

Research paper

Production Constraints and Measures to Enhance the Competitiveness of the Tomato Industry in Wenchi Municipal District of Ghana

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ABSTRACT

 **Aims:** The study assessed the production constraints and measures to enhance the competitiveness of the tomato industry in the Wenchi Municipal District of Ghana.

Study design: Cross-sectional.

Place and Duration of Study: Wenchi Municipal District of the Brong Ahafo Region of Ghana in the 2010 cropping season.

Methodology: Fifty (50) randomly selected tomato farmers took part in the study and were interviewed using a semi-structural questionnaire. Kendall's Coefficient of Concordance was used to rank the constraints to tomato production. The Porter's Diamond of National Advantage was used to assess the competitive position of the tomato industry in the area as well as the strategies needed to improve competitiveness.

Results: The study found that small scale tomato producers in the district face a myriad of production constraints which limit their ability to increase production. The constraints include lack of capital, high cost of inputs and low produce price. The tomato industry in the area can however become competitive and enhance economic growth.

Conclusion: The tomato industry in the study area has the capacity to become competitive and enhance economic growth through the creation of agribusiness clusters. For this to happen, there is the need for prudent government policies which create incentive and an enabling environment for agribusinesses to flourish.

 **Keywords:** Agribusiness clusters, Competitiveness, Ghana, Porter's Diamond, Tomato production constraints

1. INTRODUCTION

Tomato (*Solanum lycopersicum* L.) is one of the most popular and widely consumed vegetables in the world [1]. According to [2], tomato is a popular vegetable with a high per capita consumption in Ghana, used in almost every Ghanaian home. Tomato is also a food security crop in Ghana [3]. It is a source of foreign exchange and contributes significantly to the economic growth of the country [4]. In 2003, Ghana exported 4,368 metric tonnes of tomatoes valued at \$427,000 [5]. Fresh tomato and canned tomato products such as

32 concentrates, puree and paste are increasingly in demand in the country as they form an
33 essential part of the diet of the people. 

34 In Ghana, tomato production is an important economic activity for smallholder farmers. A
35 wide range of areas are suitable for the production of the crop in the country. These include
36 the forest, transitional and savanna zones of the country [1]. In recent years, domestic
37 production has intensified across the country, but the level of production falls short of
38 domestic demand. As a result, fresh tomatoes are often imported mainly from neighboring
39 Burkina Faso [6]. This situation is the result of a number of constraints in tomato production
40 including pests and diseases, low quality and insufficient quantity of tomato produced and
41 competition from imports 

42 Fresh tomato is an import substitute in Ghana. As a result, the tomato industry is subject to
43 the effects of trade liberalization policy which have implications on the competitiveness of the
44 tomato industry in the country. As indicated by [7], fresh tomato is one of the commodities
45 gravely affected by trade liberalization policy in Ghana.

46 There is insufficient empirical evidence on how Ghana's tomato markets performed after
47 trade liberalization. However prevailing public opinion and findings of advocacy studies
48 blame supply gluts and perennially volatile and often low prices of tomato on the importation
49 of tomato products into Ghana [7]. It is generally believed that the liberalization of import
50 trade in Ghana opened domestic markets to import dumping of subsidized and cheaper
51 agricultural products from the EU, U.S.A, and Asia, which consequently destroyed the price
52 competitiveness of domestic products. For example, [8] noted that at current market prices for
53 tomato in Ghana, domestically produced paste cannot compete with imported paste from the
54 EU and China. The contrasting view however is that weak market institutions, poor
55 infrastructure and high trader margins are to be blamed for the inefficient arbitrage and lack
56 of market competitiveness in agricultural markets in Ghana.

57 According to [9] tariffs reduction as a result of trade liberalization policy adopted by Ghana
58 increased the importation of tomato products into the country beyond the trigger volume after
59 2000. This led to local tomato producers losing their market share by 35 percent and local
60 tomato prices becoming perennially low, highly dispersed and volatile. According to [7], the
61 problem could be attributed to import dumping of cheaper tomato products from the EU on
62 Ghana and the resulting reduction in competitiveness for locally produced tomato. On the
63 other hand, opponents of the import dumping theory hold the view that the inability of the
64 Ghanaian government to strengthen market institutions and improve infrastructure to enable
65 the private sector replace state institutions after liberalization is the reason for the problem.
66 The emergence of "healthy" marketing systems has been identified as crucial for the
67 success of liberalized trade policy in Ghana [10].

68 There are three large-scale tomato processors in Ghana namely Wenchi in Brong Ahafo, 
69 Northern Star (formerly named Pwalugu) in Upper East and Expom (formerly named Trusty
70 Foods) in Greater Accra [8]. These processors are located in key growing areas and when
71 functioning, provide an additional market for tomato farmers. The Wenchi and Northern Star
72 factories have been in and out of production during the past two decades while Expom
73 depends heavily on imported bulk tomato paste. According to [8], by the late 1980s, a
74 combination of structural reforms, frequent breakdowns resulting from a lack of spare parts
75 and obsolete machinery, lack of technical competence and financial management, and poor
76 marketing, resulted in the closure of Ghana's tomato processing factories.

77 Wenchi Municipal District is one of the important tomato producing areas in the country
78 where the concept of agribusiness clusters can be applied to understand the

competitiveness of the tomato industry. The tomato industry in the area has been identified as a means of poverty reduction because of its potential for growth and employment creation. According to [11], improving domestic tomato processing would reduce the country's dependence on imported tomato paste and also improve foreign exchange reserves, as well as provide employment and development opportunities in poor rural areas of the country.

The study sought to identify and rank the constraints militating against tomato production in Wenchi Municipal District as well as assess strategies to improve the competitiveness of the tomato industry in the area. **The study is significant in many ways.** As the nation strives to reduce poverty as a millennium development goal, there is the need to give commitment to the tomato sector as it plays a major role in employment and income generation among smallholder farmers in many poor rural communities in Ghana.

The main objective of the study was to identify and rank the constraints to tomato production in Wenchi Municipal District and to assess the strategies that can be used to improve competitiveness of the industry in the area. The specific objectives were: (1) To identify and rank the constraints to tomato production in Wenchi Municipal District of Ghana, and (2) To assess strategies that will be effective to improve competitiveness of the tomato industry in Wenchi Municipal District.

2. MATERIAL AND METHODS

The Kendall's Coefficient of Concordance test was used to identify and rank the constraints to tomato production in the District. The Kendall's Coefficient of Concordance test is a non-parametric statistical procedure used to identify a given set of constraints or problems, from the most influential to the least influential as well as measure the degree of agreement or concordance among the respondents. The constraints were ranked from the most influential to the least influential using numerals 1, 2, 3 ... n in that order (where n is a positive integer). The total rank score for each constraint was computed and the constraint with the least score was ranked as the most pressing constraint, while the constraint with the highest score was ranked as the least constraint. The total rank score computed was used to calculate the Kendall's Coefficient of Concordance (W), which measures the degree of agreement between respondents in the ranking. The equation for the Kendall's coefficient of concordance is given as:

$$W = \frac{12[\sum T^2 - (\sum T)^2/n]}{nm^2(n^2 - 1)} \quad (1)$$

Where, W = Kendall's Coefficient of Concordance, T = Sum of ranks for constraints being ranked, m = Total number of respondents (farmers), and n = Total number of constraints being ranked.

The Coefficient of Concordance (W) was tested for significance in terms of the F – distribution. The F – ratio is given by $F = [(m-1)W/(1-W)]$, with numerator and denominator degrees of freedom being $(n-1) - (2/m)$ and $m-1[(n-1) - 2/m]$ respectively [12].

123 2.1 Test of Hypothesis:

124 The following null hypothesis was tested:

125 Ho: Respondents do not agree on the ranking of the constraints to tomato production in the
126 area.

127 The null hypothesis is rejected if the calculated F – value exceeds the tabulated F – value,
128 indicating that respondents agree with each other on the ranking of the constraints.

129

130

131 3. RESULTS AND DISCUSSION

132

133 3.1 Socio-economic characteristics of respondents

134 The study showed a male dominance in tomato production in the study area. Seventy eight
135 (78) percent of the respondents were males with 22 percent being females. The male
136 dominance could be attributed to the capital intensity of tomato production and the risks
137 involved. Men generally have greater access to productive resources and financial capital
138 than women. [13] noted a male dominance in tomato production in their study in northern
139 Ghana and attributed it to tomato production being capital intensive. According to the
140 authors, tomato production is a risky venture and women appeared unwilling to take so
141 much risk for fear of incurring debts. Women participation in tomato production can therefore
142 be encouraged if they are given more access to land and financial capital.

143 Majority of the farmers (80%) were in the youthful age of 21 to 40 years. The large number
144 of young people involved in tomato production is a positive development since the youth are
145 noted to abandon farming in search of other jobs in the major towns and cities. More young
146 people can be encouraged to pursue tomato production to reduce the unemployment rate in
147 the country and help to address the negative trend of the youth forsaking agriculture in
148 general.

149 The educational status of the respondents showed that 84% had attained up to junior high
150 school education. Twelve (12) percent had no formal education. Hence the level of
151 education of the respondents can be described as inadequate to provide them with the
152 requisite business skills to effectively manage their farm enterprises.

153 The study further showed that land acquisition for tomato farming was by inheritance (60%)
154 or leasehold/rent (40%). The farm size of respondent ranged from 0.5 – 4.0 acres with
155 majority of farmers having farm size of one acre as shown in Table 1. The small farm
156 holdings could be attributed to the capital intensive nature of tomato production and farmers'
157 inability to raise enough capital to expand their scale of production.

158

159 **Table 1. Farm size of respondents**

Farm size (acres)	Frequency	Percentage
0.5	2.0	4.0
1.0	33.0	66.0
2.0	2.0	4.0
2.5	10.0	20.0
3.0	1.0	2.0
4.0	2.0	4.0
Total	50.0	100.0

The most common method of land preparation was slash and burn, used by seventy (70) percent of the respondents. Only 16% of farmers used tractor to plough their lands.

3.2 Tomato varieties grown by farmers

The major tomato varieties grown in the study area were Pectomech, Power-Roma, Tec 5, Rheno and Ouga. Power-Roma is the most preferred variety due to its high yielding qualities although it requires stringent management practices. Power-Roma is a traditional variety and has been cultivated by farmers for a long time. Farmers' preference for Pectomech, a high yielding variety, is increasing despite its high managerial requirements. Farmers in the study area did not invest much in improved varieties as most farmers did not find any significant price differential between the different varieties grown in the area. The farmers found the cost of the high yielding Pectomech prohibitive and thus preferred to cultivate other varieties like the Power-Roma, a traditional variety. Several factors therefore influenced the varietal choices of farmers. These included cost of seed, management practices and familiarity with the variety. [13 found the hard-skinned Tropimech variety as the most preferred variety in Vea in northern Ghana due to its longer shelf life

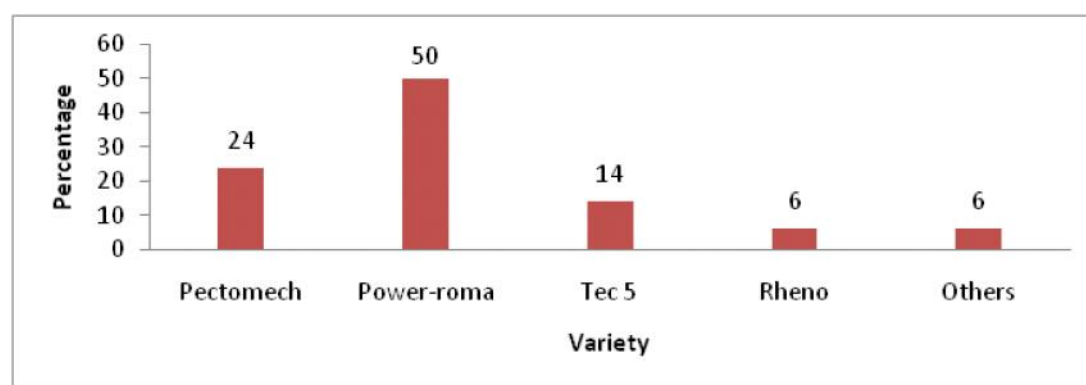
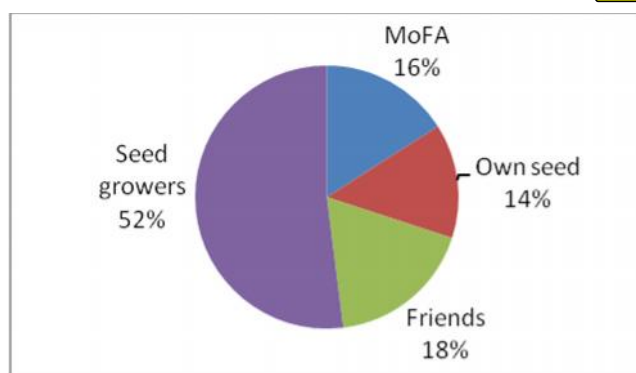


Fig. 1. Tomato varieties grown by respondents

3.3 Source of seeds

Farmers in the study area obtain their seeds from friends, seed growers and the Ministry of Food and Agriculture (MoFA) while others use their own seeds obtained from the previous season's harvest. The most common source of seeds is from seed growers (Figure 2). Thirty-two (32) percent of farmers obtained their seed from friends or their own seeds from

189 the previous season's harvest. Tomato farmers must therefore be educated and
 190 encouraged to used seed from recognised source
 191

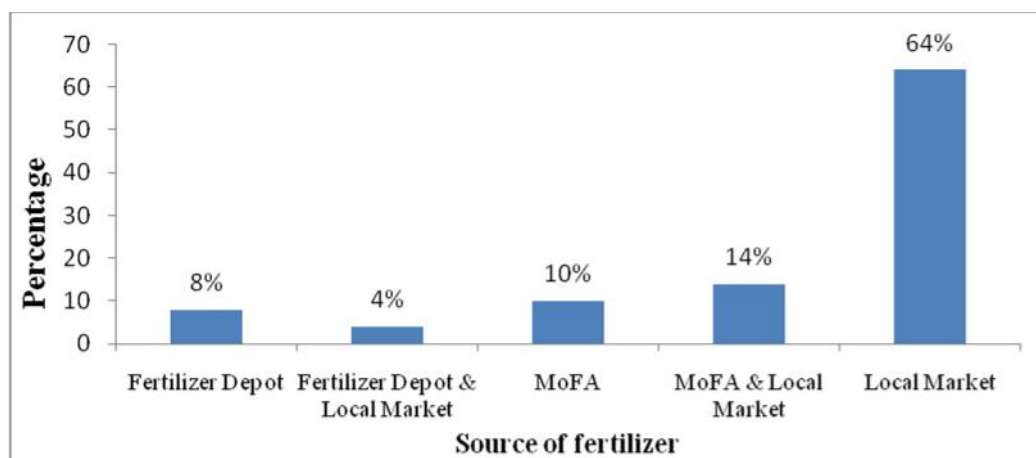


192 **Fig. 2. Respondents' source of seeds**

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3.4 Source of Fertilizer

196 Farmers in the study area purchased fertilizer from three main sources, namely the fertilizer
 197 depot, MoFA office and the local market. Majority of the farmers obtained their fertilizer from
 198 the local market as shown in Figure 3. The small farm holdings of farmers partly accounted
 199 for their preference to buy from the local market. In addition, farmers are able to buy fertilizer
 200 in smaller quantities as well as negotiate terms of payment when they buy from the local
 201 market.
 202



203 **Fig. 3. Farmers' source of fertilizer**

204
 205
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3.5 Constraints to Tomato Production

207 Table 2 represents the analysis of the constraints to tomato production using the Kendall's
 208 Coefficient of Concordance. The result showed lack of capital, high cost of production (high
 209 cost of fertilizer, pesticide, seed and tractor services), low price and exploitation by market
 210 queens as the main tomato production constraints in the study area. High land rent, difficulty
 211 in paying back loans and difficulty in acquiring land were the least occurring tomato
 212 production constraints in the study area.
 213

214 **Table 2. Ranking of the constraints to tomato production in Wenchi Municipal**
 215 **District**
 216

Production Constraints	Overall Rank	TWS (T)	Rank Score of Constraints												
			1	2	3	4	5	6	7	8	9	10	11	12	13
Lack of capital	1	84	36	6	3	2	1	1	0	1	0	0	0	0	0
High cost of production	2	209	3	3	10	15	12	4	1	0	1	1	0	0	0
Low price	3	230	6	9	9	6	3	2	3	8	1	1	1	0	1
Exploitation by market queens	4	260	0	13	13	2	4	4	2	0	2	4	2	3	1
Glut at harvest time	5	355	0	3	5	6	7	1	4	8	4	3	0	6	3
High labour cost	6	357	1	3	4	6	5	5	4	2	4	6	3	5	2
Pests and diseases	7	381	1	2	2	1	2	6	11	7	7	5	1	2	3
Poor road network	8	400	1	2	1	6	6	3	4	2	3	6	7	5	4
Poor seed quality	9	419	0	0	0	4	2	6	11	5	2	6	8	4	2
Post-harvest losses	10	435	1	0	2	0	3	5	3	6	11	3	10	3	3
High land rent	11	447	0	2	0	1	3	11	4	3	4	3	4	3	12
Difficulty in paying back loans	12	474	1	5	1	0	0	1	3	2	6	6	5	12	8
Difficulty in acquiring land	13	503	0	2	0	1	2	1	0	6	5	6	9	7	11

W = 0.39, TWS = 4554, $F_{cal} = 31.3$, $F_{tab} = 2.43$ (5% significance level)

217 The null hypothesis (Ho) that there was no agreement among the respondents over their
 218 ranking of the constraints to tomato production was rejected at the 5% significance level
 219 because the calculated F-value (31.3) was greater than the critical F-value (2.43). Hence
 220 there was agreement among respondents on the ranking of the constraints. The Kendall's
 221 Coefficient of Concordance analysis showed that 39% of the farmers were in agreement with
 222 each other on the ranking of the constraints to tomato production.
 223

224 **3.6 Strategies to Improve the Competitive Advantage of the Tomato Industry** 225 **in Wenchi Municipal District**

226 The tomato industry in Wenchi Municipal District faces competition from fresh tomato
 227 produced in other parts of the country (for example Tono and Veia Irrigation Projects in the
 228 Upper East Region, and Akumadan in the Ashanti Region) as well as fresh tomato coming
 229 into the country from neighboring countries like Burkina Faso. There is also increasing
 230 competition from tomato products imported from the U.S., E.U., China and Brazil. The
 231 survival of the tomato industry in the study area therefore depends largely on its ability to be
 232 competitive.

233 **3.6.1 The Concept of Agribusiness Cluster Formation**

234 Developing competitive strategies at the enterprise level is critical for enhancing
 235 competitiveness of an industry. For the tomato industry in Wenchi to become competitive,
 236 there is the need for competitive strategies involving the farm, processing and input supply
 237 sectors.

238 Creating a competitive tomato industry in Wenchi requires an understanding of agribusiness
 239 clusters and how they facilitate industry competitiveness. An agribusiness cluster is a
 240 geographical concentration of interconnected firms or agribusinesses and institutions in a

241 particular field. Agribusiness cluster formation is based on the principle of developing a
242 region or area based on its strengths or competitive advantage.

243 The concept of agribusiness clusters seeks to improve the business environment and
244 enhance agricultural productivity. Agribusiness clusters according to [13] bring together
245 government organizations, private enterprises, suppliers and local institutions around a
246 common constructive agenda, thus promoting growth in the economy. An agribusiness
247 cluster connects farmers, local entrepreneurs (involved in supplier and channel value
248 chains), bankers (financial institutions) and business development services in the target
249 region.

250 Access to labor, raw materials, inputs, transportation, and markets are key ingredients for
251 the development of agribusiness clusters. A cluster is typically made up of the following:

- 252 1. the core or driver industries
- 253 2. upstream industries (input suppliers)
- 254 3. downstream industries (consumers/customers)
- 255 4. other institutions (such as the Ministry of Food and Agriculture, agricultural
256 extension, research institutions, trade associations, and so on)

257 With agribusiness cluster formation, farmers are able to invest and decrease transaction
258 costs and risks in order to stimulate efficiency and innovation. Farmers' involvement as
259 active participants in the value chain is therefore required. This in turn will require support
260 from both state institutions and the private sector.

261 3.6.2 Porter's Diamond of National Advantage

262 Industry clusters create a competitive advantage for a region. The competitive advantage
263 derives from four factors identified by [14] known as the Porter's Diamond. These are factor
264 conditions, demand conditions, related and supporting industries, as well as firm strategy,
265 structure, and rivalry.

266 According to classical theory of international trade, comparative advantage resides in the
267 factor endowments that a country is fortunate to inherit. These factor endowments include
268 land, natural resources, labor, and the size of the local population. According to [14], a nation
269 can create new advanced factor endowments such as skilled labor, a strong technology and
270 knowledge base, government support and culture which will enhance its comparative
271 advantage. A diamond-shaped diagram was used as the basis of a framework to illustrate
272 the determinants of national advantage.
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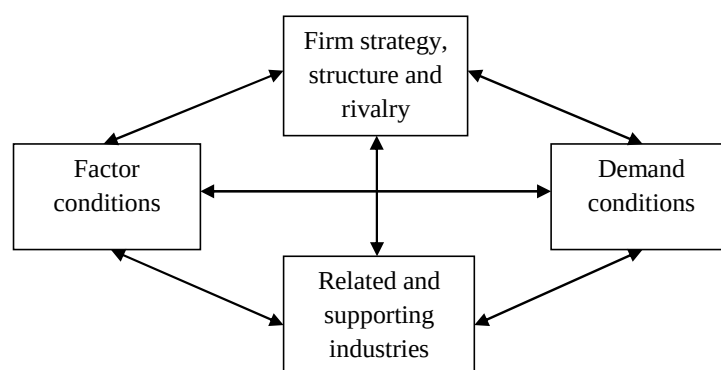


Fig. 4. Porter's Diamond of national advantage

3.7 The Tomato Industry in Wenchi Municipal District in the Light of Porter's Diamond Analysis

The concept of agribusiness clusters and the Porter's diamond analysis, was applied to the tomato industry in Wenchi Municipal District to find strategies to make the industry competitive.

3.7.1. Factor Conditions

Wenchi Municipal is part of a rich agricultural zone and tomato production is an important economic activity. The District is situated in the transition zone of Ghana, characterized by an ideal vegetation type for agricultural production. It has features of both the northern savanna and the southern forest types of vegetation and therefore ideal for the cultivation of several crops.

Agriculture production in Ghana is generally described as risky because it is mainly rain-fed. As part of the rural industrialisation policy of the Government of Ghana, the Wenchi area and the Brong Ahafo Region in general has benefitted from the construction of several large and small scale irrigation dams which can be harnessed for the production of tomato and other cash crops. The development of large and small scale irrigation sites across Wenchi, Subin, and Akrobi respectively presents the area with a comparative advantage as the irrigation facilities can facilitate tomato production all-year round. The area also has a vast fertile land that can be put to large scale tomato production. From our study, 32% of tomato farmers in the area used individual irrigation systems comprising small machines and pipes in addition to the main irrigation schemes to supplement their dry season tomato production. This is an innovation which can improve competitive as well as comparative advantage.

Wenchi also experiences longer rainfall periods compared to northern Ghana where tomato production is prominent but the rainfall regime is monomodal. Hence tomato production in Wenchi has a comparative advantage in terms of better rainfall regime over other areas of Ghana, particularly northern Ghana and the coastal savanna zone.

In addition, Wenchi is endowed with a large agricultural labour force which can be harnessed for tomato production. The nearness of Wenchi to the port at Tema and Takoradi also offers a comparative advantage over other producing areas which are located further away from the ports.

A long tradition of growing tomato in the Wenchi area also provides a comparative advantage for the industry which can be harnessed to make the tomato industry in Wenchi competitive.

3.7.2. Demand Relationship

Tomato is an important vegetable in the diet of most Ghanaians and a large demand is found in the country for the product. According to [13], the demand for tomato products is spreading in the West African sub-region. Ghana presently imports tomato products to supplement local production which is far below the domestic demand.

The location of the Wenchi tomato factory near the source of production offers an advantage as this can ensure that requirements of actors in the value chain can be better and easily communicated. For example, the processing factory can set quality standards and monitor this when the product is delivered by farmers. Farmers will also benefit from a ready market and support in production. According to [14] a more demanding local market leads to a comparative advantage.

[8] have shown that among Ghanaian tomato growers, those in the Brong Ahafo Region make the highest profits. This evidence further highlights the competitive position of Wenchi in tomato production in Ghana. Development of agro-business clusters in the area will significantly enhance the performance of the tomato industry.

Table 3. Farmer profits by region (excluding own labour costs)

Region	Cost per tonne (GH¢)	Profit per tonne (GH¢)
Greater Accra – Rainfed	200	116
Greater Accra – Irrigated	202	118
Brong Ahafo	96	345
Upper East – Public Irrigation	227	-49
Upper East – Private Irrigation	104	110

Source: Robinson and Kolavalli (2010)

3.7.3. Strategy, Structure and Nature of Rivalry between Firms

Acquiring tomato fruits from suppliers in the vicinity of Wenchi rather than importing from the north of Ghana, the Greater Accra Region or Burkina Faso will be advantageous to the Wenchi tomato factory. Hence there is the need for the tomato factory and farmers to collaborate to ensure that transaction costs are lowered.

The tomato industry in Wenchi has a strong rivalry from the tomato industry in northern Ghana. This competition can provide opportunity for the spread of innovation along the tomato value chain which in the long run will make the tomato industry in Ghana more competitive. Farmers in the study area also need to improve their level of integration into the value chain. Farmers need to improve their technical know-how and production capacities in order to play a crucial role in the value chain. Formation of farmer cooperatives will also give voice to the farmers.

3.7.4. Related and Supporting Industries

The presence of specialized institutions such as YARA (involved in agro-chemical supply), seed growers association and MoFA to provide support services alongside the long standing

tradition of tomato production in the area can be harnessed to improve the competitiveness of the tomato industry in Wenchi. Acreage expansion and better technology dissemination (for example input packages and improved farm management practices) can be employed as a strategy to improve upon farmers' position in the value chain. Farmers in the area need to take advantage of the incentive package by the government in terms of input subsidy (for example, fertilizer) in order to develop better technologies that will make them more competitive in the value chain.

The Council for Scientific and Industrial Research (CSIR) institutions particularly the Crops Research Institute (CRI) as well as the Ministry of Food and Agriculture (MoFA) are currently working towards meeting the varietal needs of tomato producers. MoFA implements the government's agricultural programmes in the district. The Ministry facilitates access to services by farmers such as credit, inputs and agricultural technology. According to [13], in 2004, there was no incentive for tomato farmers to use improved seeds. That could explain the downward trend in tomato production in Ghana in the last decade. The Methodist University College of Ghana (MUCG) located in Wenchi with a Faculty of Agriculture also offers opportunity for research linkages to improve tomato production in the area.

Microcredit institutions as well as community rural banks also exist in the study area to lend to farmers especially organized farmer groups. These include Nkoramann Rural Bank, Baduman Rural Bank, and Confidence Susu Business. Fertilizer enterprises like Wienco also offer support services to the tomato industry while seed growers and tomato crate manufacturers are other enterprises that can be supportive to the tomato industry in Wenchi.

4. CONCLUSION

Small scale tomato producers in Wenchi face a myriad of production constraints which limit their ability to increase production and make profit. The most pressing constraints identified were inadequate finance (lack of capital), high cost of inputs and low produce price. These setbacks have served as disincentives to tomato production in the area. The tomato industry in the area can however become competitive and enhance economic growth through the creation of agribusiness clusters. For this to happen, there is the need for prudent government policies which create incentive and an enabling environment for agribusinesses to flourish.

Based on the outcome of the research, the following recommendations were made:

- Actors in the tomato value chain, namely farmers, input suppliers, processors and marketers should foster relationships that would engender their integration into both national and international tomato value chains for higher economic returns. They need to forge and strengthen linkages among themselves as well as coordinate actions to improve the competitiveness of the chain.
- Tomato farmers must organize themselves into groups to access credit from financial institutions and to negotiate with the market queens and input dealers.
- The Ministry of Food and Agriculture (MoFA) research division must also address the varietal, pests and diseases problems of farmers in order to make the tomato industry more competitive.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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AUTHORS' CONTRIBUTIONS

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