a substitute for barley. It is however, worth noting that the appropriate malted sorghum potential demand from industries could reach up to 10,000 tons/year. Brewery demand was

estimated at around 2,500 tons/year which is well below the potential. There is limited supply of sorghum to brewery industries as Guinness Ghana is only getting 2% of the sorghum it requires (4000 metric tons/year) for beer production (Angelucci, 2013).

- **Pearl Millet (*Pennisetum glaucum*)**

Millet crop is from the grass family, and the seeds are small and hard. Millets grow well in dry areas under rain-fed and less fertile and moisture conditions (FAO and ICRISAT, 1996), making them the preferred cereal crop in drier areas (Kasei *et al.*, 2014). Millet (Figure 1) is known to be one of the oldest cereal crop for domestic use of humans. Pearl millet domestication in northern Ghana dates back to about 1250 BC (Davies, 1968) or 1459 BC as reported by D'Andrea *et al.*, (2001). Pearl millet is grown mainly in the Northern, Upper East and Upper West of Ghana (covering 29% total land area), (SRID-MoFA, 2011). Northern Ghana covers about 41% of the land area of Ghana, and is located within the Sudan and Guinea Savanna zones (semi-arid zone or interior Savanna) (Bennett-Lartey and Oteng-Yeboah, 2008).

The reason millet thrive well in Northern Ghana compared to other crops is that it produces grain yield under warm and dry conditions, and infertile and low water holding soils (CGIAR, 1996). Millet is first in importance as food and less in importance as a cash crop. It is a traditional crop grown by most households for food, and sold only as a last resort for money. After prolong dry season, millet is the first crop to be harvested and so regarded as a hunger breaker (Kudadjie *et al.*, 2004).

In Ghana, Pearl millet is grown mainly as a food crop with the stalks used variously as fodder, roofing material, and fencing material or source of saltpeter for cooking traditional food.

- **Wheat (*Triticum aestivum* L)**

There is some local production of wheat but domestically produced wheat is less than a tenth of the total available supply. This cereal grows best in dry, and not too warm or too cold environments and therefore resulting in less domestic production. Ghana's hot weather does not favor the cultivation of wheat (Effraim, 2013). Ghana is the fourth largest importer of wheat in the Sub-Saharan Region and the second largest importer of wheat from the U.S in the Sub-Saharan region (www.fao.org, 2000; Kessel, 1999). The importation of wheat is from Canada, Argentina and the European Union and no more from the U.S.

Wheat (Figure 1) has been long and commonly used as cereal crop in Ghana. Ghana has three major wheat milling companies having a total capacity of 1,600 tons/day, and operating at only 80% as a result of the stable consumption trend. Wheat consumption was estimated to be approximately 300,000 MT in 2010/2011, and the

estimated per capita consumption was about 12.5 kg. Almost 80% of wheat flour is used in bread making, while the remaining 20% is used in preparing cakes and other pastries.

Demand by industries for soft wheat flour is increasing, but most of the flour is sold in the open market (Rondon and Ashitey, 2011). There is controversy over the credibility and source of the unbranded wheat sold at the open market (Effrain, 2013).



**Figure 1.** The major grains cultivated in Ghana

## Grain Losses in Ghana

In considering increasing food production to feed over 9.1 billion people with safe food by the year 2050 (Parfitt *et al.*, 2010), an important factor also to be considered is to reduce food loss and waste (Hodges *et al.*, 2011). It is estimated that about 30% of the world's produced food is lost or wasted (FAO-World Bank, 2010; Prusky, 2011). This loss is about 1.3 billion tons per year in a world where over 870 million people go hungry (Gustavsson *et al.*, 2011).

The World Bank (2011) revealed that, each year, substantial volumes of food are lost after harvest in sub-Saharan Africa (SSA), with estimated value of USD 4 billion for grains alone. According to the report the magnitude of food loss exceeds the value of total food aid received in SSA over the last decade, and also equivalent to the yearly cereal imports values to SSA. In addition, such losses are estimated to be equivalent to the annual caloric requirement of 48 million people. Experts are in recent times advocating for investing in postharvest loss (PHL) reduction to enhance food security (GIZ, 2013a). Reports by the FAO and World Bank approximated that up to 47% of USD 940 billion needed to eradicate hunger in SSA by 2050 will be required in the postharvest sector (FAO-World Bank, 2010). To alleviate poverty and improve nutrition require drastic reduction in food losses.

The World Food Conference of 1974, resolved to bring about a 50% reduction in PHL by 1985 (Parfitt *et al.*,



2010). Although some approaches have been employed to reduce PHLs, limited success has been achieved (World Bank, 2011), indication that these approaches have not yielded compelling results in SSA. PHL between 10-40%, and as high as 50-70% are usually reported (FAO-World Bank, 2010; Kader, 2005; Lundqvist *et al.*, 2008; Parfitt *et al.*, 2010; Prusky, 2011), and also most often from unknown sources. Moreover, reports and several other studies (FAO-World Bank, 2010; Gustavsson *et al.*, 2011; Parfitt *et al.*, 2010; Prusky, 2011) also indicate the existence of major data gaps in quantifying PHL in SSA.

In Ghana, the trend of marketing is a contributing factor to PHL. This is because the producers are mostly not part of the marketing chain and rather sell the grains at the farm gate to traders from the city markets. The grains are then sold as wholesale and retail in urban markets (Rondon and Ashitey, 2011). According to the World Bank (2011), losses can occur (i) at harvest, (ii) during conditioning, (iii) at handling, (iv) during transportation and distribution, (v) at storage due to pests, spillage, spoilage, and contaminations, (vi) during processing due to inefficient technologies, and finally, (vii) during marketing.

Significant increase in food supply in Sub-Saharan Africa could be achieved by investing in reducing post-harvest food losses (World Bank, 2011). The creation of National Food Buffer Stock Company (NAFCO) was part of the Government of Ghana strategy in reducing post-harvest losses, ensuring price stability, and establishing emergency grain reserves (Rondon and Ashitey, 2011). NAFCO is a state-owned enterprise intended to buy, preserve, store, sell, and distribute excess grains in warehouses across the country. The recent world food and financial crises has necessitated focusing on post-harvest losses. PHL of 20% or more is unacceptable for Ghana, and inevitably Africa in grain production (World Bank, 2011).

## **Conclusion**

Maize provides the major source of calories in Ghana with average yearly production of 1.5 million MT between 2007 and 2010, accounting for over 50% of total grain output. The average rice production in Ghana is 300,000 MT, about 30% of the total rice required, and ranked second in grain production. Sorghum is ranked third in cereal production and per capita consumption is recently increasing with its industrial usage in beer brewing. Pearl millet domestication in northern Ghana dates back to about 1250 BC or 1459 BC. There is some local production of wheat but domestically produced wheat is less than a tenth of the total available supply due to hot climate not conducive for its cultivation. About 47% of USD 940 billion needed to eradicate hunger in SSA by

2050 will be required in postharvest sector. Making efforts in increasing grain cultivation in Ghana should be commensurated with good post-harvest storage technology to help reduce PHL and to eradicating hunger.

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