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Exploring the Honey Supply Chain in Ghana

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Abstract:

The purpose of this study is to assess the supply chain of honey in Ghana, more specifically as it pertains to the honey production activities undertaken at Nkwanta and Berekum municipalities in the Volta Region and Brong Ahafo Regions of Ghana respectively. The study employed the qualitative paradigm of research design. The purposive sampling technique was adopted to select 70 participants from the two study areas. Data collection was mainly through interviews with beekeepers, wholesalers, retailers and honey consumers. The results revealed that honey flows along the supply chain from the beekeepers through to the cooperative associations and then to retailers and to the final consumer. Also, quality remains a major challenge for consumers of honey.

Keywords: Honey, beekeeping, supply chain, actors, network

1. Introduction

Russell & Taylor (2011) argued that in the era of global supply chains; sourcing, production and distribution in partnerships with suppliers and distributors has become a top priority for manufacturing firms to gain a competitive advantage in the marketplace. However, Christopher (2005) acknowledge that organisations no more compete independently, but their supply chains do. A growing number of supply chain mapping studies have examined specific industry structural forces that have contributed to shaping industry-specific supply chain strategies. One of the central objectives of supply chains is to reduce cost while satisfying customer needs.

That notwithstanding, honey producers in Ghana are not reaching their full potential due to inefficiencies in their operations and their unwillingness to attach importance to their customer and supplier relationship management. Honey production in Ghana promises a great deal of economic benefits for farmers and the country at large. Even so, the many positive benefits beekeeping offers the nation; product sales are static probably due to competition on the retail shelves with sugar as a result of the negative perception portrayed about the product over the years (Adjaloo & Yeboah-Gyan 2003). That has made the industry one that has received the least attention from government probably due to the lack of awareness of the economic and biological potential that it offers (Manish & Sanjay 2013). Effectively managing the supply chain of honey in Ghana, requires levelling up inefficiencies in the operations of beekeepers while at the same time helping actors in the chain to increase the “bottom-line” from their activities.

Another major hurdle the industry contends with is the seasonality of production. The conundrum is to level up production of honey over the off-season demand of the product. Sharad & Pendse (2015) have observed a rise in customer expectations and increased competition. According to Sharad & Pendse (2015), customers are now more conscious and better informed about product value and quality. A major question bothering the honey industry players is how to achieve visibility across the honey supply chain, from which potential risks can be predicted and effectively reduced and manage disruptions to avoid lost sales and revenue. In relation to the above, the study is aimed at assessing the supply chain of honey in Ghana; specifically, to map out the supply chain network of honey and analyse the inter-linkages among different stakeholders as well as identify the risks and vulnerabilities exist in the honey supply chain in Ghana.

2. Literature

2.1. *The Supply Chain Concept*

The foundation of the supply chain concept has received inspiration from many areas of study including; the quality revolution, materials management and integrated logistics, industrial networks and marketing (Weigel 2000). The term 'supply chain' has been defined differently from many viewpoints, by many theorists and from the perspectives of different disciplines. Cox et al. (2003), described the concept as the processes from the initial raw materials to the final consumption of the finished product linking across supplier-user companies; and the functions both inside and outside of a firm that enables the supply chain to make products and provide services to the customer. Chia-Chen et al. (2009) on the other hand, viewed supply chains as a conceptualised network of businesses from suppliers to end-users, which have with the intention of integrating supply chain and demand through coordinated business efforts.

Besides, the Canadian Supply Chain Council outlines three functions that define the supply chain: These include materials supply to a process; the distribution of finished goods through a network of distributors and retailers to a final customer (Canadian Supply Chain Sector Council, 2016). Hence, companies participating in the various stages of this process are linked to each other through a supply chain. That means materials have to flow from suppliers through to the manufacturer where the materials are transformed into other materials (products). The materials are then distributed to the other parties in the chain and finally made available to customers. In that regard, finances or funds from customers' flow backwards from the customers to the suppliers. It is worth noting that the funds are paid to offset the organisation's expenses as well as increase their value.

2.2. *The Food Supply Chain*

Most food products are produced thousands of miles away from their points of consumption. The distance, be it long or short between the point of origin and the point of consumption is connected by a food supply chain. Matopoulos et al. (2007) described a typical food supply chain to consist of a number of entities linked from "farm to fork", which includes farmers, input suppliers, co-operatives, pack-houses, transporters, wholesalers, retailers, exporters, importers and finally consumers. Zhang & Aramyan (2009) observed that the Chinese food supply chain involves multiple actors and also covers long stages from input suppliers to the final consumers. In China, food chains consist of millions of small-scale farmers (suppliers), which are not well structured and coordinated in the supply chain.

For this purpose, Vorst et al. (2007, p. 16) described the supply chain as "a sequence of decision making, execution processes and materials, information and the flow of money with the intention of satisfying the demands of final consumers, which occurs at different stages along the continuum, from point of production to the point of consumption". The authors considered not only producers and suppliers but also included the synergies of warehouses, logistics, transporters, retailers and consumers, which are interconnected within the total supply chain network.

The structure of the food industry may be complicated, and for some products, it is quite extended, including many entities and resulting in numerous interactions (Sparling 2002). For instance, Zhang & Aramyan (2009) observed that China's agribusiness is so complicated that it is challenged by the difficulty of linking the smallholders into the modern agribusiness supply chain. The implication for the local food supply chain is that farmers should not only focus on producing crops or food products but also be prepared for a quick response to market demands.

Management processes along the food supply chain to attain superior customer value can be referred to as the "food supply chain management". Christopher (2011, p.12), described SCM as the "management of upstream and downstream relationships with suppliers and customers to deliver higher customer service at less cost to the supply chain as a whole". A process by which relationships between parties in the supply chain is managed to incorporate individual interests into common interests for the entire supply chain.

Food supply chain management may be defined as the management of the upstream and downstream relationships in food supply chains to deliver safe foods of the highest quality to consumers at reasonable prices. Food supply chain management may require unique supply chain management practices which do not apply to general industrial supply chains. For instance, Mena & Stevens (2010) identified seasonality, short shelf-life, health and safety and unstable demand as a result of environmental conditions as major points of departure from the industrial or general supply chains.

Concerns associated with the seasonality of food supply chains relates to both demand and supply since food products have sensitive demand and short shelf-life. This requires a responsive approach than is required by industrial supply chain demand. Product traceability, quality, safety and food risk management are also other concerns worth considering.

Furthermore, Mena & Stevens (2010) pointed out that, the over-dependence on natural resources such as water and its impact on environmental degradation also constitute important issues associated with food supply chain management practices. Maloni & Brown (2006) reported other issues imposed by consumers on food supply chain managers which include fair trade, animal welfare, labour, biotechnology, and human rights and the environmental concerns.

2.3. *The Ghanaian Food Supply Chain*

Going through literature, there is not much written on the Ghanaian food supply chain. Though over the years, the food supply chain in Ghana has been offering a lot of socio-economic benefits to players and actors involved in it. The Ghanaian food supply chain by far remains the largest employer of people in Ghana with a myriad of retailers, distributors, farmers, manufacturers, spare parts

dealers, table-top traders to supermarkets and giant malls and among a host of others who are directly and indirectly involved in getting products and services to customers across the country. Efficiency in food systems and food security has been high on the international agenda since 2008 and the world, including Ghana, occurring under high and volatile food prices caused by the 2008 – 09 food crises, a crisis that was followed by the 2011 – 12 food crises (Addo 2016). The Ghanaian food market is rapidly changing and facing new challenges.

Relative to these difficulties Ghana must position itself to manage the current problems and future risks. For instance, Addo (2006) suggested that supermarkets in Ghana are wasting over GH¢ 2million weekly to food wastage at a time when 1 out of 4 children in most parts of Ghana goes to bed hungry. Available data shows over 40% of food goes waste along Ghana's food supply chain from production to consumption (Addo 2016). Farmers have wallowed in poverty due to post-harvest losses, the poor state of our roads to transport food across the country, poor transportation facilities, local market setup and lack of food processing facilities are some of the factors affecting the efficiency of our supply chain to achieve food security.

3. Methodology

The study assessed the supply chain of honey production in Ghana. The study utilised the multiple case study approach. As Robson (2002) pointed out, a case study research is 'a strategy for doing research which requires an empirical investigation of a particular contemporary phenomenon within its real-life context and setting using multiple sources of evidence' (p. 178).

Adopting a case study approach helped to assess the supply chain of honey in its real-life context particularly on the activities of the actors and agents involved in the supply chain of honey. Yin (1994) emphasised that multiple case studies reinforce outcomes by replicating the patterns thereby improving the robustness of the research results. Using the Nkwanta and Berekum communities of Ghana allowed the researcher to focus on the necessity to establish whether the findings of the first case transpire in the case and as a consequence consider the possibility of generalizing the findings. The participants were purposively sampled which included honey producers (beekeepers), wholesalers, retailers as well as consumers from the two communities. In all a total 70 participants were selected with Table 1 below showing the sample;

Category	Nkwanta	Berekum	Total
Beekeepers (producers)	15	15	30
Wholesalers	5	5	10
Retailers	5	5	10
Consumers	10	10	20
Total	35	35	70

Table 1: Category of study respondents
Source: Fieldwork

The qualitative approach to data collection was adopted. Data was collected through face-to-face interviews with the sample participants. Interview sessions were recorded and transcribed for further analysis and inferences drawn from the data. Tables and charts have been adopted where appropriate to make presenting and understanding of the results easy.

3.1. Profile of Study Centres

Honey is produced in almost all the ten regions of Ghana (Adjaloo & Yeboah-Gyan 2003). However, Nkwanta South in the Volta Region and Berekum in the Brong Ahafo Regions of Ghana boasts of the largest numbers of beekeepers in the Ghana. The two communities are wide apart geographically but share similar climatic and vegetative characteristics. According to MOFA (2016) agriculture remains the main economic activity in both districts engaging about 90% of the inhabitants.

4. Findings

4.1. Demographic Background of Participants

Demographic attributes of the participants have been presented in Table 2. The results indicate that the sample was male dominated as almost two-thirds (n=52, 74%) of the respondents were male as compared to 18 (26%) of the respondents who were females. Regarding their ages, the study indicates that about half (n=37, 53%) of the respondents were between the active and productive age range of 41 to 60 years whereas 21 (30%) of the respondents were more than 60 years. The age distribution of the respondents demonstrates that beekeeping or the honey business is a business that all manner of ages can engage in. Additionally, the dominance of the active production age groups in the business in the study area proved a direct bearing on the increased availability of labour for honey production. Furthermore, the educational level of the study participants showed the majority (n=37, 53%) were SHS leavers whereas 20 (29%) of the respondents had JHS as their highest level of education as at the time of data collection.

Characteristic	Study Area		
	Nkwanta	Berekum	Total (%)
Gender			
Male	28	24	52 (74)
Female	7	11	18 (26)
Total	35	35	70 (100)
Age			
< 20	-	-	-
20 – 40 years	7	5	12 (17)
41 – 60 years	15	22	37 (53)
61+	13	8	21 (30)
Total	35	35	70 (100)
Highest level of education			
JHS	11	9	20 (29)
SHS	18	19	37 (53)
Tertiary	6	7	13 (19)
Total	35	35	70 (100)

Table 2: Background of participants
Source: Fieldwork (2016)

The demographic results, relative to the dominance of males in the distribution of respondents engaged in honey-related activities is in sync with the findings of Adebabay et al., (2008) who reported of low level of women involvement in beekeeping or honey related activities. Likewise, Hartmann (2004) found that beekeeping in Ethiopia is traditionally a man's job. This could be as a result of the natural tendency of the fear women have towards bees and insects in general. Also, the time required for major apiary activities is not favourable for women due to their household workloads around the evenings and early mornings.

4.2. Main Actors in the Honey Supply Chain in Ghana

4.2.1. Input Suppliers

These are specialised input suppliers who deal specifically in beekeeping related inputs. Some of these inputs include beehives, bee suits, veils, smokers, gloves and other essential supplies. Notably, carpenters were the primary input suppliers of beehives for the honey producers in the study areas. Given the large number of hives required for sustainable honey production, carpenters are sometimes contracted by the producers and NGOs to produce scores of beehives of different kinds for the beekeepers. Aside the beehives, other input materials are procured from the traditional hardware stores that sell gloves, smokers, and other hive tools. Meanwhile, at Berekum, most of the beekeepers have learnt to make the beehives themselves. Selected responses have been given below;

- “WADEP and Game and Wildlife support us with the hives but this time round we are building our own hives. After getting the wood, you find a carpenter to build for you. Even I can build it myself...”
- “I buy my overalls from the Second-Hand Cloth dealers. As for the gloves and other tools like knives and smokers I buy them from the who sell construction materials (hardware stalls).”

4.2.2. Farmers/Beekeepers/Producers

These are individuals commercially engaged in the keeping and rearing of bees solely for honey and some other apiculture products as part of their livelihoods. The honey producers identified in the study areas are primarily involved in timely apiary management practices until the honey are ripe or matured for harvesting. Some of these practices include ensuring that the bees are comfortable in their hives to continue the production process. The majority of the farmers indicated that their roles are to clean around the hives and ensure that no predators can have access to the apiary as this usually drives the bees away from the hives. They also do their individual harvesting when the honey is matured for harvesting for sale to other actors in the chain. The following sums up some of the responses from the farmers;

- “I weed around the hives so that it does not get overgrown with weeds and I also do the harvesting myself I will even be doing some harvesting this evening maybe you should come and see”.

Another beekeeper put it differently;

- “I visit the hive from time to time. You have to guard the hives against invading animals like red ants and lizards disturb them a lot. I weed, sweep and make sure the under and around the beehive is always clean free of ants. You also have to construct a fire belt around the hives so that it does not get burned in the bushfires. Ensure that if the hive is not close to a water source, you make sure that you provide them with water especially during the dry season.”

Furthermore, it was noted from the two study areas that, the honey producers were organised into producer groups and associations. The purpose of this organisation was to afford ease of access to training services and other logistical support from possibly, the

Government through the Agricultural Extension Department and NGO's. In Nkwanta, the groupings were made based on the NGO's they belonged to, and the Wildlife Department also had their own associations. At Berekum, the groupings were strictly based on one's membership in the community honey association. Few ones worked individually as independent beekeepers. Some of the responses supporting this are given below;

- "We have an association here with about 200 beekeepers as members. The association was initially formed by the Game and Wildlife people. We even have a container car with the inscription 'Nkwanta Beekeeper's Association'. That is the association car, and that is what sometimes the members use to transports their honey to the customers..."

Again, the results showed that the beekeepers who belong to the groups engage in collective production and marketing, accessing input materials and credit.

- "we sell all our honey through the association and some time ago, COTVET and I think World Vision also brought the association some materials, overalls, smokers, gloves and extractors which were shared among the members and sometimes we help ourselves with the harvesting when there are bumper harvests..."

4.2.3. Wholesalers

Wholesaling was found to be an integral part of the roles of the beekeeper's association's in the two study areas. Additionally, beekeepers with large numbers of beehives who churn out large volumes of honey also sell in large quantities to interested individuals and organisations. The associations buy in bulk the fresh honey from the farmers and sell them either to organisations such as pharmaceutical firms, catering institutions or retailers. Notably, at Nkwanta, the beekeepers' association compelled the members to sell their produce to the association's office because of the collective agreement they have among the members. A participant at Nkwanta made the comment below;

- "...you know as members of the association when you harvest you have to sell to the association office so those who need honey will go to the office to buy. There was a strong rule that we only sell our harvest to the association office and this was in an attempt to compel members who have taken hives and other materials on credit from the association to pay up..."

Another farmer added;

- "Before the formation of the association, people used to buy from the farmers directly but because some farmers were adding water and other things. Some of the farmers were spoiling the business here. So, when the association was formed, we began telling people rather to buy directly from the association's office where the honey is tested. We did some program to show people the difference between good and bad honey and people began buying from the office, and so the farmers were compelled to send their harvests to the office..."

The Nkwanta Association secretary held;

- "as an association, we try to encourage them to bring the honey here for testing and onward sale. Let me say the majority of the farmers comply even though we hear some of them sell on their own I think on the whole we try to buy in large chunks from the farmers to take off the burden of looking for customers from the farmers so that they can concentrate on other things. You know most of them double as crop farmers as well..."

However, what pertained at Berekum was different as the association was not very effective. The members sell their products themselves and sometimes trade among themselves as well as from the association's outlet where farmers who are in need of quick money take their honey for ready cash as a participant indicated;

- "...we were selling at the association office so those who needed the product will go to the office to buy. At the moment, the association is not as effective as it used to be so now people who need honey come to you for the product. At first, there was a strong rule that we only sell our harvest to the association office, but now it is not like that..."
- "...when I'm in need of quick money quickly send my honey to the office they will buy it and give me ready cash even though they buy at a slightly lower price but it's ok..."

4.2.4. Exporters

The study discovered that some persons were also involved in the exportation of honey overseas. These individuals buy medium to large quantities of honey from the associations and other beekeepers who produce more quantities of honey for export to overseas customers.

- "My friend (name withheld) at Koforidua directed a man here who wanted 15 jerricans to export to his brother in the US. But by then I didn't have, so I directed him to another man (name withheld) whom I knew had more than that."

4.2.5. Retailers

In the study areas, the survey uncovered that individuals from around the country buy honey from suppliers (Wholesalers - Associations and Individual Honey Producers) for onward supply to final consumers. In the honey chain, these included individuals

who buy in bulk and sell in smaller quantities to final consumers. This is dominated by roadside honey sellers while others sell to other individual consumers in the cities. A retailer recounted the following words;

- “The thing is I come to buy from here, and I package it in bottles and put on sale. However, those who wants it in gallons I come here and buy for them...”
- “Sometimes I wait at the entrance of the Assemblies of God Church over there and sell to the members after church. They buy a lot. I have been doing this for a long time, so they know me. Sometimes when I’m unable to go, some of them call me on the phone. So, I package it in bottles and sell to them and take my money...”

4.2.6. Consumers

The study established that variety of individual consumers buy honey in various quantities from their suppliers. Notably, roadside honey sellers dominate the honey consumer distribution. However, in terms of volume organisations particularly pharmaceutical companies and catering firms (bakers and beverage manufacturers) constituted significant consumers of honey from the study areas as obtained through interviews conducted. Figure 1 summarising the number of times respondents mentioned them as those who come to buy from them.

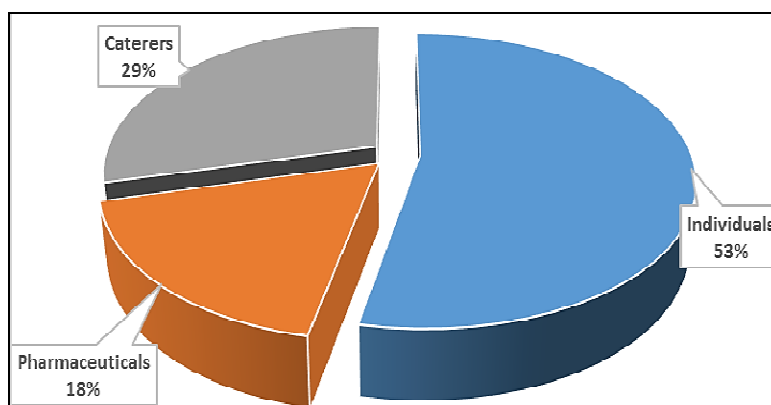


Figure 1: Category of honey consumers at Nkwanta and Berekum

Source: Fieldwork (2016)

From Figure 1 it could be observed that Individual constitutes the bulk number of honey consumers (53%). Additionally, 29% of the participants mentioned Caterers (Roadside Beverage Sellers and Bakers) as another group of customer who usually walk-in to buy honey from them whereas 18% of the participants mentioned Pharmaceutical companies coming to them to buy their honey.

4.3. Supply Chain Network Map of Honey in Ghana

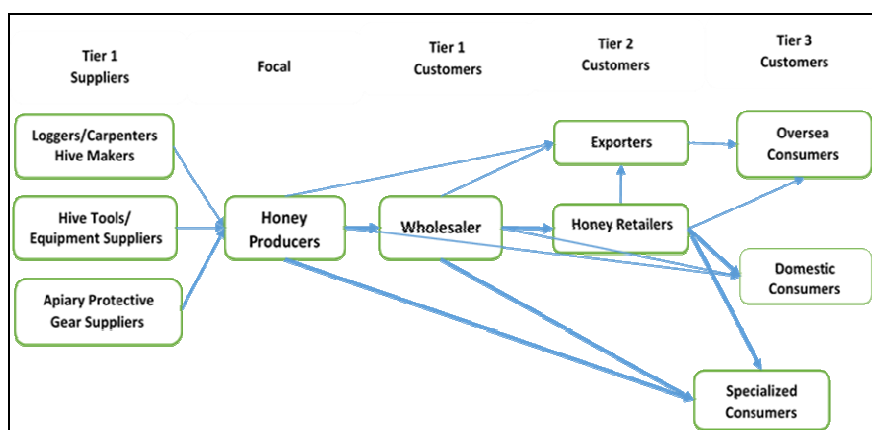


Figure 2: Outlook of Supply Chain Map of Honey

Source: Fieldwork (2016)

From the illustrated supply chain of honey in Figure 2, it could be observed that the honey producers produce honey taking input materials from the Tier 1 suppliers mainly being input suppliers of logs and wood products for the construction of hives by carpenters. Additionally, the producers also buy basic apiary tools and implements such as knives, smokers, gloves, boots, foundation sheets and water sprayer, bee brush and other necessary tools and equipment.

Analysis of the production strategy of the producers demonstrates that honey producers implement a mix of make-to-order as well as make-to-stock strategies of honey production. The study also revealed that some of the customer's advance funds to the farmers or beekeepers for honey before the harvesting season. Make-to-stock producers store their yields of honey while they wait for customers to come around to purchase the honey. Eventually, the majority of the beekeepers send the honey to the Association (wholesaler). The study revealed that the link between the producers (focal firm) and the input suppliers is relatively strong given the fact that there are very few input suppliers. However, the producers have a weak link with the retailers and individuals who do not go through the association as an intermediary.

The majority of the honey producers by virtue of their membership of the association transport their honey to the association's storage points. The association buys the honey from the farmers for onward sale. The Association stocks the honey it buys from the producers and sells them to myriads of customers. The study found a stronger link between the association (wholesaler) and the producers. The association is well-integrated into the day-to-day activities of the producers ensuring that the beekeepers implement best practices in their beekeeping activities. The association takes a keen interest in issues particularly concerning quality practices. For this reason, the association sometimes organizes training through seminars and workshops for the farmers to keep them abreast with modern beekeeping practices. The honey they buy from the farmers is taken through series of tests to ensure that it is of the best quality. The honey is then stored for orders to come from customers notably individuals (walk-ins) which include retailers and organisations who need the product. There are special individuals who buy in large volumes from the Association for export.

The retailers buy small to medium quantities of honey from the association and sometimes directly from the beekeepers for sale in smaller quantities to their customers. Some of the retailers are typically roadside sellers of honey to caterers (Roadside Beverage sellers as well as individuals). Some of the retailers also buy from the association and then supply to other customers who then export to their customers abroad. The link and level of collaboration beyond wholesaler points that is between the retailers and exporters and then the final consumers are not that strong but limited to informal-based trust among the actors. The retailers and other actors in the chain were found to thrive on their reputation built over a period with respect to the supply of quality honey as perceived by their customers.

As can be seen in Figure 2, the honey consumers have several purchase options at their disposal. The level of collaboration as found in the data demonstrates that there is stronger links between some group of customers notably the pharmaceutical companies who have a keen interest in the source of the honey hence undertake series of collaborative ventures with the association and some selected retailers.

4.4. Risks and Vulnerabilities in the Chain

4.4.1. Downstream

From the consumer's perspective, the study noted that most of the actors in the supply chain have issues with the quality of honey supplied by the honey producers. They believe most of the honey producers and other actors do not follow the quality standards. Specifically, the wholesalers and distributors were much concerned about the quality of honey supplied them by the farmers. Mostly, complaints were about the fact that some of the honey supplied when tested, showed they contained other foreign materials such as (raw sugar, smoke, dead bees as well as crumbs of combs). Selected comments from the respondents are given below;

- "...we are afraid because of late the kind of honey some of them bring here I wonder those who buy from outside this place the quality is very bad sometimes we check and found that it contained dead bees which mean they had been in the honey since it was harvested. These things will make the honey go bad quickly".
- "I have serious problems with the quality of honey. This is because I nearly got myself into trouble with one military officer. He has been buying from me for some time, but one day after he had bought from me he came back after a few days angry about the quality I had sold to him. Hmm! didn't know the farmer had added water to the honey. The soldier man has some experience so the honey settled and the water all came on top. He nearly beat me up here!!"

The wholesalers (Associations) and distributors appeared to be much concerned given the fact that it is seriously affecting their sales as they have observed a decline in their customer base over time.

- "once a while you have some of the people coming to lodge complaints at the office that something has been added, and then they don't come back to buy again it is really disturbing we have records of some people who used to buy, but they have stopped coming even though I can't say it is because of the quality I suspect they are buying from somewhere else"

Also, the problem is compounded during the harvesting period where there are large volumes of honey to be tested. This quality assurance process rather culminates into another problem of delaying onward forwarding of product to customers. This process according to the association's officer is painstaking and slow as they have to make sure that every honey that is supplied to the office stands the test of at least four methods; that is the honey is tested for maturity, water levels, foreign materials and level of sugar.

➤ Upstream

4.5. Producer's Perspective

Enquiries were made about the challenge of risks encountered by the honey producers. Themes that emerged out of the interview included Colonization & Absconding of the bees, Honey Processing, Finance and Bush Fires.

Risks	Study Area		Total
	Nkwanta	Berekum	
Colonization/Absconding	8	5	13
	53.3%	33.3%	43.3%
Processing/Technology	3	3	6
	20.0%	20.0%	20.0%
Finance	0	3	3
	.0%	20.0%	10.0%
Bush Fires	4	4	8
	26.7%	26.7%	26.7%
Total	15	15	30
	50.0%	50.0%	100.0%

Table 3: Categorization of risks from honey producer's perspective
Source: Fieldwork (2016)

Table 3 presents responses on the vulnerabilities encountered by the beekeepers with respect to the production of honey. A summary of the responses shows colonisation and absconding of the bees into and out of the hives is a major challenge for the farmers. As the majority (n=13, 43.3%) of the respondents made it known in the interview. Most of the beekeepers blamed the activities of chainsaw operators in the area. Most of them believe that the chainsaw operators' incessant cutting down of trees that flower to attract the bees is the main cause which in effect drives away the bees from the area. This greatly affects honey production as the farmers are unable to predict honey production hence declining their year on year honey yield. Some of the respondents are quoted as follows;

- "At the moment, I am only having about 30 hives. Twelve years ago, I was getting a lot of bees to colonise the hives but now just see I added 15 more hives to the 30 and out of the 15 I added only 2 had been colonised. So, we are doubting as to what is happening. Others are saying it is because of how they are cutting the Rosewood. The Rosewood is the major tree the bees also feed on it."
- "...we cannot actually plan for anything because we cannot be sure as to how much of volume of honey we will get and you know the honey is produced by the will of the bees and it is seasonal too. There are times we get a lot of honey, and there are times we do not get that much due to the behaviour of the bees..."

Other upstream issues concerned the effects of bushfires during the dry season (n=8, 26.7%) stated they have had bushfires destroy their hives at one time or the other before. Another, challenge falls with the lack of processing technology of the honey remain a challenge for the beekeepers. Most of the farmers (n=6, 20%) indicated one or two concerns with the processing. Some of the beekeepers indicated that they are unable to extract the honey properly from combs which sometimes affect their yield. Others noted theirs has to do with maintaining the quality of the honey once extracted. They are unable to keep the product under conditions which protect the integrity of the honey leading to the rejection of the honey at the association's office when they send it for purchase.

5. Discussion

The results also agree with the description of food supply chains provided by Matopoulos et al. (2007). They specified that food supply chains consist of a number of entities linked from farm to fork such as input suppliers, farmers, co-operatives, transporters, pack-houses, importers, exporters, wholesalers, retailers, and finally consumers. The findings also affirm the conclusion arrived at by Johansen (2005) who detailed supply chain actors to include but not limited to growers, processors, packers, storage facilities and transportation services, marketers, importers, exporters, distributors, wholesalers as well as retailers. The study discovered that the honey supply chain is dominated by major actors such as beekeepers (honey producers), wholesalers, retailers, exporters and then the final consumer.

The findings on the supply chain network of honey confirm Sparling's (2002) assertion that the structure of the food supply chain for some products may be complicated, quite extended, with many actors resulting in numerous interactions. The structure of the honey supply chain as revealed in the study looks relatively complicated with rather fewer entities but a series of interactions taking place both up and downstream of the chain.

The supply chain also shows an interplay of interconnectedness and complexities in the chain as noted by Ritter (2004). Reference to Ritter (2004) illustrations, each actor, represents one level of internal supply chain beyond which the individual actors have formed a dyadic relationship among themselves. Further analysis showed that it is impossible in the current competitive business environment for one actor to interact with only one actor hence we observe the myriads of interactions taking place along the honey supply chain.

The beekeepers, for instance, are directly connected to the wholesaler whiles linked to other honey retailers, customers and then some specialised consumers (pharmaceuticals) as well. Beyond, it was noticed that the wholesalers (mainly the association) are linked directly with retailers but indirectly linked with exporters, and some specialised buyers as well. The outlook of the chain confirms the assertions of Zhang et al. (2011) who argued that producers and manufacturers be connected directly with distributors who buys their products but indirectly linked with retailers who also buy their products from the distributor which sets up the downstream distribution network.

Subject to the risks and vulnerabilities in the chain; Finch (2004) described risks in the supply chain as uncertainties or unpredictable events which affect one or more of the actors within a supply chain which influence the potential of achieving the objectives of the organisation. In connection with this, the results demonstrate that producers face myriad of challenges impeding the production of honey in the study areas such as uncertainties and unpredictability associated with baiting the bees to enter the hives as well as the bees also abandoning the hives.

The findings confirm the work of Kebede (2016) who emphasised that the most pressing challenges faced by beekeepers in Ethiopia are both colonisation and absconding of bees from the hives. Particularly, the absconding of the bees usually occurs with the shortage of food or reduction of honey flow in the hives and also a disturbance of the colony either by predators or pests and sometimes by the beekeepers themselves due to poor hive management practices.

In relation to the above, Segeren (2004) also found that the absconding usually occurs as a consequence of bad hive management by beekeepers such as excessive use of smoking during harvesting and the use of unsuitable hives and wrong placement of the hives (where there is too much shade, no shelter from rain and excessive heat). Another notable issue challenging the production of honey as discovered in the study areas was bush fires which the farmers indicated sometimes burns up the hives including the bees thereby destroying the honey in the process.

However, from customers' point of view; the honey supply chain is challenged by virtue of the quality of honey on the market. Actors have issues with the quality of honey they buy. This outcome is supported by earlier studies like that of Vanany et al. (2009) who regarded risks in the supply chain to relate to lead time, quality assurance, price risks, delivery reliability and demand volatility which results in the need for safety stock, inventory and various hedging strategies. However, it is worth noting that delays in product delivery did not constitute a major challenge in the honey supply chain.

6. Conclusion

Honey producers take input materials from the input suppliers (Tier 1 Suppliers) and then undergo their production activities by baiting the bees into the hives to begin the honey production. The honey producers mainly supply their honey to their respective association outlets with the association acting as a wholesaler of the product. Honey is then made available to retailers and other consumers. The supply chain of honey is open with customers freely able to approach any actor aside the input suppliers for a gallon of honey. The study affirmed that there exist strong collaborative links between the wholesalers and the producers mainly due to quality concerns associated with the trading of honey. Once more, the study found that actors in the supply chain thrive on their reputation built over a period of selling quality honey as perceived by the customers. Also, the study discovered that honey, as found in both study areas, remains unprocessed throughout the chain up to the final consumer stage.

The study discovered that the downstream side of the supply chain, including customers, continue to have concerns in terms of the quality of honey produced. This has made downstream actors very cautious about the honey and where they buy it from. The upstream actors are also aware and recognise it is affecting their business. However, concerning the upstream risks and vulnerabilities, the study found that colonisation and absconding of the bees into and from the beehive respectively is the major challenge and risk they face in their activities. More so, the invasion by Bushfires remains a major threat to their activities. Also, the study found that some of the beekeepers lack the tools required for effective hive management.

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