

Supply chain analysis of organic vegetable export from Bangladesh: Is contract farming a feasible solution?

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Abstract

Purpose: This study attempted to find out whether the contract farming procedure in practice is capable of eradicating the hindrances in vegetable export and make Bangladesh a competitive performer in international market of fresh vegetables.

Methodology: Qualitative method was used to serve this purpose. The study is exploratory in nature. Data was collected from Solidaridad enlisted organic vegetable farmers, middleman and external facilitators through personal interview and focus group discussion.

Findings: Contract farming can be a feasible solution to increase vegetable export from Bangladesh as it eradicates many problems of traditional supply chain and at the same time maintains proper quality for export. To make this supply chain more effective government should provide financial, legal and technical support to farmers.

Implications: The study may help government and policy makers to have better understanding of this particular supply chain and enable them to introduce more effective policies for the betterment of the industry.

Originality/value: Solidaridad is working with Bangladesh Government to introduce contract farming to local farmers and exporters and build a national framework to enhance international market share of Bangladeshi fruits and vegetables. No prior research had been conducted to measure the effectiveness of this contract based supply chain in Bangladesh.

Keywords: Organic Vegetables, Supply Chain, Contract Farming, International Trade, Food Safety

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Introduction:

For how long will we be able to depend only on RMG export from Bangladesh? While our only contribution in RMG export is cheap labor the answer is evident that we need to find other options where we can have core competency. Bangladesh is an agricultural country and she is bestowed with fertile land and favorable environment to produce different crops, fruits and vegetables.

Bangladesh has the ability to produce huge number of fresh vegetables for both internal consumption and global market export. However, the performance of Bangladesh in fresh vegetable production and international trade is not up to the mark (Hasan & Naim, 2018). In the international market horticultural produce and processed products have great demand. This market for horticultural products is lucrative for developing countries as it can help to reduce poverty and increase employment (Weinberger & Lumpkin, 2007). In horticultural products vegetables have high potential because of both health and economic effects. Many developed countries are planning to import fresh vegetables from developing nations like Africa (Levitt, 2016). This scenario is creating fresh vegetable export opportunities for developing countries like Bangladesh.

In a report of Food and Agriculture statistic, it was published that in 2014 Bangladesh produced 1.36 million metric tons of fresh vegetables and was ranked as the 18th largest producer of fresh vegetable. From other country's statistics it can be seen that a small south Asian country like Nepal produced 3.42 million metric tons of fresh vegetable in the year 2014 (Hasan & Naim, 2018). In 2017-2018 FY Bangladesh has produced approximately 1.60 million fresh vegetables (Zaman, 2019). Though the production rate is gradually increasing it is still not up to the mark. The statistics is even worse in case of vegetable export. Although the export rate has increased in recent years, it is still very low in comparison to other competitor countries (BFTI, 2016). It is almost like Bangladesh has no existence in the export market of fresh vegetables. According to the paper of Hasan and Naim Bangladesh ranked 82th place and exported only 44.5 million (USD) worth fresh vegetable in 2016 (Hasan & Naim, 2018). The expatriates are the main consumers of exported vegetables but Bangladesh has very high potential in vegetable export (Karim, et al., 2011).

To find out the reason of this low performance despite the high potential, in 2018 Hasan and Naim conducted research on traditional vegetable supply chains and found out that the local vegetable supply chains are incapable of meeting the requirements of international trade. Some

of the major problems incorporated in the local supply chains are safety and hygiene problem, storage problem, transportation problem, high operational cost of supply chain and many more (Hasan & Naim, 2018). Ineffectiveness of supply chains is often considered as the main reason of country's failure in fresh vegetable production and exportation. Sometimes exporters use false phytosanitary certificate to hide the poor quality and harmful elements of vegetables. European Union in 2011 banned Bangladeshi fruits and vegetables as harmful chemical and pest were detected in them (BFTI, 2016). People all over the world are now becoming more health conscious. They search for food which is free from chemical and harmful elements. Organic vegetables are naturally grown vegetables which does not contain any harmful organism (Hossain, 2012). As a result, the market for organic food is growing rapidly. This growth rate is projected to be 25-30% over the coming years (HM, et al., 2017). Bangladeshi farmers could not successfully avail the growing international market for organic vegetables and crops (Sarker & Itohara, 2010). In order to tap into this market a strong connection should be built between farmer and exporter. This connection will ensure proper quality, SPS standards, and fulfillment of buyers' requirements (BFTI, 2016).

The idea of contract farming in case of organic vegetable export is relatively new in Bangladesh. A few researches have been conducted on the existing supply chain of vegetable exportation. In 2018 Hasan and Naim compared the experience of exporters and local traders on four dimensions and found that there are differences between exporters and local traders' experience (Hasan & Naim, 2018). In all those researches the experience of the farmers was neglected. Farmers are the most important entity of organic vegetable supply chain. The quality of the vegetable depends mostly on the production procedure. The stages through which organic vegetables reach exporters hand are very important. Organic production procedure is relatively new in Bangladesh. In this new supply chain how, each party is being benefitted is not focused in any earlier researches. Whether this particular supply chain can eradicate the problems of existing or traditional supply chains for vegetable export is not found out yet. Farmers are the most sufferer party in all of existing supply chain be that used for local trade of vegetables or international trade of vegetables. Many prior researches including the report of Bangladesh Foreign Trade Institute have suggested contract farming as a mean of maintaining international standards in case of vegetable export (BFTI, 2016). In real scenario whether farmers are being able to produce organic vegetable maintaining its taste, quality and low cost is not figured out yet. How exporters are monitoring and ensuring the safety of

vegetables using this particular supply chain can be a useful insight for other exporters using traditional supply chain. No prior research has been conducted to figure out that.

Many have also reported the unsuccessful stories of contract farming. Contract farming was not found helpful in Maharashtra, India (Raja, 2011). According to Rehber the terms of the contracts vary based on the parties' interest and the products' category. The experiences also differ from country to country (Rehber, 2007). Supply chain analysis offers a deeper understanding about points where the strengths and weaknesses of a specific supply chain lie (BFTI, 2016). It also provides information about involved party or market players, their roles and relations. Thus, it becomes easier for government and private sector policymakers to make policy for the betterment of the industry (BFTI, 2016).

This study attempts to find out whether the contract farming procedure in practice is capable of eradicating the hindrances in vegetable export and make Bangladesh a competitive performer in international market of fresh vegetables.

Literature Review:

Supply chain analysis of vegetables:

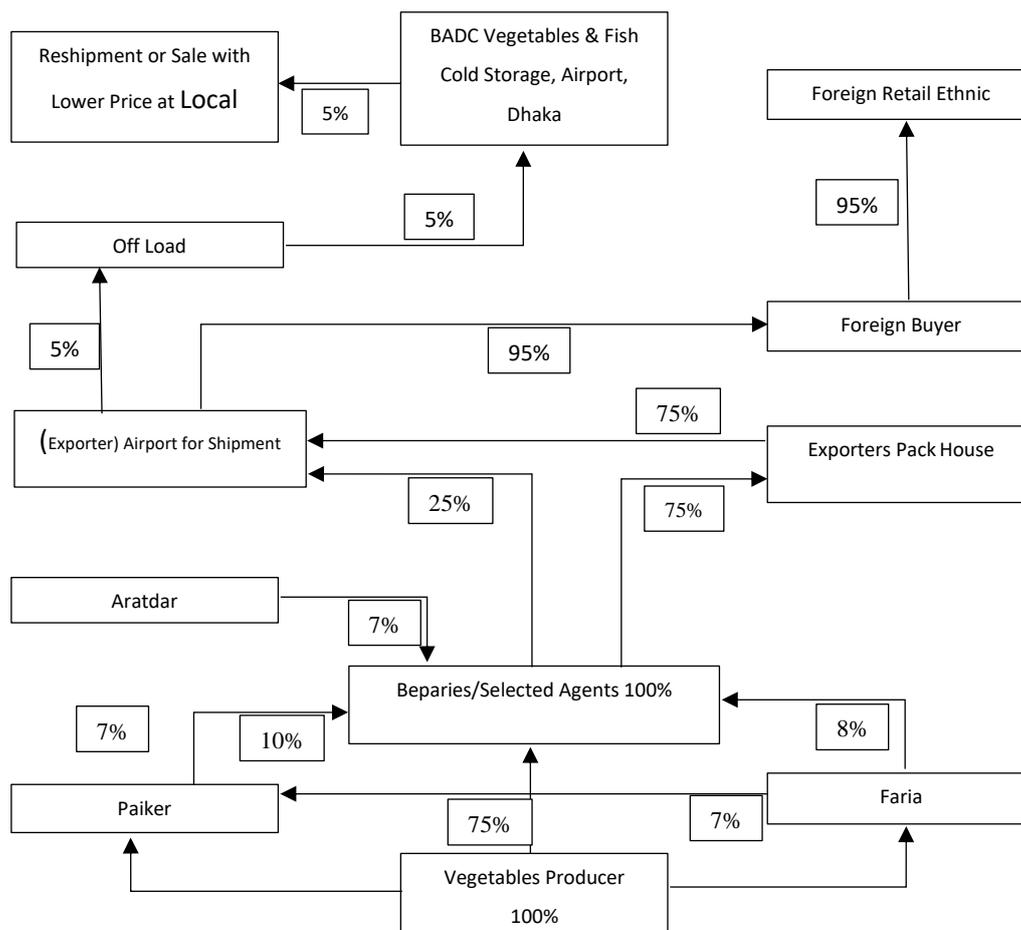
The role of supply chain is always important in different sectors but it is crucial in case of perishable goods like vegetables (Deliya, et al., 2012). A supply chain contains different parties/firms. It can be divided as upstream and downstream and obviously at the end of the chain there will be the final consumer. There should be two different flows in agriculture supply chain. One is flow of products from farmers to consumer and the second one is flow of information from consumers to farmers (ICS, 2015) (Beamo, 1998). Generally Small and medium enterprises are involved in agriculture supply chain (BFTI, 2016). The list may include agriculture input suppliers like seed, fertilizers, pest and other raw materials suppliers, farmers who are the users of these raw materials, output suppliers who actually process the produced crops, fair or brokers, farmers co-operatives, distributors, wholesalers and retailers (Negi & Anand, 2015). Depending on the nature of the product supply chain may also include the logistics providers like transport and warehouse providers (Vorst, 2004). Managing the supply chain of perishable goods like vegetable is complex (Negi & Anand, 2015). In case of export, the supply chain is little extended and little more complex. It then includes the exporters and also can include the buying agent in the foreign country and then the product or vegetables actually reach the final consumers. All activities in a supply chain are performed to satisfy the

needs of consumers. If anyone link or party becomes weak in the supply chain the strength of the overall chain gets reduced (BFTI, 2016). The motive of supply chain analysis is to ensure effectiveness and efficiency as much as possible from point of production to point of consumption. Through supply chain analysis it is possible to have better understanding of constraints and opportunities involved in the supply chain. It also depicts the role of different parties or stakeholders (BFTI, 2016).

Vegetable export supply chain of Bangladesh:

In Bangladesh, Vegetables generally reach the exporters hand through different middlemen. Hasan and Naim reported there are five kinds of middlemen. By name they are Faria, Bepari, Aratdar, Paikar and retailer (Hasan & Naim, 2018) On behalf of exporters agents usually buy vegetables from various sources. They usually do this on the basis of contract. They may collect it from farmers, local traders, faria or beparis. After acquiring they may store the vegetable in warehouses or send it to exporters for further processing and exporting. Though vegetable is perishable product no cool chain is maintained in this way. Nor does any international standard is followed in case of grading, sorting, packaging and transferring (BFTI, 2016). According to Bangladesh Foreign Trade Institute report insufficient infrastructure and lack of quality control are major problems of vegetable supply chain. It ultimately leads to wasted vegetables or vegetables with deteriorated nutrition value (BFTI, 2016). Post-harvest losses of fruits and vegetable reported to be 18 to 44 percent. In monetary term the loss amount is taka 3392 crore per year (BFTI, 2016) High wastage rate, lower quality of vegetables and poor hygiene actually affecting Bangladesh's competitiveness in the international market. Export supply chain of vegetable in Bangladesh is shown below in figure1:

Figure 1: Export supply chain of vegetables in Bangladesh



(Source: Saha, 2000, incorporating interview findings of this study; BFTI, 2016, Analysing Export Readiness of the Vegetables Sector of Bangladesh)

Organic vegetable:

Organic farming is a sustainable and eco-friendly system (Musa, et al., 2015). organic vegetables are produced using genetically modified organisms (Hossain, 2012). This particular production procedure produces sufficient amount of high-quality vegetables or crops without disrupting the harmony of nature and cycles (Musa, et al., 2015). This particular production process maintains natural biodiversity by using pheromone trap for insects, yellow board, natural fertilizers like vermi compost, pile compost, basket compost, kitchen waste etc. (Hossain, 2012). Renewable resources are used in production to reduce pollution and waste. It reduces all air, water and soil pollution. Organic farming improves the socio-economic situation and ensures ecological development (Hossain, 2012).

Organic vegetable production in Bangladesh:

According to Hossain along with rich countries Organic farming can also be a solution to developing countries like Bangladesh (Hossain, 2012). Bangladesh has fertile land and favorable climate for year-round production of crops and vegetables but now Bangladesh is facing problem like soil degradation, infertile land, insufficient production of crops and vegetables. The reason behind it is increase in the use of pesticides and chemical fertilizers which is also harmful for human body. More than 47% farmers have reported to use pesticides more than required amount in the production of different crops and vegetables. As a result of using the organic matter of soil is reducing at an alarming rate. It has come to 1.7% or in some cases 1% where the required amount of organic matter is 3.5% (Hossain, 2012). As a result, it has become the high time when Bangladesh should ensure sustainability of agriculture and food safety by adopting organic farming procedure (Sarker & Itohara, 2010). According to Hossain Bangladesh have high potential in organic production. Identified organic products include crops like rice, pulses, fruits, different oil seeds and of course different vegetables. Hossain also suggested that Bangladesh may export these organic produces to earn foreign currency (Hossain, 2012). However, Bangladesh was not successful to establish a domestic organic food market yet. So, the international market for organic food or vegetables is yet unexplored by Bangladesh (Hossain, 2012).

Contract farming for vegetable export:

In the formal definition of contract farming describes that each firm or entity in the contract will be able to retain its own identity while one will perform any task under the supervision of the other party (Rehber, 2007). In case of vegetable exportation, the objective of contract farming is to produce, process, package and export vegetables in a specific way that will fulfill the consumers or buyers' requirements. In such case a farmer and an exporting firm may have oral or written agreements (glover & Kusterer, 1990). The agreement stipulates certain terms or conditions under which the farmer has to produce vegetables and under which the firm remains bound to buy that vegetables or crops (Arumugam, et al., 2010). Contract farming is considered as beneficial to export as the buying firm or exporter can pass all the export related necessary information to the vegetable farmers directly (BFTI, 2016). As a result, the standard of the product is maintained strictly. It is also considered conducive to farmers as they can get rid of the tension of selling their vegetables or crops. In such case farmers do not need to worry about the uncertainty of market demand or the price fluctuation in the market (Arumugam, et

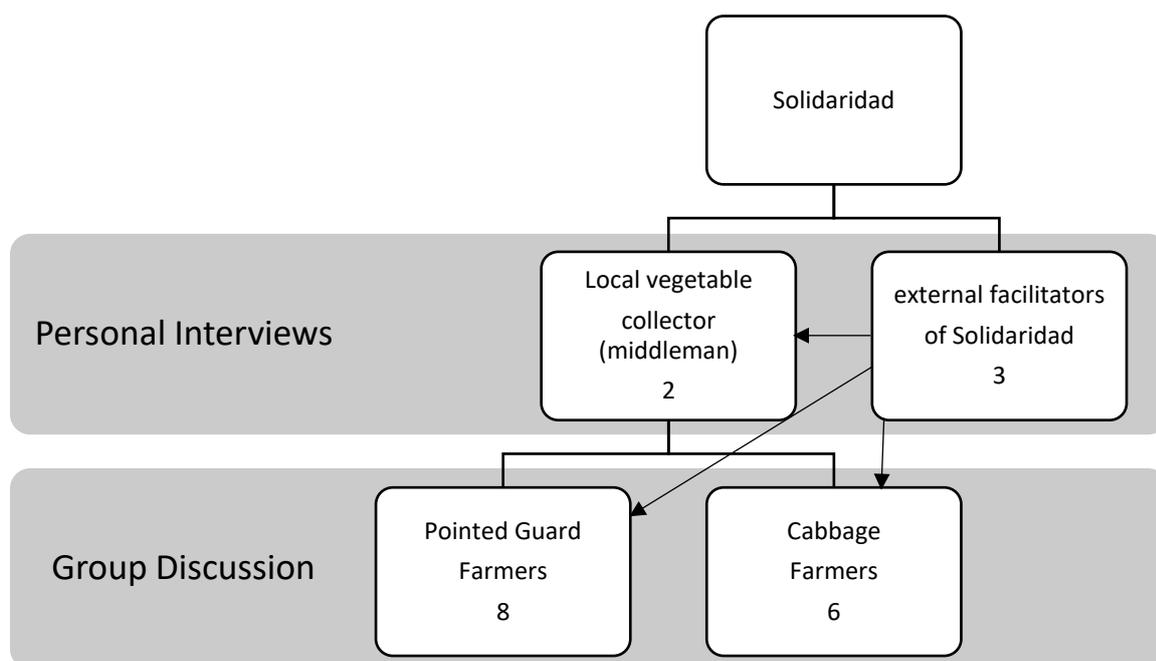
al., 2010). Grosh in 1994 said that contract farming can work as an economic institution (Grosh, 1994). It can be an effective response to market failure or government's inability to provide credit, infrastructure, insurance, or other incentives (Arumugam, et al., 2010). Despite having all positive aspects in many cases contract farming turned into a failure. In many cases it only bore initial success (Sriboonchitta & Wiboonpoongse, 2008). In case of vegetable export, in 2019 Fredrick Ajwang identified that short term relationship between farmers and exporters is one of the major reasons of such unsuccessful outcome of contract farming. In some cases, inputs and production services provided by exporters had boomerang effect on exporter farmer relationships. Instead of bringing positive result it affected the relationship negatively (Ajwang, 2019) as contracted crops for export often require intensive management (Sriboonchitta & Wiboonpoongse, 2008). For export purpose maintaining long term relationship between farmers and exporters is important. Again, small farmers often exit and reenter the chain based on their perceived risk and profitability that may create challenge for exporters to ensure flow of reliable products (Ajwang, 2019). According to world bank report, the effectiveness of contract farming may vary across commodities (Minot & Ronchi, 2014). So far contract farming is relatively common in the case of fruit and vegetable production for export (Minot & Ronchi, 2014). According to the report of Bangladesh Foreign Trade Institute Bangladesh has started contract farming system for producing fruits and vegetables with a hope to establish itself as a leading exporter in international fruit and vegetable market. By doing so Bangladesh is trying to fulfill the phytosanitary requirements of export destinations and maintain the required hygiene and standards (BFTI, 2016). The contract farming procedure for export has started in small scale and its effectiveness is not measured yet.

Methodology

This study is qualitative in nature. The Study focused on conducting an in-depth analysis of the potential of contract farming in organic vegetable exportation. It attempted to do so by analyzing the pros and cons related to this new supply chain. The study intended to investigate the current situation of contract farming that would enable the country to effectively tap its export potential in the vegetables sector.

Organic Vegetables farmers who on the basis of contract produce vegetables for exportation only were selected as the sample for this study. It was not easy to find this particular group of contract farmers. To reach its respondents and collect data this study took help from the Netherlands based organization Solidaridad. Solidaridad has been working worldwide to

ensure sustainable agriculture and food security. Under this organization there are actually two groups of enlisted farmers who produce two different types of vegetable in Jashore district of Bangladesh. One group produces pointed gourd (Patol) and another group produces Cabbage (Badhakopi). Data was collected from both groups. Again, data was collected from the local vegetable collectors and also from the external facilitators who are very important entities of this supply chain.



The main method of primary data collection was experience survey and focus group discussion. A semi-structured questionnaire was used to collect data. Respondents were asked questions about the features of contracts, production process, product price, trading process, delivery process, quality maintenance and profit at different levels of this particular supply chain. All the respondents were asked to make overall comparison of their experience in traditional supply chain and contract based supply chain. Data was collected from 2 collectors and 3 external facilitators through personal interview. 2 focused group discussion was conducted among 2 particular groups of vegetable farmers. Total 14 people attended the FGD, 8 farmers from Pointed gourd group and 6 farmers from Cabbage group. Farmers joined the discussion as a group. In addition to the answers of the questions, they enthusiastically expressed their experiences, needs, opinions, and suggestions to make this particular supply chain more effective. Inputs generated from the FGD proved very much useful for the Study in identifying the major information related to this supply chain. All interviews and focus group discussions were video recorded so that the data can be analyzed later. The interviews and focus group

discussions were conducted in Bengali. Later English transcripts were prepared by the author using the video recordings. The responses were reviewed carefully.

Data was collected from Jashore district of Bangladesh. According to the saying of Solidaridad Network Asia 60% of total vegetables produced in Bangladesh is produced in Jashore region. The first FGD was conducted among Pointed gourd producers. It was conducted in Palashi village, Rohita Union, Jashore. The second FGD was conducted among Cabbage producers. It was conducted in Abdulpur village, Churamonkathi, Jashore. All the FGD and interviews were taken on 3rd November 2019.

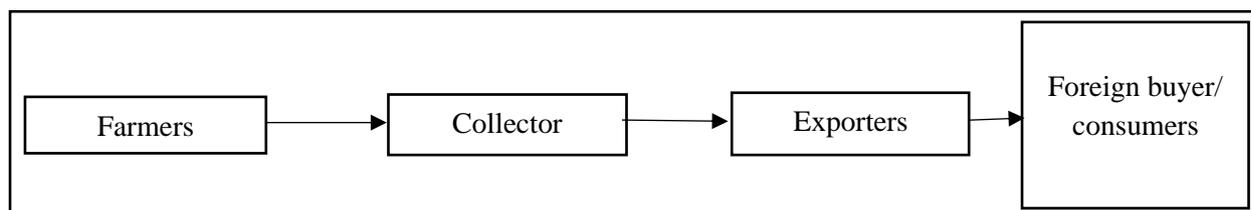
Results and Discussion:

Along with Department of Agricultural Extension, Bangladesh Ministry of Agriculture, Solidaridad works to facilitate the contract farming and export promotion in Bangladesh. Solidaridad works as a bridge between fruit and vegetable producers and exporters. The organization helps these two parties to enter into contract through its SaFal project. Through its initiatives Solidaridad is actually trying to ensure high quality fruits and vegetable production, adoption of good farming practices, good marketing practices, and overall growth of this sector by expanding domestic and international market. The organization is working with Bangladesh Government to introduce contract farming to local farmers and exporters and build a national framework to enhance international market share of Bangladeshi fruits and vegetables.

Structure of supply chain:

Contract farming or production is different from purchase agreements or simple contracts on market specification. Defining contract farming is difficult as in agriculture myriad forms of contract farming are used (Rehber, 2007). This supply chain is simple in its structure as it eliminates most of the middlemen. The figure 2 depicts the contract-based supply chain for vegetable export.

Figure 2: contract-based supply chain of vegetable export



Source: own elaboration

As asked about the structure of this supply chain one commodity manager of an NGO replied that,

“Farmers produce vegetables and sell them at the collection point. These farmers have agreements with the exporting firm that they will provide vegetables with specific requirements and will produce it using specific procedure. Farmer’s responsibility is limited in producing and selling the vegetables. Exporters collect the vegetables from this collection points and put it forward in export procedure”

About collection point another external facilitator, the commodity manager said,

“Collection point is a center where only enlisted farmers for organic production can sell their products at the specified price. The person who runs the collection point is a local entrepreneur. Whose job is to aggregate different farmers production and do the sorting and grading job for exporters. The location of collection point is near the vegetable farms.”

Although contract farming was suggested in different researches to increase quality and eliminate middlemen, this particular form of supply chain includes one middle man. In 1986 Minot described that the form of contract farming is depended on political, social and economic structure of local and national level along with the specialization of the product (Minnot, 1986). Perishability of products is one characteristic that determine the degree of concentrated production and carefulness in scheduling, grading and sorting of products (Rehber, 2007). Vegetable is a perishable product and as a result the collection point near producing farm ensures more control over the production process. It also ensures scrutinized grading sorting and proper management right after the harvesting of vegetables.

Overcoming the challenges of vegetable export :

Competitive price for exportation:

The export market for fresh vegetable also increasing significantly (HM, et al., 2017). This changing economic situation is creating huge opportunity for developing nations for vegetable exportation (HM, et al., 2017). In countries like Malaysia and China it was found that small farmers are unsuccessful in fulfilling the quality requirements of retail chains. According to Arumugam through contract farming it is possible to upgrade small farm holders from

traditional producers to high quality producers for export (Arumugam, et al., 2010). It is not sufficient to grow high quality vegetable only. The price of the vegetable should also remain competent. Reducing cost is a big challenge in vegetable exportation. Bangladesh is one of the leading countries in terms of vegetable production in the South Asia (Ali, 2000). Vegetable production is profitable. Despite producing a large quantity of fresh vegetable Bangladesh's performance in vegetable exportation is not noteworthy. One of the workers of NGO said in this regard,

“The answer to the question why we are not being able to efficiently export vegetables in the international market lies in the hand of vegetable producers.”

In this regard one of the farmer in FGD said,

“At first, we used to laugh at this concept that vegetables produced by us will be sold in foreign countries but now we are convinced and we are producing vegetables for export.”

In Bangladesh most of the farmers use old and traditional production procedures. They are unaware of the requirements of international trade. They also lack knowledge on GAP or Good agriculture Practice. To increase the amount of vegetable export first of all it is necessary to inform the farmers about the benefits of vegetable export otherwise the number of willing farmers in organic or safe production of vegetables will always be small. But does the answer lie only on the farmers' hand?

The traditional supply chains for vegetable export contain several middle men between the exporter and the vegetable producer. This huge list of traders in the supply chain increases the price of vegetables as each party adds up their profit margin with the cost. Often it raises the procurement cost (Hasan & Naim, 2018). Local traders consider the cost of production is low enough, but the exporters disagree with it. The vegetable market in Bangladesh is a seller's market and the suppliers can cover the cost of the supply chain by selling at a higher price to consumers (Hasan & Naim, 2018). The international market of vegetables is competitive and many nations can supply vegetables at low price. It is the reason for which the exporters do not feel the cost of local vegetable production is low enough to be competitive in the global market. Cost of production plays a very important role in vegetable exportation. One of the farmers in FGD said,

“price of vegetable rises as it enters the local market. The same vegetable that we are selling 15 or 16 taka per kg often sold at double price in the local market which may be a few

kilometers away from our farm. The price of vegetable in the local mainly depends on supply and demand. It fluctuates very rapidly.”

“In this process of export, we sell vegetables at a specified rate which may be 1 or 2 taka higher than the price that we sell at the local market. Ultimately we do not get much higher price for our vegetables that we produce for export but we get higher profit in this supply chain as our cost is reduced in this.”

One of the collectors said in this regard,

“My cost for running this business is very minimal. I just have to rent a shop and provide its utility bills. Farmers from nearby farms bring vegetables here. Exporters send cars with cold facility and take all the sorted vegetables. I sell the leftovers in local market.”

The NGO worker said,

“We use this collection point as a place of communication. We meet with the all the contract farmer here and we provide them information about organic production procedure, GAP and we introduce them with different buyers.”

The spiral increase in price is absent in this supply chain. The location of middleman or collector is a very important factor in this supply chain. As the amount of cost incurred by this particular middleman is not very high, he adds very little profit margin. This particular middleman actually makes the supply chain smooth. It would be costly on exporters part to collect vegetables from scattered farmers. The collector also sorts the vegetables and ensures proper packaging for transportation which keeps the quality intact. Another pointed gourd farmer said,

“We like to sell pointed gourd at this collection point. To sell 40kg of pointed gourd in the local market we have to pay the cost of 30 to 40 tk. But we do not have to pay any transportation cost in this system. Sometimes they go to fields and collect vegetables. Again, the collection point is close to our farms so we do not have any transportation cost. we prefer this system.”

High wastage rate has been a great problem in previous supply chains. An ineffective transportation system can raise the operating costs of export business. That problem seems reduced in this contract-based supply chain. Prior researchers found that in the whole supply chain a large number of vegetables is wasted (BFTI, 2016; Ali, 2000).The reasons behind this

loss are lack of post-harvest management, poor packaging system, lack of cooling transport, poor infrastructure etc. (Hasan & Naim, 2018). Sometimes the wastage rate is almost 40% of total production and it adds to the total cost of vegetables (Badrud-doza, 2006)

One of Cabbage farmers added,

“If you want to transfer 300 cabbages in the local market approximately 16 to 20 cabbages will be rotten. But as the collection point is closer to our fields, the wastage rate is very low. In that case may be 1 or 3 cabbage will get rotten. We are interested in this contract farming because we are getting quality vegetables, higher price and the reduced cost of production. Our total cost is reduced by 25%. ”

This supply chain removed multiple exchange of vegetables among different parties and ensured one single transportation system for keeping the vegetables fresh and less costly.

Quality assurance for export:

Effectiveness of contract farming can be effectively measured from the perspective of farmers and exporters or traders (Arumugam, et al., 2010). Some previous researchers have identified few reasons behind the poor export performance of vegetable. One of the important reasons is maintaining the international standard. Buyers, especially from the European Union (EU), banned Bangladeshi fruit and vegetable as considerable amount of pesticide was found in the consignments (BFTI, 2016). In addition, the use of fake phytosanitary certificates by a section of unscrupulous exporters has threatened the possibility of Bangladesh as a leading country in vegetable export (BFTI, 2016). For instance, harmful elements were found by EU in 270 shipments from Bangladesh between 2011 to 2014. Again, some 211 consignments were detected with fake or no phytosanitary certificates during the same period (BFTI, 2016). Bangladeshi farms and exporters are ignorant of the importance and need of SPS. Moreover, there is no strict monitoring system to see whether the vegetables comply with buyers' requirements. When asked about this scenario one of the contract farmers stated,

“Exporters often visit our farms. They regularly pay visit to determine the quality of the pointed gourd. Without agriculture office certificate it is not possible to export vegetables. So, agriculture officers also visit our farms. ”

Another farmer stated,

“We have agreement with the exporters. The agreement states that we will supply safe food to them. The agreement does not contain the number of vegetables.”

The NGO moderator replied,

“It becomes easy on our part to communicate with all the farmers at once. We can investigate easily whether they are following the proper production method and following the standard for pesticide and fertilizers. For this we do not take any money or for our work we do not make any profit.”

In the former supply chains exporters urge their agents to collect high quality vegetables. Now agents can buy it from farmers, from local whole sellers or retailers. It is quite difficult for agents to certify that these vegetables bought from various sources will pass the SPS test. The link between producers and exporters is very weak (Arumugam, et al., 2010). Exporters, therefore, have little influence on the quality of the produce. It is possible in contract farming as the exporters, government and different external facilitators can keep a close eye on the production process. In this particular supply chain this surveillance is easier on part of exporters, government and external facilitators as they use the collection point as a center of control. One of the pointed gourd farmers stated in this regard,

“we use organic pesticide, insect trap, yellow board. We all use the same procedure. We have been producing pointed gourd for a long time but we came to know about this organic production procedure when we became enlisted for vegetable exportation. Prior to that we used to learn things from here and there. Now we produce pointed gourd as per their advice. We take help from them and now the quality of production is better than before.”

Post-harvest management:

The vegetable is a perishable product and demands specialized cold storage for effective management of the supply chain. Unfortunately, there is shortage of appropriate storage facilities in the country, to fulfill the needs of vegetable traders. Consequently, it is difficult on the traders' part to keep procured vegetables fresh and to avoid perishability. Hence, absence of storage facilities is a serious impediment for the vegetable supply chain of Bangladesh. Because of this lack of proper cold storage facilities, the farmers and traders often use life-threatening chemicals preservative to keep the vegetables fresh for a long time (Rahman & Pandey, 2014). In this regard a farmer stated,

“In this contract farming process, we do not need any storage facility. We sell our vegetables to the collector. From then it is his responsibility. We do not have any headache about whether the collector sells or throws out all the vegetables.”

One of the collectors replied,

“I collect the vegetables and the exporters send cars with cold facilities. I do not need to think about the transport or storage facility. If there is any leftover of vegetables, I sell it in the local market.”

One NGO worker said,

“From the collection point the vegetables directly reach the destination for final grading, sorting and packaging by exporters. Then the vegetables are ready to reach its final customers in foreign countries. Now we are trying to provide training at the collection point so that proper packaging can be done at this collection point.”

With this particular supply chain, it was possible to eradicate the storage problem. Overcoming the shortage of storage problem also reduced the amount of total cost. Again, maintaining the quality and freshness of vegetable has been possible without any use of chemical preservative.

Exchange of information and technology:

Flow of information is very important in vegetable export. The farmers of Bangladesh are mostly uneducated and unaware of modern farming procedures. They know very little about export requirements and procedures. Without the flow of information, contract farming remains confined in the paper. The objectives of contract farming are never implemented. This flow of information should work in two ways. First the production method, technology and requirements related information should reach farmers. Then again condition of products, their growth-related information should reach the exporters. Knowledge sharing or information sharing has become very effective in this particular supply chain.

Regarding this matter one of the Cabbage farmers replied,

“Saving vegetables from insects is a big problem. Using chemical pesticide is costly. Using organic procedure, we can control insects in less costly way. We can use organic fertilizers as much as we wish there is no harmful effect. Vermicompost is easily available in our area. We

also use mehegoni oil. Previously we were unknown about vermicompost fertilizer. Then we get to know about it from this export project. That saves our money. Our carrying cost is reduced than other process.”

A majority of the vegetables farmers in Bangladesh still follow traditional production methods. This particular method is labor intensive. Bangladesh has available and cheap labor which is beneficial to this traditional method (BFTI, 2016). Modern methods of cultivation with modern technology and mechanization are needed to reduce production costs, reduce labor inputs, and increase farming efficiency and productivity. One of the pointed gourd farmers said in this case,

“We use modern equipment like tractor, irrigation process etc. we need more technical equipment because getting laborer these days is difficult. What we are using now may be invented 20 to 30 years ago. We want to use updated tools and techniques because there will be more crisis in the future.”

Technology transfer is an important aspect of contract farming. Without this transmission it will be difficult to compete with countries who are already advance in agricultural technology. The exporters, NGOs and government all should work together so that modern technology is introduced, disseminated, adopted and properly used by farmers.

Financial Support:

Among various reasons of contracting access to financial inputs is very important. According to Grosh contract farming can act as an economic institution (Grosh, 1994). It can provide solutions to market failures for credit, insurance and different factors of production (Arumugam, et al., 2010). Regarding this matter one farmer stated,

“The exporters do not provide any credit or advance payment for us. We use our personal capital. As farmers we do not get any facilities in case of taking loan. We have an agriculture bank but we do not get any facility from there. We heard something about agriculture insurance but it did not reach us till now.”

Another farmer added,

“ sometimes they do not take the vegetables if it fails to fulfill their requirement. Say for example if the size of the vegetables does not match, they refuse to take it. Then we have to sell

that vegetable in local market. Again there are natural calamities on which we have no control. This also creates financial burden on us.”

Bangladesh is a land of natural calamity. Agriculture is very much depended on nature. All the farmers are small farm holders. Thus, access to financial resources could be beneficial to farmers and also for exporters in case of timely delivery of products.

Discussion:

From the analysis of this supply chain structure, it was found that location of production farms and the collector is very important factor. It eliminates the transportation cost on the farmers' part. The study on Mexican vegetable export revealed that due to personnel shortage the exporters cannot always provide technical support to all contracted farmers (Huacuja, 2006). This study reveals that in this particular supply chain due to hub system, all farmers are being benefitted from the knowledge of organic production procedure. Thus, they are ensuring environmental and economic sustainability for themselves.

Analyzing Kenyan Fresh Fruits and Vegetables Export Value Chain Ajwang in 2019 revealed that smallholder farmers are opportunist. According to Ajwang smallholder farmers often switch between traditional and contractual supply chain based on their perceived benefits (Ajwang, 2019). This study found that contract farming provides win-win situation for all the parties in the supply chain. In contract farming farmers enjoy certainty of selling products which actually make them consistent in this supply chain. With organic farming procedure farmers have been able reduce their cost significantly. Thus, they are being able to enjoy higher profit than they used to enjoy in traditional downstream supply chain. The collector or the only middleman enjoys little profit but his cost of running business is very minimal. Thus, the collector is also being benefitted. This study could not assess the exporters experience directly but still few things can be summarized. Exporters are getting high quality vegetables in comparatively low or at the same price. They also get freedom from the fear of not getting the SPS certificate.

This particular supply chain has been so far successful to overcome or reduce some problems. Getting rid of storage problem is one of them. Reduction of vegetable waste rate is a noteworthy change in hygiene and safety of food.

There are also some problems that this study could identify. Farmers have little access to financial inputs. During natural calamities and hazards they suffer from huge loss. No insurance

or financial opportunities have been introduced to them either by government or exporters. Technology transfer has been slow in this supply chain. Without the implementation of modern technology, it is not possible to have long term gain from vegetable export.

The role of Solidaridad or external facilitator is very important in this supply chain to ensure this success. They play a mediating role between farmer and the exporter. In fact, they are providing most of the information and training to the farmers. Now if we want to implement this supply chain all over the country, the government has to play a major role. In this regard government can have the following steps:

1. Using the local agriculture office, government can build farmers' hub based on their produced crops or vegetables and their interest to be involved in contract farming. It is not mandatory that all farmers have to be involved in contract farming. Farmers in a particular region, who are inclined to bring change in their production procedure and follow the rules, should be enlisted in particular hubs based on their crops.
2. The local collector can be the key communicating person in this regard. Instead of providing training to all farmers government can choose these collectors for training later who will be responsible for spreading the knowledge among his or her hub members. This will also be cost effective on governments' part.
3. Training programs should include organic production, post-harvest management, export requirements for specific crops, market demands etc.
4. This hub will also help the farmers to discuss their own problems to each other and share it with agriculture office.
5. Government should ensure easy bank loan and insurance facilities for farmers who exclusively produce for export purpose.

The nature of contract farming is completely informal in nature in Bangladesh. In this regard to make it successful government should build a legal framework that will preserve the interest of each party in the supply chain of contract farming. According to farmers they get a little bit higher price than the market price but they have to depend on the market price. At the same time there is no law regarding the crisis period. Sometimes exporters refuse to buy vegetables on the excuse of improper grading, size or appearance. There is no monitoring authority to observe these unfair means. Improvement of infrastructure is also required. The legal framework should include the following issues:

Contract Design: It is true that according to nature of crops or vegetables the conditions in a contract will vary. Still there are some issues that can be fixed by government. Government can make it mandatory to include some clause in the contract. The following issues are very important:

1. Role of Farmers in quality management.
2. Role of exporters or Buyers in marketing.
3. Minimum standard for crops to be qualified for export.
4. Minimum price to be paid.

Pricing policy: Price of the vegetables can be determined as a percentage of export market price rather than local market price. That will ensure higher price for farmers. It will inspire more farmers to produce organic vegetables and bring positive changes to their production procedure.

Legislation procedure for dispute: Government should depict a clear legislation procedure through which each party in the supply chain can seek help if any controversy arises among them.

Conclusion:

Bangladesh is an agricultural country with high potential to become a major producer and exporter of fresh vegetables. However, the country has failed to become a significant producer of these produces. There is huge demand for vegetables all over the world and its consumption has been increasing because of proven health benefits. The vegetable supply chain of Bangladesh is not capable to meet the requirements for international trade. Its production cost is not competitive and unable to supply the required quantity of fresh vegetable produces for international market. Analyzing the whole procedure of contract farming it can be said that through contract farming it is possible to eradicate some of the challenges in existing supply chain. Contract farming ensures high quality vegetables or production from small farm-holders. To obtain the ultimate objective of leading vegetable exporting country, government and external facilitators should work simultaneously with farmers and exporters. More farmers should be informed about the benefit of contract farming at the same time the interest of the farmers should be preserved. Transfer of knowledge is not sufficient for farmers. Implementation of that knowledge using modern technology is very important. Regulatory authority should be introduced to determine clarity in the execution of contract. Nowadays people all over the world are becoming more health conscious. It is high time Bangladesh

should tap into this gradually growing market for organic food. For this purpose, this contract-based supply chain is suitable to fulfill the requirements of export. The study did not include exporters' perception regarding contract farming. So, this study invites for future research to investigate the experience of exporters and consumers regarding contract farming of organic vegetables. At last, this study will suggest that not only for international trade this supply chain can be followed by local super markets to ensure food safety and hygiene.

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