Factors affecting the use of modern technologies in Agro processing in Ghana

Accepted 5th June, 2015

ABSTRACT

The critical role that technology can play in agribusiness development and food security in Africa and for that matter in Ghana cannot be overemphasized, where there are high post-harvest losses, arising largely from limited food preservation capacity and adequate storage facilities. Post-harvest loses is a major factor constraining food and nutrition security and while most governments in Africa with the support of their private sector partners are playing a unique role in promoting industrial development in Africa through employment generation, value-added processing and training of skilled manpower, there hasn't be much improvements and underlying issue is still the lack of adoption and adaptation of appropriate technologies. Like most countries in Sub-Saharan Africa, the agro processing industry in Ghana is characterised by micro/small scale industries involved in lower capital investment and most rely on old traditional processing technologies yet these small scale industries generate employment opportunities in the rural areas and are crucial to rural development. Even though some successes have been achieved in the mechanization of agriculture and agro processing in Ghana, a lot still has to be done in upgrading traditional and rudimentary agro processing technologies. This paper discusses some of the major factors that affect the adoption and use of modern technologies in agro processing in Ghana.

Key words: Agro processing; Agriculture; food security; technology

INTRODUCTION

Agriculture in Ghana still accounts for majority of the national economy and decades after independence, Agriculture still remains the single most attractive and important sector that seriously engages the attention of every Government, no matter the ideology and political manifesto. Agricultural production consist a number of activities ranging from land preparation, planting, weeding, irrigation, harvesting, processing and preservation or storage. Each of these stages requires particular types of scientific and technological inputs with implications on both the farmer and society in general. The majority of African farmers use obsolete and poorly developed science and technology in their production endeavours. Planting, weeding and harvesting are still done using mostly poorly developed technologies. Use of poor science and technology limit the amount of land available for cultivation as well as the efficiency of carrying out the production and storage processes. Moreover, most agricultural strategy in Africa concentrated on increase agricultural output and productivity with limited attention to storage and processing.

Majority of the agro-processing technologies used in Ghana are small scaled and are traditional or rudimentary level technology. These include a wide variety of indigenous foods processing, some of which are rich in specific micronutrients. With increasing popularity and demand of Western processed foods, consumption of African indigenous foods have decrease, especially in urban cities. Hence improvement and access to technology is critical for the local processing industries in these modern times to
compete. One major distinction between Developed and Developing Countries are partly attributed to different levels of science and technology development between them. Technology development continuously offers ample opportunities that can be exploited to enhance development through achieving improvements in productive efficiency and productivity.

According to Henderson (1989), technological development has profound and long-term impact on income distribution, economic growth, employment, trade, environment, industrial structure and defence and security matters. The type of technology used for production in an economy is determined, to an extent, by the nature of production activities undertaken. By and large the level of technological advancement in Africa is considerably low and much of processing is rural-based along with peasant agricultural production, fishing, and livestock keeping. These types of production activities depend, to an extent, on the availability of land and water. Fishing activities are undertaken in coastal areas, lakes, rivers, and artificial lakes (dams). Livestock keeping is common in grassland areas. Off-farm production activities such as agro processing, small-scale industries, energy and transportation are also carried out. With such a diversified production structure the technological needs are also diverse.

Agro processing industries also plays a crucial role in the industrialisation process of the developing countries. Although its importance declines as industrialisation advances, yet with rise in income and with increased urbanisation, the demand for more complex and diverse types of processed food increases. The value of commerce in processed foods exceeds that of basic agricultural commodities by several magnitudes. Although bulk of this trade takes place in the developed countries and is dominated by a few multinational firms, the scope of subcontracting to these firms is enormous. Another important contribution of agro- industry in manufacturing is its capacity to generate employment. It is generally found to be more labour intensive and less capital using and has low import content than the industry average in the developed country (Table 1). According to the decreasing in share of the country's GDP, it is generally found to be more labour intensive and less capital using and has low import content than the industry average in the developed country (Table 1). According to the decreasing in share of the country's GDP, it is generally found to be more labour intensive and less capital using and has low import content than the industry average in the developed country (Table 1). According to the decreasing in share of the country's GDP, it is generally found to be more labour intensive and less capital using and has low import content than the industry average in the developed country (Table 1). According to the decreasing in share of the country's GDP, it is generally found to be more labour intensive and less capital using and has low import content than the industry average in the developed country (Table 1). According to the decreasing in share of the country's GDP, it is generally found to be more labour intensive and less capital using and has low import content than the industry average in the developed country (Table 1). According to the decreasing in share of the country's GDP, it is generally found to be more labour intensive and less capital using and has low import content than the industry average in the developed country (Table 1). 


data and information are the most essential necessity for a research. The approach of this paper is based on the data and information collected. The authors examined and extracted information from documents from both primary and secondary sources. This paper is based on research data in the agro processing industry in Ghana. Data has been collected from various communities, including local government officials, reports on Agriculture and agro industries, newspapers, articles, conferences. Data collected has been analysed.

Status of Agriculture in Ghana

Agriculture is Ghana is an important economic sector and contributes considerable to GDP of the country (Table 1). The country produces variety of crops in various climatic zones which range from dry savannah to wet forest and which run in east west bands across the country. Agricultural crops, including yams, grains, cocoa, oil palms, kola nuts, and timber, forms the base of Ghana's economy. Performance wise, the sector used to be lead economic sector but this has been decreasing over the years as its share of the total GDP has been decreasing. Despite the decreasing in share of the country's GDP, it still employs more than half the workforce on formal and informal basis (Figure 1). According to the (GSS, 2010) population census, agriculture's contribution to total employment was estimated to be 42% and until recently, Agriculture was the largest employer, accounting for over 50% of total workforce but the Services sector has now dislodged the agricultural sector as the largest employer in Ghana, with a share of 43% (MOA 2012).

Cocoa is the only commercial crop of economic significance and while other industrial crops, including cotton, rubber, and tobacco are grown, their earnings is significantly small when compared to that of cocoa and other exports (The major exports are timber, gold, diamond, bauxite, and manganese). Unclear policies, weak institutional arrangements, poor infrastructure and inadequate financial support are amongst the several factors that adversely affect food production and agriculture in Ghana in addition to social and environmental problems.
from the agricultural sector. Agro processing industry thus means transforming products originating from agriculture, forestry and fisheries (FAO, 1997). The agro processing industry can be characterized along a number of dimensions including processing of imported agricultural commodities for the local market (global-to-local), processing of locally grown commodities for export (local-to-global), and processing of locally grown commodities for domestic consumption (local-to-local) (Sautier et al., 2006). Even though there are examples of large-scale global-to-local and local-to-global agro processing in Ghana, the sector is characterised by local-to-local agro processing which mostly dominated by informal sector activities that account for the bulk of informal employment and manufacturing in the country. The origin of Agricultural products processing in Ghana can be traced back to the very beginnings of colonial capitalism in the then Gold Coast. Until recently, a greater part of Ghana’s agro processing was only food which was done on a small scale and consumed internally. These included processing cassava into Gari and Cassava dough, Palm Kernel in to Palm Kernel oils, Groundnut and Copra into oils, Palm wine tapping, local Pito brewery, local gin distillery, fish processing and traditional soap-making. Traditionally, food processing has been the domain task of women in Africa and Ghana is no exception. These activities are mostly dominated by married female workers, over 30, and predominantly illiterate and they acquire these skills from within the family (Okorley and Kwaten, 2000). It is the belief that given the chance women can contribute substantially to the development of this sector of the food processing industry in Ghana (Okorley et al., 2004). Then there are also the forest product workers, mostly male, namely, carpenters, rattan and bamboo craftsmen, wood carvers and woodworking machine operators who were into non-food agricultural products like timber or bamboo processing.

Current Status and performance of Agro processing sector in Ghana

As is common in most developing countries, in Ghana agro-processing is the most important manufacturing sector accounting for at least 50% of manufacturing value added where food and beverages represent the largest part of agro processing. However it is estimated that about 80% of Ghana’s agricultural produce is sold raw. The high levels of unprocessed agricultural produce offer dear opportunities for the agro-processing sector, especially in the area of food, feed and the industrial processing of roots, tubers, grains fruit, vegetables, oil seed, fish and meat. Until recently, only a relatively small part of Ghana’s agricultural commodities was industrially processed. Most of the foodstuffs (cereals, roots and tubers, fruits and vegetables, pulses and oilseeds) are processed at home for subsistence with little surplus for sale on the local market. Operations in the informal sector are increasingly being mechanized, although the level of mechanization is still dominated by milling of grains, dehydrated tuber chips or slices, fresh or dehydrated vegetables, fresh or dehydrated fruits and grating of cassava. Mechanizing whole processing operations for local foodstuffs is hindered by the inadequacy of local raw materials to meet the demands of procedures involving the use of imported technologies or local adaptations. Processing of export commodities like fruits, cocoa, tobacco, coffee, and tea is limited, in quantity and stage of processing. Again, most of the firms in the industrial sector of the nation are not engaged in exports. The agro-processing and agribusiness subsectors in Ghana are yet to evolve into the anticipated growth pole of the rural development. The mode and conduct of majority of business in the agricultural sector and subsectors strongly reflects the dominance of subsistence and rudimentary nature of agricultural production in Ghana and even in the free zones where agro-based manufacturing investments fall within medium to large size industry categories, much of these firms are low in technology base (Mensah, 2006).

Processing of produce from the Agricultural sector in Ghana is critical for the food Security agenda, growth and transformation in agriculture which is a pre-requisite for sustained development of the overall economy and various National economic policy programmes since independence have regarded the creation of a strong and robust agribusiness and agro-industrial sector. Development policy programmes in the country have over the past years therefore consistently formulated various strategies on improving the agribusiness and agroindustry. An example of such programmes was the Presidential Special Initiative (PSI) established by the former president John Agyekum Kuffour government in 2001 to expand the industrial sector to employ some of the unemployed and promote private sector investment. The PSIs were originally intended to cover accelerated development for many local products however, the government quickly realized the huge task involved and decided to focus on developing four items as potential drivers of economic growth and wealth creation and targeted these sectors for special support: textiles and garments, salt mining, oil palm, and cassava starch production. In summary, over the years Governments of Ghana have implemented policies that add value to Ghana’s raw agricultural products (e.g. cocoa, cotton, oil palm, etc.). In recent times, intensive efforts have been made by government to process some of these products; for example, volume of cocoa beans processed locally doubled in the last decade, from 395,000 tons in 2000 to 740,000 tons in 2005, contributing 28% of agricultural growth in 2006 - up from 19% in 2001 (Bogetic et al., 2007). The main processed agro products are Maize, Rice, Oil palm, Groundnut, Cassava, Cocoa, Fruits (pineapple, mango, papaya, coconut, passion fruits etc.), Fish, Chicken,
Cattle and Snails. Processed agricultural exports amounted to US$323 million (Table 1) over the period January to December 2006. Cocoa products were the leading product category (Table 2), accounting for 47.3% of the total; this was a substantial increase from the 2005 export figure of US$74,029,004 to US$152,945,183, a growth rate of 106.6%. Cocoa paste and cocoa butter accounted for the bulk of cocoa products exported.

As mentioned earlier, the establishment of a special initiative by the President of the Republic of Ghana for oil palm, cassava starch and cotton was to expand and add value to non-traditional exports (Table 3) and to diversify the economy, create employment and improve local livelihoods.

About 1.2 million hectares of land are currently utilized for cocoa production and the country processes between 18 and 22% of cocoa output into liquor, paste, and butter for export markets, while all other cocoa is exported in its raw state. The link between cocoa production and other sectors of the Ghanaian economy including the processing sector (cocoa milling and cocoa butter production), other food industries (beverages, bakery, chocolate products) and trade, transportation, and other marketing activities, offer additional potential for growth. Two major non-traditional agricultural export commodities, palm oil and processed fruits, together account for only about 4% of total agricultural exports.

**CHARACTERISTICS OF THE AGRO PROCESSING SECTOR**

The Ghanaian agricultural product processing sector can be classified into village and domestic (Small Scaled) and factory processing.

**Domestic processing (micro, small and medium scale)**

This sector is dominated by small- and medium-scale family-owned businesses that process locally grown foods such as cassava, fruit and vegetables, and nuts. Their activities include processing cassava into Gari, cassava dough, of palm kernel, groundnut and copra oils, palm wine tapping, local Pito brewery, local gin distillery, and traditional soap making. These activities are dominated by married female workers, mostly over 30, and predominantly illiterate. Their skills are acquired from within the family. Their experience of seasonal underemployment is pronounced. Mostly married, with children, they lack social security protection. They are predominantly processing units dependent on family labour and are made up of a large number of small families in the rural and semi-urban areas. They are mostly illiterate or semi-illiterate and have no formal training. Farming skills are acquired through apprenticeship. They are predominantly processing units dependent on family labour and are made up of a large number of small families in the rural and semi-urban areas. They are mostly illiterate or semi-illiterate and have no formal training. Farming skills are acquired through apprenticeship. There are also the forest product workers, mostly male, namely, carpenters, rattan and bamboo craftsmen, wood carvers and woodworking machine operators. A case study on the informal rural agricultural sector show six distinctive types of rural labour were identified including Family labour, Casual labour (by-day), Apprenticeship, Permanent labour, Communal labour and Child labour (APADED, 1998). Domestic processing is limited to small-scale production and can be of variable quality. Most village and domestic processing industries cannot take advantage of powered machinery, except where an electrical supply is available and can have much influence on the community.

An advantage of small-scale agro-processing enterprises is that they can create employment at low levels of investment that make effective use of local resources. Enterprises owned and managed by individuals or households are often more successful than group enterprises, so technology development organizations need to be aware of this need for small-scale technologies.

**Factory processing (medium to large scale)**

Factory processing industries in Ghana are mostly of foreign decent or state owned. There are local establishments such as Cowbell and Fan Milk which produce dairy products and juices. Athena Foods Ltd and Pinora Ltd also have set up pineapple and orange concentrate juice factories. There are also multinational and regional food processors such as Nestle and Cadbury. Their activity has the potential to transform a society from mainly subsistence farmers to factory labourers. The community as a whole often does not share the profits, however, and the traditional lifestyle is lost. The labourers spend the money they earn on food and clothing and housing and are often poor. If factories are too big or not well planned, massive investments may be lost and local lifestyles, cultures and traditions can be badly and often irretrievably affected. However these factories can process large amounts of raw materials and the national economy can be improved by sales on the world market of such products such as coffee and cocoa.

**IMPORTANCE OF AGRO PROCESSING INDUSTRIES**

**Employment and income generation**

In Ghana, the agricultural sector remains the dominant sector employing most of the economically active labour force in the country. Currently about 56% of economically active labour force is employed in the agricultural sector.
and about half (48.7%) of the total female population is self-employed in agriculture and its sub-sectors, with the majority being engaged in food production (MOFA, 2207). Agro-processing industries in Ghana have the potential to generate directly significant employment in production activities and also indirect employment through its forward and backward linkages. This employment will be in rural areas where these industries have to be located near the source of raw materials, especially perishable agricultural products. The agro-processing industries are seen to play an important role in the economy of developing countries as a dynamic and fast-growing sector and therefore have the potential to provide opportunities for income generation and employment. Due to the continual growing of labour forces in many developing countries, it is an important income and employment sector since the agricultural and the formal sector are unable to absorb this growth. Farming on its own rarely provides a sufficient means of survival in rural areas of low income countries like Ghana. Agriculture is a seasonal activity in Ghana hence local processing at village level therefore offers employment to many as an important off-farm income-generating activity. Food processing industries contribute considerably to African national economies. In Africa, food processing accounts for 40% of the value-added by all manufacturing industries. These activities which are mostly small or informal enterprises are a major source of rural employment and particularly for women. They create jobs and income for about 60% of the Sub-Saharan African labour force, most of whom are women. These small-scale food processing industries are mostly rural based and supply local markets with low-cost consumer goods, add value to Africa’s produce, contribute to its economic growth through diversification, contribute to import substitution, and to foreign exchange earnings (as non-traditional export products) and increase the technical and management skills of the rural population.

### Food security

Food security is more complex than not having sufficient food to eat. It is more about having access to safe and nutritious food. Agro-processing can enhance the food security agenda by reducing food losses; increasing food availability and improving access to food but the vast majority of the development strategies undertaken to improve food security in most developing countries has concentrated on increased food production and the role that agro-processing can play has not received sufficient attention. Until now, most interventions have concentrated on post-harvest technologies with emphasis on on-farm and off-farm storage of agricultural produce (Andah, 2000). The major thrust of African governments strategies and agricultural research and development programmes have been to increase yields rather than make optimum use of what is already available (Owusu-Sekyere, 2011). Agro-processing helps to preserve food, reduce post-harvest losses and also extend the availability of food products over a longer period which reduces the hunger gap between the harvest period and the lean period when prices of food shoot up and put many people at nutritional risk (Owusu-Sekyere, 2011). The promotion and improvement of agro-processing and preservation, at all levels of food production, should be an essential component of national strategic plans for food security and should be an integral part of agricultural development efforts that aims at achieving national food security. In addition to this, governments and development agencies have to invest in micro and small-scale food processing to upgrade technologies and assist them to grow into market-oriented enterprises which would help facilitate increased demand for agricultural produce and thereby expand the market and incomes of farmers (Andah, 2000).

### Nutrition

Processing agricultural produce can contribute immensely to nutrition directly and indirectly through generating income to purchase a more varied and nutritious diet. Directly through producing food products that can contribute to a nutritious diet. In terms of poor nutrition in Ghana like the rest of Africa, the most vulnerable groups are women, children and weaning infants and many of the poor in rural Ghana depend mostly on agriculture for a living and to improve food and nutrition security of the whole of Ghana, the prevailing developmental view of the agricultural sector which focuses mainly on production must be expanded to include adequate storage and processing. Processing agricultural produce improves the

---

**Table 1. Share of Agriculture in GDP (%) by Year.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Share of GDP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>20</td>
</tr>
<tr>
<td>2001</td>
<td>20</td>
</tr>
<tr>
<td>2002</td>
<td>20</td>
</tr>
<tr>
<td>2003</td>
<td>20</td>
</tr>
<tr>
<td>2004</td>
<td>20</td>
</tr>
<tr>
<td>2005</td>
<td>20</td>
</tr>
<tr>
<td>2006</td>
<td>20</td>
</tr>
<tr>
<td>2007</td>
<td>20</td>
</tr>
<tr>
<td>2008</td>
<td>20</td>
</tr>
<tr>
<td>2009</td>
<td>20</td>
</tr>
<tr>
<td>2010</td>
<td>20</td>
</tr>
<tr>
<td>2011</td>
<td>20</td>
</tr>
<tr>
<td>2012</td>
<td>20</td>
</tr>
<tr>
<td>2013</td>
<td>20</td>
</tr>
</tbody>
</table>

**Source:** Compiled from Ghana statistical service.
value by the addition of ingredients for the purpose of enrichment, nutrition and healthier diets since processing activities add value to food.

Promotion of socio-economic development

Strong links exist between agro processing industry, agriculture and poverty alleviation. An Agro processing industry provides extra capital and services to farmers, promotes entrepreneurship, raises the demand for value added agricultural products and connects farmers with markets through the handling, processing, marketing and distribution of agricultural products. As a result, productivity and quality of agricultural production, farm returns, and economic stability for rural households, food security and innovation throughout the value chain can be enhanced. When considering food security agenda and poverty alleviation, one aspect that is often neglected is the cultural importance of food products however all cultures have traditional food products that they value for more than just the nutritional role. Small-scale agro processing helps to maintain production of these products. Small-scale agro-processing is dominated by women and thus has a central role to play in poverty elimination as it builds on indigenous knowledge, it requires few inputs and can be carried out in the home, thus enabling women to fully participate while maintaining their various other roles as carer and homemaker. Also Agro-processing encompasses the development and use of appropriate equipment and technology which are designed to save time and to make the processing of foods less labour intensive.

INDIGENOUS AGRO PROCESSING TECHNOLOGIES IN GHANA

Indigenous technologies are micro/small/medium-scale in capacity, ranging from household level operations to small/medium commercial operations and operations are mostly manual with high labour requirement (Andah, 2000). According to Warren, (1987) indigenous knowledge is unique to a given culture or society and Rajasekaran (1993) defines it as a systematic body of knowledge

Table 2. Exports of processed agricultural products, Jan to Dec 2006.

<table>
<thead>
<tr>
<th>Processed/Semi Processed Agricultural Products</th>
<th>Weight (kg)</th>
<th>Value, US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocoa Products</td>
<td>80,425,551</td>
<td>152,945,183</td>
</tr>
<tr>
<td>Prepared Foods, Beverages etc</td>
<td>72,483,795</td>
<td>151,945,183</td>
</tr>
<tr>
<td>Prepared Cereals/Tubers</td>
<td>25,942,197</td>
<td>4,374,793</td>
</tr>
<tr>
<td>Animal or vegetable oils</td>
<td>5,974,471</td>
<td>4,489,591</td>
</tr>
<tr>
<td>Sugar and sugar confectionary</td>
<td>1,605,919</td>
<td>1,884,091</td>
</tr>
<tr>
<td>Animal feed</td>
<td>16,432,095</td>
<td>5,954,111</td>
</tr>
<tr>
<td>Dairy products</td>
<td>3,567,334</td>
<td>5,311,511</td>
</tr>
<tr>
<td>Essential oils</td>
<td>17,942</td>
<td>17,851</td>
</tr>
<tr>
<td>Tobacco and tobacco substitutes</td>
<td>294,245</td>
<td>721,569</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>323,158,782</td>
</tr>
</tbody>
</table>

Source: Ghana Export Promotion Council (2007).
acquired by the local people through the accumulation of experiences, informal experiments, and intimate understanding of the environment in a given culture. Indigenous technologies are dependent on local agricultural produce and can therefore be found mostly in the rural areas in close proximity to the source raw materials which is advantageous in terms of having ready access to the raw material before deterioration sets in. Local people are the custodians of indigenous knowledge systems and are well informed about their own situations, their resources, what works and don't work, and how one change impacts other parts of their system (Butler and Waud, 1990). Productivity is usually low with indigenous technology as a result of inappropriate management of manpower usually family labour, made up of children and relatives however in rare cases where labour is fairly well managed, efficient use of manpower is achieved in terms of unit output per labour requirement (Andah, 2000). Indigenous technologies are often associated with health hazards such as exposure of operators to smoke, heat and toxic gaseous emissions from processing of certain product and some operations are carried out under very unhygienic conditions especially in remote areas without adequate supply of water. In summary indigenous knowledge systems are (Rajasekaran, 1993):

(i) Adaptive skills of local people usually derived from many years of experience that have often been communicated through "oral traditions" and learned through family members over generations (Thrupp, 1989).
(ii) Time-tested agricultural and natural resource management practices, which pave the way for sustainable agriculture (Venkatratnam, 1990).
(iii) Strategies and techniques developed by local people to cope with the changes in the socio-cultural and environmental conditions.
(iv) Practices that are accumulated by farmers due to constant experimentation and innovation.
(v) Trial-and-error problem-solving approaches by groups of people with an objective to meet the challenges they face in their local environments (Roling and Engel, 1992).
(vi) Decision-making skills of local people that draw upon the resources they have at hand.

Some examples of traditional agro processing technologies and techniques in Ghana include:

**Cleaning, separation and grating:** Harvested agro products needs further processing to get rid of various types of contaminations or undesirable matter. Cleaning grading and separation usually results in reduced bulk of the material, high value products, safe and longer storage, more out-turn of better quality milled products. Traditionally, women are children are involved in the initial processing of agricultural produce. For example in Ghana and common in West Africa, cassava processing into ‘Gari’ involves, cleaning and grating of the peeled tuber.

**Drying and dehydration:** Drying of agricultural products is an important unit operation. It refers to removal of moisture from grains and other products to a predetermined level, whereas dehydration means removal of moisture to very low levels usually to bone dry condition. Drying is a thermo-physical and physico-chemical operation by which the excess moisture from a product is removed. Drying makes the food grains and other products suitable for safe storage and protects them against attack of insects, moulds and other microorganisms during storage. Fresh Agricultural produce contains up to 95% water and thus is sufficiently moist to support both enzyme activity and growth of microorganisms and depending on the commodity, the critical level is about 10 – 15% moisture,

Table 3. Top ten non-traditional exports, 2005 – 2006.

<table>
<thead>
<tr>
<th>Product</th>
<th>Export Value (US$’000)</th>
<th>Percentage Contribution to Non-Traditional Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Cocoa Paste</td>
<td>95592</td>
<td>10.71</td>
</tr>
<tr>
<td>2 Veneer Sheets</td>
<td>77234</td>
<td>8.65</td>
</tr>
<tr>
<td>3 Prepared Tuna</td>
<td>55520</td>
<td>6.22</td>
</tr>
<tr>
<td>4 Cocoa Butter</td>
<td>53059</td>
<td>5.94</td>
</tr>
<tr>
<td>5 Plywood</td>
<td>40236</td>
<td>4.51</td>
</tr>
<tr>
<td>6 Frozen Tuna</td>
<td>39434</td>
<td>4.42</td>
</tr>
<tr>
<td>7 Shea Nuts</td>
<td>27249</td>
<td>3.05</td>
</tr>
<tr>
<td>8 Cut Fresh Pineapples</td>
<td>25869</td>
<td>2.90</td>
</tr>
<tr>
<td>9 Other Prepared Fish</td>
<td>24745</td>
<td>2.77</td>
</tr>
<tr>
<td>10 Other Frozen Fish</td>
<td>22839</td>
<td>2.56</td>
</tr>
<tr>
<td>Total</td>
<td>461776</td>
<td>51.72</td>
</tr>
</tbody>
</table>

Source: Ghana Export Promotion Council (2007).
because removal of too much water may make the product become brittle and shatter easily (FAO, 1989). The traditional method of drying of crops and grains in Ghana is sun drying. The aim in drying is to reduce the water content of the produce to a level insufficient for enzyme activity or the growth of microorganisms to reduce post-harvest loses. In most parts of rural sub-Saharan Africa, the agriculture produce that are dried are generally the surplus not consumed at harvest time. Due to prevailing dry atmosphere, sun-drying in the open method is feasible without the use of solar drying structures. Vegetables in these areas are reduced to about 10% moisture content by sun-drying, which ensured that they could be stored at moderate temperatures for about 18 months (Samu-Negus, 1985). Also in Ghana, sun-dried vegetables, spices and tubers like cassava feature prominently in the Ghanaian diet during the lean or off-season (Gyabaah – Yeboah, 1985). The traditional methods include drying on roof tops, on concrete constructions, along roadsides and in courtyards but have the disadvantage of being subjected to contamination from dust, fly and even human beings. The production, preparation and marketing of horticultural products; especially garden vegetables, are managed by women in West African countries hence all efforts at improving traditional techniques should be directed towards them (Fabre and Mihailov, 1985). Solar drying of agricultural products is better alternative to sun drying. It can be a means of supplementing or replacing artificial dryers with consequential savings in fuels and costs. Solar drying provides higher air temperatures and lower relative humidity than simple sun drying. It enhances the drying rate and lowers the final moisture content of dried products.

**Milling:** Milling is a common feature in food processing in Ghana, which normally involves reduction of food grains into various and products like meal, flour, split products etc. Milling may include pearling, dehusking, grinding / size reduction, mixing, polishing etc. and varies with different crops. For example milling of wheat refers to a grinding operation to produce flour, whereas in rice industry, milling refers to overall operation in a rice mill from cleaning of paddy to rice gradation. Milling also refers to extraction of juice and oil. Dehulling involves removal of the fibrous seed coat that tightly envelops the cotyledons. It is the major primary process in developing countries and it improves the cooking quality, digestibility and appearance of the product. Tools and process involved in milling ranges from hand held rudimentary tools to more mechanised setup as shown in the Figure 2. There are such established mills in most past of rural Ghana which offer services to food processor.
FACTORS AFFECTING THE USE OF IMPROVED TECHNOLOGY IN THE SECTOR

Traditionally, economic analysis of agricultural technology adoption (or lack thereof) has focused on imperfect information, risk, uncertainty, institutional constraints, human capital, input availability, and infrastructure as potential explanations for adoption decisions (Feder et al., 1985; Foster and Rosenzweig, 1996; and Kohli and Singh, 1997).

The literature on technology adoption suggests that technology adoption decisions may also be affected by a number of other factors (Feder et al., 1985; Feder and Umali, 1993). In the 1960s, several economists tried to explain how technologies could be diffused among countries. Gerschenkron (1962) believed that differences in nations ability to innovate technology and adapt it to their particular circumstances were the primary cause of difference in per capita income between countries and that the ability to appropriate what others had innovated was the essence of latecomer’s advantage (Vandana Chandra, 2006). Change is the key to a country’s development. History has shown that adoption of technology in response to environmental forces to a large degree has determined the economic fate of major developed nations. Therefore, a major factor in the survival of developing countries in the agro processing industry and to be able to withstand competitions from the developed countries is their ability to effectively capitalise on the immense potential of advancing technologies and to be able to achieve this developing countries like Ghana must be able to comprehend the changes that unfold in their environment and how to effectively adapt. During the last decade there has been a vast increase in international competition. The proliferation of diversified corporations has resulted in more companies competing in more markets and in more industries. With this growing competitiveness has come the need for productivity and quality improvement. To improve the competitiveness of Ghanaian small scaled agro processing industries, which is the heart and core of our manufacturing industry, investing in new and appropriate technology is the most important means to improve a competitive market position. There are number of factors that influence the extent of adoption and appropriation of technology such as; characteristics or attributes of technology; the adopters or clientele, which is the object of change; the change agent (extension worker, professional, etc.); and the socio-economic, biological, and physical environment in which the technology take place (Cruz, 1987). These factors that affect or influence the use of technologies for processing of agricultural products in Ghana can be categorised into the following headings;

Limited availability of credit for agriculture and agribusiness: The major financial problem in the agro processing sector is that the cost of processing and the machinery and equipment is still high in Ghana. Processors need two main types of finance; Capital for machinery, buildings etc. and working capital for some or all of the processing costs. The most common sources of finance for micro-enterprises are personal money from the owner, or borrowing from family members or friends. Equity financing is usually from personal savings, or from profits or earnings from selling most of their farm produce and other jobs or business. Borrowing from family, friends or banks requires repayment and the lender may also become shareholders in the business. Limited availability of commercial credit for agriculture and agribusiness is a severe constraint to the development of the agriculture and its sub sector in Ghana. Factors limiting the availability of agricultural credit include;

(i) The rural banking sector in Ghana is somewhat thin, although it is slowly expanding. With limited banking coverage, there is a lack of aggressive competition for the placement of loans.
(ii) The number of different financial instruments, such as factoring, warehouse receipts, and inventory credit that are available to Ghana’s borrowers is quite limited especially in the rural areas.
(iii) Banks only do collateral-based lending with steep coverage requirements, amounting to two or three times the value of the loan. Given the structural problems related to land titling in Ghana, most farmers cannot produce a clear title to their land and consequently, cannot qualify for bank loans. Furthermore, banks in Ghana will simply not lend against unsecured future cash flows, or against a signed sales agreement.
(iv) There is a strong reluctance by most banks to do agricultural lending, in view of the perceived risks of agriculture investments. Banks are concerned about crop failure due to too much or too little rainfall, pests, and diseases. Only a very small amount of Ghana’s farmland is irrigated during the dry season, which considerably reduces the risk of crop loss due to unfavourable weather.
(v) Most Ghanaian small scale agro businesses are not capable of preparing investment project analyses and investment proposals that present a “bankable” project. They require assistance and training on business planning, as well as financial accounting and business records. Furthermore, loan repayment terms are not sufficiently flexible for some longer term agriculture crops such as pineapple, and particularly for agro-forestry.

In situations where the technology must be brought from outside which is usually the case of medium and large scale processors, there is huge sums of import duties or tariffs on this technologies when they imported. Limited credit is such a deep-rooted problem in Ghana that no single solution is likely to provide much of an impact. Instead, a number of different programs running...
concurrently will likely be required to improve rural credit in Ghana. Hence majority of this processing industries with new technologies depends mostly on the presence of non-governmental organizations (NGOs), donor supported projects. Lack of access to credit is almost universally indicated as a key problem for the sector. This affects technology choice by limiting the number of alternatives that can be considered in technology acquisition in Ghana.

**Political Patronage and Governmental policy:** Ghana’s national policy and regulatory environment has an important impact on technology adoption decisions at the enterprise level. Primarily accounting for the situation is the failure of past policy initiatives to induce higher levels of value addition and industrial processing of agricultural outputs along a much longer value chain. Rather, these initiatives have generally focused on expanding the range of raw agricultural commodities offered by Ghana to the international market, with little emphasis on high-level processing, and reasonably so because of the weak infrastructure and absence of sufficient capacity for industrial activities. Consequently, the country’s exports, following over a decade of policy efforts to expand and stabilize sources of foreign exchange earnings still show considerable vulnerability to international price fluctuations.

Additionally, post-harvest losses still remains very high caused by the minimal progress achieved in agribusiness and processing. Since agriculture contributes a greater percentage of Ghana’s gross domestic product (GDP) which was estimated at GH 11.6 Billion in 2006 (ISSER, 2007). Apart from attempts to re-align the macro incentive structure which sought to liberalise Ghana’s economy in the mid-1980s, a specific medium term agricultural development plan (MTADP) was launched in 1990 and two rounds of Food and Agricultural Sector Development Policy (FASDEP I &II) have been implemented in the 2000s (Ghana Government, 2007). These policy interventions allowed a number of development partners such as Sasakawa Global 2000, Monsanto Company and Gatsby Charitable Foundation to support growth promoting projects in the food crop subsector (Boahene et al. , 2007).

Because the government of Ghana realises the economic importance of the processing industries, there are Tariff incentives of zero rated for agro inputs, plant and machinery and non-tariff - observation of regulations on import/export of agro products. Therefore processors can import in technology in the form of tools and machines free of charge According to the Food and Agricultural Sector Development Policy (FASDEP) tax incentive; Business’ converting crops, fish or livestock produced in Ghana into edible canned or other packaged products other than in their raw state enjoy a tax holiday of 3 years from commencement of commercial production. Where a company is engaged in farming and processing it may choose which of the applicable holidays it will wish to enjoy (FASDEP II):

(i) Agro-Processing businesses established in Ghana after 1st January 2004 enjoy 5(five) years tax holidays from date of commencement.
(ii) Companies producing cocoa by-products from cocoa waste also enjoy 5 years tax holiday from date of commercial products.
(iii) Companies engaged in the processing of waste enjoy seven (7) years tax holiday from date of commercial production.

While it is noticeable that some effort is being undertaken on the part of current and previous Governments and multilateral institutions, lack of a coordinated approach amongst small scale processing industry support institutions remain the greatest inhibitors for the growth of the sector. It is evident that most of the agents in the agro processing sector are incapable of sourcing, evaluating, and adapting such technologies effectively hence any government policies should aim to develop these capabilities in the agro processing sector through supportive institutions. Governmental policies should encourage the development of assistance programs to facilitate processors access to resources, information and training about the appropriate technologies which compatible with the major stakeholders’ circumstances.

**Limited linkages between research, extension services and the sector:** Linkages amongst research institutions, technology transfer agencies, farmers and Agro processors are far from effective in Ghana. The uptake of new technologies is often influenced by the farmer’s contact with extension services, since extension agents provide improved inputs and technical advice (Doss and Morris, 2001) and the same can be said for processors. The term ‘Institutions’ here are used in the loose sense to refer to bodies that support industrial technology, such as education and training, standards, metrology, technical extension, R&D, long-term credit, technology and export information etc. which may be government run, started by the government but run autonomously, or started and managed by industry associations or private interests. According to Entsua-Mensah and Sam (1999), an increase in Ghana’s agricultural productivity does not depends only on the dynamics of technical changes associated with farming systems, but also on some other decisive factors including:

(i) The generation of innovative knowledge through research,
(ii) The dissemination of innovative ideas through extension services
(iii) The reaction of farmers/processors, the potential adopters to these ideas.
The linkages that exist between researchers, extension officers and farmers are therefore of paramount importance in any successful agricultural endeavour since they facilitate the technology transfer process and the same can be said of the linkages between the agro processors, researchers and technology transfer agents. One major reason for the limited use or non-adoption of the technology in agriculture and agro processing in Ghana is due to the fact that farmers and processors in the rural areas are often treated like ignorant recipients of information rather than knowledgeable partners in technology transfer by extension officers and other technology transfer agents. In Ghana, the extension service is considered the main tool for agriculture and agro business information dissemination by the state. A review of the extension services in most parts of rural Africa indicates that most of them tend to operate within the RDD (Research, Development and Diffusion) model in the transfer of agricultural technology (Monu and Omole, 1982; Havelock, 1989; Lado, 1989). However, there is a relatively large shortfall in the number of extension personnel with the relevant skills and the willingness to work in rural areas, as transport and communication facilities are inadequate or non-existent. Admittedly, Ghana’s agricultural sector has been faced with the existence of enormous gap between available knowledge on improved technologies and actual practice. Apart from cash crop production for export where farmers have been benefiting from very efficient extension and many potentially useful technologies are “sitting on the shelves” while the private sector is struggling to commercialize a limited range of outdated technologies. Means to effectively and efficiently transfer technologies are needed in order to increase the capacities of producers to provide high quality raw materials and fresh products in agricultural value chains. Technology transfer to producers is far from being sufficient to support value chains development. There is often a gap between the supply of technologies and the specific requirements of farmers and firms. Increased attention is needed in developing and transferring improved agricultural and food engineering technologies, and operational and logistical technologies for improving efficiency along value chains. Public-private collaboration and partnership in research and dissemination of research results can improve the technologies available to small scale producers, processors and other value chain actors. One of the major features of a science and technology policy is the need for cooperation with a view to make optimal use of available resources and with a view to enhancing the development and application of science and technology. Inter-ministerial cooperation at the national level is enhanced by the existence of structures and mechanisms that can enable the science and technology community to mix and share experiences in their different fields. The existence of national unions for science and technology can go a long way in fostering such cooperation.

Scientists, technologists, and engineers can join hands and cooperate for the national good through national unions for science and technology.

**Limited technology transfer and Lack of Appropriation of agro processing technologies:** The lack of cohesiveness between the processors and the institutions limit their technological know-how about new and improve technologies in agro processing. Appropriate technology is technology which is suitable for small businesses and adapted to local conditions. The low overheads and greater flexibility of such technology would enable small businesses to compete effectively with larger organisations. The choice of an appropriate technology or machine seems straightforward, but it is still necessary to gather as much information as possible about the said technology. The main things to consider in adopting a new technology or buying equipment are:

(i) Which parts of the process require mechanization or technological improvement and which can be done manually;
(ii) The correct size of the equipment or its capacity to able to achieve the intended scale of production to ensure that all equipment has a similar throughput;
(iii) Whether to buy equipment from a local engineering company or to import it.

Generally, it is preferable to see machines or technology in operation elsewhere to properly understand the workings of such a technology or machine. According to Auto and Laamanen (1995), technology transfer is a goal-oriented process that is likely to enhance the technological capabilities of an organization and increasing the performance of a particular organization. Generally, the need for new technology stems from three factors (Sherman, J. Daniel):

(i) A slowdown in productivity growth,
(ii) increased international competition, and
(iii) Advances in technologies.

Since majority of the agro processing industries in Ghana are small scaled, their productivity is low when compared with competition internationally where advanced technologies are mostly used. The ineffectiveness and slow progress of technological development, adoption and transfer in Ghana constitute a major problem in the agriculture and agro processing sectors. The inability and/or failure of the research centres to generate useful and easily acceptable technologies can generally be attributed to the lack of adequate resources and inappropriate policies. There are institutions set up by the government to cater for the needs of smaller agro processing industries. One such institution in Ghana is the National Board for Small-Scale Industries (NBSSI). The National Board for Small-Scale Industries (NBSSI) is
the apex organization set up by the Government to promote and develop the small-scale industrial sector. The NBSSI was established by an Act of Parliament in 1981, Act 434, and is governed by a Board of Directors. The Government makes nominations to the Board, headed by an Executive Director who sees to the day-to-day running of the organization. It is subsidized and funded mainly by the Government of Ghana. Included in the many purpose of NBSSI is to support small scale industries to secure credit by;

(i) Providing advice and direction for obtaining financing,  
(ii) Helping to locate sources of funding and working with the entrepreneur on his/her application,  
(iii) Helping to improve and streamline entrepreneur’s accounting and business records, 
(iv) Credit delivery and recovery.

The Intermediate Technology Transfer Units (ITTUs) has been established in all the capitals of the 10 regions to develop and supply appropriate equipment for agro-processing and The Agriculture Engineering Services Department also promotes the construction of improved storage structures such as cribs and barns to improve farm level and household storage.

Another such institution is that aiding in the technology transfer in all sectors is the Council for Scientific and Industrial Research (CSIR). The Council for Scientific and Industrial Research is Ghana’s main R&D Organisation and was established in 1968 as a public organization to undertake and coordinate Ghana's Scientific and Technological Development. It is made up of 13 Institutes each specializing in specific scientific and technological discipline. By an Act of Parliament of the Republic of Ghana CSIR Act 521 of 1996, the CSIR was re-established with a new mandate to conduct market-oriented, demand, driven research and also to commercialize the research results and technologies developed (Parliament, 1996; Yawson, 2003).

Characteristics of the technology to be adopted: It has long been recognized that the nature of the technology itself is a key condition in the rate and extent of adoption of any new technology. Important characteristics that can encourage or discourage adoption include the complexity of the technology, its profitability, riskiness, compatibility with other technologies or practices, and divisibility (Morris et al., 1999). The characteristics of the technology do matter and deserve careful attention even though these characteristics themselves do not determine adoption or use of technology as technologies that are simple, inexpensive, and risk-free may never be taken up the same way technologies that are complex, costly, or risky may find wide acceptance (Morris et al., 1999). Agro processors like Farmers are naturally interested in technologies that give higher returns to scarce factors of production (e.g., labour, cash, land, or some combination of these) and also consider the risks involved in adopting a new technology. Several types of risk can be distinguished (Morris et al., 1999). Research on farmers has shown that often they place a premium on stability, choosing technologies that perform satisfactorily under a wide range of conditions instead of technologies that perform exceptionally well but only under favourable conditions and new technologies also stand a better chance of being adopted if they are compatible with current farming practices and this situation can be inferred to the agro processing sector. Most micro level or small scale processors are unable to adopt certain technologies in Ghana because they consider these technologies to be “Hi-Tech” or highly technical.

Maintenance and Management requirements of new technology: The universal definition for maintenance is based on minimum principle of conservation and long life cycle on structure, systems and equipment. The main objective of maintenance is seen as preserving the operational reliability and the economic value of an asset (Diaz-Cabrera et al., 2007). The greatest challenge that may hinder the development of any economy is the discipline of maintenance and many African countries like Ghana are caught within this phenomenon of limited culture of maintenance thereby hindering their progress and increasing their budget deficits annually on the same projects they could have avoided if measures of sustainability were observed. Poorly maintained technologies are a potential hazard to its operators and leads to the production of substandard products but proper maintenance ensures that machinery operates correctly and safely and prolongs its life, thus reducing capital and operating expenditure. A common reason for loss in production is delays caused by equipment breakdowns and waiting for spare parts which causes processors to operate at below planned capacity and reduces its profitability.

Improved technologies presents important new opportunities for both small scale and medium scale and even larger scale agro processing industries but if this potential is to be realized, the different functional areas of the agro industry must be managed as an integrated whole. To remain competitive, it is necessary to change and to adapt to new developments on all fronts. This is where management of the new technologies becomes essential. Most small-scale processors do not keep a stock of machinery spare parts because of the cost and only a few producers have compares the cost of keeping a stock of spares with the cost of delayed production. This is especially important if delivery times for spare parts of machinery not locally produced are several weeks hence processors that have adopted some improved technology or equipment should identify the priority spares for each process, and ensure that a spare component is always kept in stock. Many small-scale processors in Ghana do not have
a programme of planned maintenance to replace parts before they wear out and the culture is to continue using a machine until it breaks down and then repair it which they believe that it is cheaper. Decisions regarding the costs and benefits of planned maintenance depend on the speed at which repairs can be done, the value of the spares that have to be held in stock and the value of lost production caused by stoppages however maintenance is better than rehabilitation in economic sense.

**Inadequate supply and Cost of Energy:** Energy is an essential facet of human activities, the live wire of industrial, food and agricultural production, the fuel for transportation as well as for the generation of electricity in conventional thermal power plants. Energy determines the rate at which work is done and is an essential ingredient of socio-economic development and economic growth (Sambo, 2005). Industrialized agriculture and food production rely on energy to carry out the desired operations and obtain high efficiencies in mechanization of crop handling and conveyance and processing, to assure safe storage of agricultural products, and conversion processes that create new forms of food. Electricity and petroleum account for a major portion of energy for food and farm processing operation. Commercial energy inputs are indispensable parts of transitional and modern agriculture because a slight increase in the energy inflow often results in a significant response in food production (Bamgboye and Jekanyinfa, 2007), hence there is a particular need for energy management strategy in agricultural industry.

Ghana has an energy (electricity) supply deficiency and anytime there are long periods of erratic rainfall which causes the hydro plant which generates the bulk of the country’s energy requirements to dry up. Renewable energy sources such as solar energy and wind are not well known and are yet to be fully exploited, but can be considered potential sources to supplement hydro power generation. The agricultural sector in Ghana has the lowest share of energy demands of all the sectors because of its relatively low capital intensity, limited adaptation of technology and heavy reliance on labour-intensive technologies. Even though Agriculture and its subsector also contributes to the energy sector immensely by producing and supplying wood fuels however the final energy use by the sector is very small, accounting for less than 2% of total energy use in 2000 as shown in Table 4.

According to Ghana’s Energy Commission, the agricultural sector largely consumes petroleum products particularly diesel and pre-mix fuel but its demand for electricity is minimal and sectorial analysis of electricity consumption reveals that agriculture’s share of electricity has barely changed, in 2013 agriculture and the fisheries sector consumed about 1.5% of total consumption by sector (Energy Commission, 2014). The energy intensive activities within the agricultural sector are fishing, ploughing, tobacco curing irrigation and poultry with the fishing subsector accounts for the largest share of energy use in the agricultural sector in 2000 (Table 5) largely because of the use of diesel and pre-mix fuel to power fishing vessels.

Ploughing activities accounts for the second largest source of energy use in agricultural sector in 2000 because of the diesel required to power tractors. Poultry activities tend to be electricity intensive while irrigation facilities are powered by both diesel and electricity. Irrigation and agro processing currently accounted for less than 1% of energy utilization within the agricultural sector and sadly this hasn’t improved over the years.

The National Electrification Scheme (NES) was instituted in 1989 as the Government of Ghana’s principal instrument to achieve its policy of extending the reach of electrical energy to all parts of the country over a thirty-year period from 1990 - 2020. The importance of the NES was seen in the fact that at the beginning of the NES, only about 15% of the total population of Ghana had access to electricity supply. However, for the rural population who from more than 70% of the country’s population, access to electricity was only 5%. Sixteen years down the line however there is growing evidence that not all the objectives have been achieved although through the NES access to electricity nationwide has risen to 54% as at 2005 (DEA 2007). Demand for electrical power in Ghana has been growing at

---

**Table 4. Total energy demand (%) by sector in 2000.**

<table>
<thead>
<tr>
<th>Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture &amp; Fisheries</td>
<td>1.65</td>
</tr>
<tr>
<td>Commercial &amp; Services</td>
<td>1.65</td>
</tr>
<tr>
<td>Households</td>
<td>52.7</td>
</tr>
<tr>
<td>Industry</td>
<td>15.8</td>
</tr>
<tr>
<td>Transport</td>
<td>23.9</td>
</tr>
<tr>
<td>VALCO</td>
<td>4.05</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Ghana Energy Commission

**Table 5. Energy share by sub-sector in the agricultural sector in 2000.**

<table>
<thead>
<tr>
<th>Sub-Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishing</td>
<td>75.6</td>
</tr>
<tr>
<td>Irrigation</td>
<td>0.5</td>
</tr>
<tr>
<td>Land preparation &amp; harvest</td>
<td>20.6</td>
</tr>
<tr>
<td>Tobacco Curing</td>
<td>3.2</td>
</tr>
<tr>
<td>Post-harvest processing</td>
<td>0</td>
</tr>
<tr>
<td>Poultry</td>
<td>0.1</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Ghana Energy Commission
14% annually, far outstripping growth in total supply. The Electricity Company of Ghana loses 4% of its domestic energy production through transmission losses, and 24% more as a result of obsolete equipment in its distribution system. At the same time, there is a lack of reliable and affordable energy for the agricultural economy. In one case, the unreliability of the electrical grid required a packing operation to resort to freestanding generators to run the plant. In this instance, costs associated with generator operations amounted to 60% of total operating costs for the plant. Constant and reliable electrical and water supplies are essential for successful processing operations. Continuing deterioration of these services could harm the industry. The shortage and high cost of electrical power is a major problem for the agricultural sector, especially for agro-processors. While many companies have access to commercial power in industrial areas, the erratic supply requires the company install stand-by generators to provide uninterrupted electrical power. Majority of the processors are in the rural areas where there is abundance of raw materials, however there is little or no access to electricity which powers most processing equipment. In areas where there is no access, alternative energy sources are used; mainly wood fuel and charcoal. Energy use in this case is very wasteful as a result of application of inefficient heating appliances. Very often stoves are made of three stones with openings that allow most of the heat from burning fires to escape. Fuel (wood) requirement per batch is very high. This contributes to extensive degradation of the environment through indiscriminate exploitation of forestry products.

Dependence of FDI (Foreign direct investment) and fatigue: Numerous studies have shown that the inflow of foreign direct investment (FDI) can be a valuable tool for development, however not all forms of FDI can be quite beneficial for the host country. Deep into Ghana’s rural areas, there is a heavy presence of multilateral and bilateral donor sponsored organizations that underwrite a wide variety of assistance programs for stakeholders in the agricultural sector including farmers, farmer based organizations (FBOs), and small and midsized agro-enterprises.

Under the backing of the World Bank and the IMF, Ghana’s government purposefully began to acquire FDI through the Economic Recovery Programme of 1983 and at the early 90s, a large privatisation programme that sold over 200 state-owned facilities – arranged further incentives to steer more FDI into the economy (Abdulai, 2005; Franz and Muller, 2015).

In comparison to the total GDP, agricultural FDI volume in Ghana is rather small, between 1994 and 2009 for example, only 3% of the FDI inflow was invested (383.07 million USD) in Ghana’s agricultural sector but in the period of 2009 to 2012, FDI in agriculture increased to 975.18 million USD, approx. 6% of the total volume (GIPC, 2008 – 2012; Franz and Muller, 2015). Ghana’s agricultural sector has been seen to be strengthened by these outside interventions, including contributions to or support of investments over the years, as the FDI inflows in the agricultural sector have had an important impact on the Ghanaian economy, especially for the creation of employment as it was expected to create 196,313 jobs between 2001 and 2009, of which 195,814 were supposed to be allocated to local people and 499 to foreigners (GIPC, 2009) but according to the FAO (2013), the employment creation of FDI inflows in the Ghanaian agriculture is “underscoring again the crucial role FDI can play in reducing poverty in rural areas given the relatively high labour-intensive nature of agricultural related activities therein” however, it is questionable whether the expected employment numbers are actually reached (Franz and Muller, 2015).

In many developing countries, the demand for processed and/or packaged food is growing hence the food processing and manufacturing sector is gaining importance (Wilkinson and Rocha, 2006) and compared to other areas of the Agro-food value chain, food processing became the main beneficiary of FDI in the 1980s (Hawkes and Murphy, 2010).

The impacts of Agro processing FDI in developing countries can be observed in different areas but despite numerous research studies having been conducted on these impacts of FDI in the food processing sector in developing countries, no consensus can be reached on whether these impacts are of a positive or negative note. As some surveys suggest that the effects may be negative, inhibiting host country innovation and drawing only on engineering and technical assistance services, other studies suggest that basic food research in large developing countries is increasing pointing to the need for capacity building in this area (Rama and Wilkinson, 2008). The impacts of food processing FDI on the food security of developing nations are widely neglected and the positive impact of food processing FDI on the poor population in low-income developing countries is very minimal or even has a negative impact as the poor population cannot afford the products, the production of goods for the sole purpose of exporting them clearly limits the actual national food security level. On the contrary, in middle-income developing nations, where processed food is a standard repertoire on domestic markets, the consumption of these foods has increased over the last years (Wilkinson and Rocha, 2009). Also most donor projects tend to run for three to five years, after which they close down and new projects take their place. This creates a tendency for local stakeholders as well as state institutions, to focus on short term projects with immediate results, rather than on the long-term sustainable projects that can have much broader and more durable impact on the sector. In addition, state institutions often surrender their responsibility for providing support and services to the agricultural sector. In Ghana, many believe that the government has transferred control over...
management of the agricultural sector away from
government institutions and into the hands of donors and
NGOs. The government is seen as performing well in the
development of policy, but poorly in terms of
implementation, due to a shortage of staff and skills, as well
as excessive reliance on NGOs to get the job done.
Moreover, there is a tendency by farmers to “farm projects”
either than land. If new funds can reliably be expected to
come along every three to five years, each one based on a
new agricultural direction, there is an understandable
tendency on the part of farmers and processors to split
their attention between maximizing earnings from their
land and maximizing income from grants and program
support. All too often, this dual-track strategy leads to
conflict, which in turn leads to de-emphasis of the
production dimension in favour of FDI. However on the
positive side, from a resource-based point of view, this
transformation process may have positive impacts which
may include its contribution to overall economic
development, the innovation performance and changes in
the prevalence of poverty and food security. FDI has
considerable importance as a vehicle for technology
transfer. This transfer can of course take place directly to
the firms affected, but there may also be important effects
of indirect diffusion of technology in the host country. Such
diffusion may be deliberate, for example through the
upgrading of technologies in other domestic firms doing
business with the foreign affiliate, or in the form of spill
over effects, such as when technology is copied by other
firms. Other important positive effects in the host country
could be the pressure on domestic producers to upgrade
and improve efficiency. According to WTO, the empirical
evidence tends to support the view that FDI is the most
potent vehicle for technology transfer and that FDI leads to
higher productivity in locally owned firms.

**Gender Issues:** Gender equality and women’s
empowerment are far from being achieved in Ghana,
although studies have shown that women play significant
role in agriculture and agro processing. Despite the role of
women in the production, processing and marketing of
agricultural produce in many countries in Africa,
agricultural information and production resources are not
reaching and benefiting them in the food security chain,
women have limited access to land, agricultural extension
services, credit, infrastructure, technology and markets that
are crucial for enhancing their productivity. Women in
agricultural households play important roles in the
agricultural production process but their input is often
underestimated or not accounted for at all. In fact, it is
estimated that women constitute about 48.7% of the labour
force and they account for about 70% of the total food crop
production. The post-harvest sector is well dominated by
women in Ghana; they process and market nearly all the
grain and starchy staple foods. Indeed, women’s role in the
marketing and distribution of agricultural products has
long been recognized. Women in Ghana form the bulk of
the "middlemen" who will brave all odds and reach out to
the remotest village to bring food to the rural and urban
markets and also provide useful market intelligence on
agricultural commodities. Despite the tremendous role of
women in the socio-economic development of Ghana, social
and cultural practices, traditions and customs have
prevented women from realizing their full potentials in the
development process.

**Conclusion and Recommendation**

In order to achieve long-term growth in the agro processing
sector, especially food processing, Ghana must invest to
upgrade the small scale processors to medium scaled
massively in the medium- to long-term through research
and extension services, access to new and appropriate
technology, access to market (both local and
international) and the development of rural
infrastructure. That way, the overall contribution of agro
processing sector to GDP and well as the food security
agenda will increase tremendously.

Long-term growth in Ghana’s agro processing sector can
only be achieved through a sustained commitment to
strengthening the country’s infrastructure, including
through better roads, warehouse space, access to energy,
and most important of all the technology and technological
transfer institutions and other fundamental resources for
doing business.

Links, networks and alliances amongst agricultural
research centres in the regions need to be forged and
strengthened in order to facilitate and foster modes of
institutional collaboration that enhance agricultural
production, productivity and agro processing. Additionally,
exhibitions of agro processing and agricultural technologies
frequently would generate some awareness for potential
adoption and users of such technologies. It should
however to be stressed that this kind of exhibitions should
be done at the level that that is accessible to the rural
industry, thus, an urgent need to enhance exhibition
activities of agro processing and agricultural technologies
in the rural areas instead of limiting them to urban areas.
Such events are vital in improving the use of modern
agricultural science and technology amongst farmers and
hence increase agricultural production, productivity and
ultimately food security.

The importance of agricultural extension services to
improved agricultural outputs, productivity and food
security in Ghana should not be underestimated. Extension
services activities can be extended to small scale agro
processors to assist them adopt improved processing
practices through direct interaction with the extension
personnel. Studies have shown that the Extensive services
in Agriculture proves to be a most effective and efficient
way of diffusing, assimilating, and absorbing improved
agricultural techniques and technologies for increased production, productivity and food security hence can be applied to the processing sector. However for the extension services to reach their full potential of information dissemination in Ghana, certain constraints against their operation have to be resolved. Apart from limited personal, they lack access to the rural areas due to poorly developed infrastructure, like transportation and electricity and though there has been efforts from the various governments and multilateral organization there needs to be the introduction of more incentives in the extension services to appeal to the youth as a viable career option. To raise the technological level of subsistence and small-scale commercial agriculture and agro processing industries, Ghana has to increase the supply of modern agricultural equipment and technology to these sectors. The problem, however, is not only one of ensuring a greater supply of modern equipment but also of devising ways and means through which farmers and processors can get access to new knowledge and technologies.

One approach of achieving this is to make it easier to borrow money, but also to give such loans to the purchase of equipment and equipment parts and accessories. Furthermore, generating the capacity to buy equipment or technology is only the beginning of a long journey, the task of making processors 'learn' the skills, knowledge and expertise required for the efficient use, maintenance, repairs and upgrading of equipment.

Since the state cannot afford to subsidize all individual purchases of processing equipment on a mass scale, the establishment and consolidation of cooperative societies remain important in increasing agricultural production and agro processing. The small scale processors should be able to form, operate and change collective or co-operative institutions. Savings and Credit Cooperatives Societies (SACCOS) is not a new thing in Ghana, in fact the first SACCO Society, in Africa, was introduced in Ghana in 1959, intended to assist villagers improve their economic conditions (Ng’ombe and Mikwamba, 2004). Also as common in most Sub-Saharan Africa, there are gender specific constraints that women face such as less education, inadequate access to land and low level of production assets ownership there is a need to know how development policies and programmes are likely to affect the economic activities and social relationships among different groups of people in a community. As indicated earlier, science and technology can make substantial contributions to effective development of Ghana’s agriculture and its subsectors. However, it recommended that priority should be placed on at least these five domains:

(i) Human resources development;
(ii) Increased investment in agriculture;
(iii) Establishment of appropriate institutions;
(iv) Formulation and adoption of appropriate policies and
(v) Inter-institutional cooperation within and outside

Ghana.

REFERENCES


1191427986785/WilkinsonJ&RochaR_Agriprocessing&DevelopingCntries%5B1%5D.pdf).


Cite this article as:

Submit your manuscript at http://www.academiapublishing.org/journals/ajar