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Factors affecting the choice of governance structure along the vegetable value chain in Bangladesh

RESEARCH ARTICLE

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Abstract

Analyzing governance structure is considered important when designing development interventions in the value chain. The objective of this paper was to explore the governance structure (GS) in cauliflower and tomato value chain, specifically the types of GS followed by the farmers and factors behind these choices. The two-stage random sampling procedure was used to collect data from 100 farmers whereas 60 traders were surveyed purposively for this study. Multinomial logit model was used to analyze the factors affecting farmer's choice of GS. Trader's perceptions regarding internal and external governance as well as good governance indicators were assessed by utilizing non-parametric test. Cauliflower and tomato farmers were involved in practicing spot market, relational, farmer's association and outgrowing scheme-based GS. The results showed that the probability to choose relational, outgrowing scheme and farmer's association-based GS were significantly affected by education of farmers, distance to the nearest market, access to extension services, access to price information, trust commitment, transaction specific investment, preferences of diversification, farm size, transactional uncertainty, and access to producer's cooperative. Wilcoxon-Mann-Whitney-U test established trader's dissimilation towards governance indicators. The study suggests that smallholder farmers need to be well organized and coordination mechanisms among all stakeholders should be increased.

Keywords: governance, value chain, multinomial logit model, Wilcoxon-Mann-Whitney-U test, cauliflower, tomato, Bangladesh

JEL code: C22, C51, Q13, Q18

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1. Introduction

The value chain refers to the entire process of bringing a product or service from conception to final consumers and final disposal after use (Kaplinsky and Morris, 2001). It emphasizes the linkage between production, marketing and other activities of the products and services in an effective and efficient manner. The dynamics of value chain makes it necessary to consider the power relation among actors and identify activities for balancing between more powerful actors and rural poor (Thiele *et al.*, 2011). As a central issue of value chain analysis, governance structure (GS) highlights the importance of inter-relationship agreements between farmers and traders that impact the overall efficiency of the chain. This is determined by the degree of explicit coordination and power asymmetry between stakeholders (Gereffi *et al.*, 2005). It denotes the relationship among the buyers, sellers, service providers and regulatory institutions that operate within or influence the range of activities required to bring a product or service from inception to its end use (Kaplinsky and Morris, 2001). Hinnou *et al.* (2018) and Reardon *et al.* (2012) stated governance as a system of the division of labor and responsibilities among the actors in the value chain that integrates the different strategies of various stakeholders in context of factors of production and marketing as well as the inclusion (equity) of poorest actors. In order to sustain competitive advantages and improve performance of the value chain, governance structure acts as an important instrument by analyzing and investigating the rules operating within a chain as well as assessing the distribution of power among various value chain actors. It is the mechanism by which a stakeholder of a value chain influences the activities of other stakeholders (Hinnou *et al.*, 2018; Schiffer *et al.*, 2010) that can be extended to the definition of products, processes, and quality standards that suppliers are required to follow (Hinnou *et al.*, 2018). With this in mind, we seek to analyze the governance structure of the Bangladeshi tomato and cauliflower supply chain and uncover the underlying reasons behind farmers' choices associated with trading under this structure.

Vegetable farming in Bangladesh plays an important role in achieving food and nutrition security. Farmers usually earn higher income from vegetables cultivation (Ibeawuchi *et al.*, 2015) and this has led to increased commercial cultivation (Kamruzzaman and Takeya, 2008). In addition, vegetable production in Bangladesh is growing because of policy support, farmer's adoption of hybrid seeds, and higher return than that from low incentive rice production, as well as home gardening and cultivation of off-season and all-season vegetables (Ahmad, 2017).

Tomatoes and cauliflowers are two of the most popular and nutritious vegetables grown in Bangladesh. They are also important in terms of their yield, acreage, nutrition, consumption, and commercial uses. Cauliflower and tomato value chain involves various direct and indirect actors. Besides the value added by these actors, analyzing governance along the chain is of paramount importance in determining the sustainability of the chain and distribution of profit. The actors along the chain may have limited access to service and other forms of support required for meeting value chain standard and thus insufficient support can hamper their possibility to actively participate in higher value segments of the value chain (Moniruzzaman, 2019). Analyzing the GS in a value chain helps determine if all actors – particularly farmers can adequately access resources and overcome potential structural barriers to entry. Such an analysis should focus attention on the relative degrees of economic power wielded by the different actors in the value chain, and determine if a lead actor exercises power to enforce the rules and enable good governance. With this in mind we provide such an analysis with respect to the Bangladesh cauliflower and tomato value chain. Being perishable in nature it is crucial to identify formal or informal arrangements among the cauliflower and tomato value chain actors and to assess whether existing chain linkages actually benefited the socially and economically disadvantaged producer groups that ultimately enable them to meet specific market requirements and standards as well as to improve the competitiveness of their product. Analyzing governance is the most important research problem in vegetables value chain in Bangladesh. Although, there are several studies conducted on value chain analysis, there is dearth of research work on governance structure in the value chain. Moreover, no systematic study was found regarding the value chain governance of vegetables particularly focusing on factors affecting the choice of governance structure.

Therefore, this study analyzes the intrinsic and extrinsic factors on farmer's choice of GS and also identifies trader's perceptions regarding internal and external governance along the value chain. Section 2 discusses the relevant literature followed by the conceptual framework in Section 3. The methods used in the paper are discussed in Section 4. Results are presented in Section 5, and the final section concludes.

2. Literature review

The extant literature reveals that although a large number of vegetable value chain studies exist, none have addressed the topic of governance. We seek to address this gap in the literature by providing an analysis of the governance structure within the Bangladesh cauliflower and tomato value chain. This type of analysis is of great value as cauliflower and tomatoes are the most important vegetables grown in Bangladesh.

Zhao *et al.* (2019) discussed the governance of organic food value chain in China that a tight value chain was effective in the governance of organic food supply chain under third party certification while a loose value chain discouraged from producing organic products because of transaction costs. Broeder (2018) worked on utilizing value chain analysis to understand the challenges of tomato farmers in Ghana and stated that it was difficult to classify the fresh or processing tomato value chain either as producer driven or buyer driven chain although buyer driven value chain appeared to best described tomato pastes value chain. But due to the lack of international dimension, neither of Gereffi's two classifications could be applied to the outdoor/fresh tomato market in Ghana. Camanzi *et al.* (2018) investigated the factors affecting governance structure of firms and assessed the influence of vertical coordination on economic performance of the firms. The study identified: (1) product characteristics; (2) environmental condition; and (3) relationship among chain actors as factors that had influence on the adoption of governance types in agri food supply chains. While analyzing governance structure of agricultural value chain, Mishra and Dey (2018) established that governance in an informal value chain was much more complex than a bilateral contract causing a more complex interaction among the chain actors. GS often riddled with contradictory roles of actors as revealed from the value chain analysis of six commodity specific sub sectors namely milk, rice, poultry meat, cotton, potato, and sugarcane that were non retailer trader driven and consisted of relatively informal market. The nature of coordination, control and interdependence was distinct and closer to a network system that was expected to shift towards buyer driven market with the increasing trend of market being controlled by organized players. Nikolakis *et al.* (2018) identified Value chains were replete with moral hazard and other information asymmetry problems that often lead to inefficient economic decisions as upstream suppliers may choose to cut corners on quality or may maintain lower levels of inventory than what is desired by firms downstream. Without supportive governance safeguards, the value chain could be misused or become meaningless. Uddin *et al.* (2018) reported about poor governance practices in pangas and tilapia value chain in Bangladesh due to low government inspection and lack of knowledge of respective stakeholders. Power practice in terms of price setting (price of fish was determined by bargaining power), driver of value chain (pangas and tilapia value chain was buyer driven), information flow (information flow along the value chain of pangas and tilapia was crystalline), relationship (trust level was high among all the actors of the chain), mode of contract (done by actors within the chain was mutual) were the key outcome of governance along the value chain. Dolci *et al.* (2017) found that supply chain governance comprised with contractual, relational, and transactional aspects that had a positive influence on operational and financial supply chain performance. Moreover, it was found to be a more comprehensive view of the supply chain that focused on more strategic aspects and concerned with the balance between long term self-interest decisions and interdependency that exists among actors within a supply chain. Hailu (2016) found that the potato and onions chain were governed mainly by wholesalers with the assistance of brokers while producers were price takers and hardly negotiated the price due to fear of post-harvest loss in Ethiopia. Coordination mechanism among the value chain actors was low and also there were the complexity of information and knowledge transfer. GS exercised was favorable to wholesalers and retailers that put the smallholders and consumers in a weak position. Bargawi (2015) defined the governance of agricultural value chains in terms of smallholder farmer's access to storage, transport, niche markets, closer linkages, elite producers, and information. Somasekharan *et al.* (2015) established that in terms of the whole-chain governance, the seafood chain of Kerala was indubitably governed by

the overseas buyers and thereby was dominated by the captive form of coordination. However, Nelson and Tallontire (2014) suggested for safeguarding the interests of smallholders and expanding livelihood opportunities while assessing coordination and control in a governance structure of a value chain. Arinloye *et al.* (2013) explained the intrinsic and extrinsic factors that affected the choice about governance structure in the pineapple supply chains in Benin and also considered whether farmer's selection of governance types was independent or related. Various pineapple supply chain (local, regional, export market) followed different form of governance structure that ranged from spot market to collective actions. Farmer's choice of GS was mainly based on transactional attributes, institutional environment, market attributes, and firm's characteristics. Blanc and Kledal (2012) advised not for exclusively private governance in case of agro food value chain since integrating smallholders with few lead firms or multinational suppliers was questionable in developing countries. Hoi *et al.* (2009) recognized private arrangement furnished with low trust from market actors particularly the consumers, in food governance of many developed countries and recommended for a strong market governance of food safety. Gibbon *et al.* (2008) highlighted governance of a value chain as driving (role of lead actor), normalization (realignment of practices) and coordination among actors. A key distinction between the producer driven and buyer driven chain reflected governance as a function of lead firm type where producer driven chain was driven by manufacturers (industrial capital) and buyer driven chain was driven by retailers or marketers (commercial capital). Milagrosa (2007) identified three GSs while conducting the institutional economic analysis of vegetables production and marketing in Northern Philippines. The most common types were commissioner based followed by wholesaler and contractor-based organization where wholesaler-based GS was found to be the most efficient marketing arrangement from a transaction costs perspective. Jones *et al.* (1997) presented about network governance that was not purely contract or agreement based when demand was uncertain, tasks were complex, assets were specific, and exchange were frequent.

3. Conceptual framework

GS describes the rules and procedures under which a marketing system and supply chain operates. A specific GS may take many different forms depending upon the market actors within the system. We highlight the main types of GS typically associated with agricultural supply chains found in developing countries:

- *Market GS*: Market based governance structure comprises with very simple transactions. The buyer and seller have 'one-time', unrepeated connection in spot market GS (Williamson, 1985). Transactions have little or no formal collaboration among market actors because they do not necessarily know one another. Self-interest drives the transacting parties, and it is a low-cost option to alter the partners. The buyer has no controlling influence over the production and they provide very limited information to producers about the market needs. Although, it is feasible but not required to repeat transactions. Here, the basic governing mechanism is pricing. Under this structure little information is interchanged among the actors.
- *Relational GS*: In relational governance structure, buyer-seller interactions are defined by the exchange of information and services based on mutual trust, which binds the participants together in the chain. It's a type of informal contracting that is built on prior experiences and relationships (Gibbons *et al.*, 1994). When buyers and sellers count on complicated knowledge that is difficult to communicate and when swift adaptation is required, relational governance emerges. In spite of their mutual reliance, lead actor has the capacity to assert greater control over the other actors by directing the most valuable activity along the chain. Because deep knowledge and linkages take time to establish, switching to new partners can be costly and complex.
- *Farmer's association-based GS*: Farmer's associations are supposed to play a variety of roles and accomplish a variety of functions, since they are designed to serve a multitude of objectives. This association-based GS is defined by long-term contracts that last as long as the association's membership is active (Wennink and Heemskerk, 2006). Its legal responsibilities include improving the smallholder farmer's capacity building and connecting them to the higher value segments. Being the member of the association, a farmer can easily access extension and financial supports.

- *Outgrowing scheme-based GS*: Outgrowing scheme based GS is typically carried out under short or medium-term bilateral contracts and contracts for resource provision, marketing specifications and product management falls within this structure (Baumann, 2000). Generally, out grower schemes are defined as contractual agreements, which a farm uses to assure its supply of agricultural products by individual or groups of farmers. It facilitates the farmers by providing loans to buy necessary inputs or provides direct inputs as well as notifies them sufficient instruction on optimum production practices. It provides the buyer with a great amount of control over production and harvesting activities, ensuring that quality is maintained.

Transaction costs are the cost of reaching and accomplishing economic exchanges, the magnitudes of which are determined by the type of governance structure (Hobbs, 1995; Slangen, 2005). In the case of vegetables marketing, transaction costs might arise from three different activities: searching, negotiation or bargaining, and enforcement of agreement (Milagrosa, 2007). The goal of transaction cost economics (TCE) is to analyze the governance structure in a variety of situations and its focus is to determine how to organize transactions in such a way that transaction costs are kept to a minimum. Any transaction's costs can be divided into ex-ante and ex-post costs using the TCE framework. Information costs, search costs, and negotiation costs are examples of ex-ante costs, which are incurred before and during transactions. Moreover, ex-post costs include monitoring costs and the costs of enforcing contracts (Williamson, 1996). A primary emphasis of 'transaction cost economics' is to analyze the evolution of the institution and governance structure in a market setting. In a market-based governance framework, price is the most important driving element. The extent to which the farmer participates in price negotiation is governed by the governance system through which he sells his harvest production. For example, producer's access to the market is hampered by high transaction costs (Mbapila *et al.*, 2019). Both fixed transaction costs (FTCs) and proportional transaction costs (PTCs) have effects on the market participation of Mexican corn farmers (Key *et al.*, 2000), while several studies identified transaction cost as the greatest barrier to smallholder's market access. For specific transactions, specific governance models are applicable. Optimal governance structure is associated with the fewest transaction costs. The magnitude of transaction costs may be ascertained from a wide range of possible combinations of three key attributes: asset specificity, degree of uncertainty, and frequency of occurrence (Williamson, 1989). From the theoretical standpoint of transaction cost theory (TCT), we argue that vegetables farmers likely prefer to participate in a governance structure that minimizes both production and marketing transaction costs. As transaction cost decrease the vegetable farmer profits, optimal GS must be one that minimizes uncertainty and transaction costs (Janvry and Sadoulet, 2006). Using the TCE framework outlines in Figure 1, we postulate that certain key factors influence the choice of a governance structure for Bangladesh vegetable farmers.

Under this framework transactional traits are linked to a set of Williamson-defined concepts that describe how transaction costs are determined, and the optimal chosen example, on governance structure is assumed to be influenced by the transactional attributes. For example, non-transferability of the investment reflects its specificity. The more specific an asset for a particular use, the more likely it will be upheld in the governance structure. In addition, environmental uncertainty and behavioral uncertainty are two sources of transactional uncertainty that probably influence the choice of vegetable farmers GS. Fluctuations in rules, policies and regulations are examples of institutional environmental uncertainty, whereas market environment uncertainty includes price fluctuations and variations in demand. Behavioral uncertainty manifests itself through the activities of key market actors, which have an impact on how transactions are carried out. The frequency of a transaction is related to the number of time it occurs, as it can occur once in a while or more frequently. Market stability has an impact on how transactions are conducted, which in turn influences GS choice decision.

The 'rules of the game' are a crucial aspect for farmers to ensure that they gain from market participation. When these rules and regulations are transparent and fair, farmers can better their economic and social condition. Institutional environment is a set of underlying political, social and legal foundations that establishes the game's rules, with institutional arrangements overseeing how the game is played. In the present study, institutional support includes access to extension services, price information, and producer

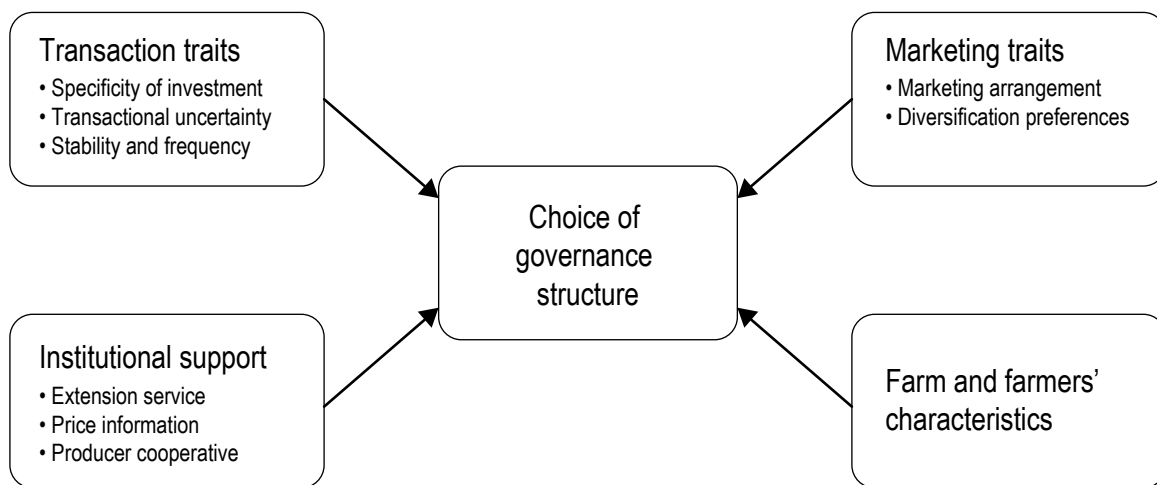


Figure 1. Factors affecting the choice of governance structure.

cooperatives. Due to lack of information and skills, smallholder farmers frequently remain unaware of the rules. A supportive institutional environment enables farmers to get access to timely market information and extension services, which reduces asymmetric information imbalances between farmers and wholesalers, and improves the capacity building of poor farmers. Farmer characteristics can also influence the choice of GS. Educated farmers are more capable of developing ties with other stakeholders. Improved interconnectivity with other actors along the supply chain creates the groundwork for better coordination, cost savings, product quality, and marketing efficiencies. Elderly farmers are experienced and well better understand their transactional environment, which helps them to select the optimal GS. However, for farmers in general, it is crucial to determine the supply chain effects of different forms of GS. Moreover, negotiation power and trust commitment influence farmers' choice of a particular GS.

4. Methods

4.1 Description of the study area

In order to assess governance structure in the cauliflower and tomato value chain, the study was conducted in Sylhet and Moulvibazar districts of Bangladesh (Figure 2). Sylhet is the divisional capital and is located in north-east Bangladesh. The district is bordered on the north by India's Khasia-Jaintia Hills, on the south by Moulvibazar district, on the east by Cachar and Karimganj districts of India, and on the west by Sunamganj and Habiganj districts. It is situated in between 24°36' and 25°11' north latitudes and in between 91°38' and 92°30' east longitudes. Moulvibazar is a district in north-eastern Bangladesh, which is located between the latitudes of 24°08' and 24°29' north and the longitudes of 91°36' and 92°17' east. The district is bordered on the north by the Sylhet district, on the south by the Tripura state of India, on the east by the Assam and Tripura states of India, and on the west by the Habiganj district. Kandigaon union and Hatkhola union from Sylhet Sadar Upazila of Sylhet district as well as Alinagar union and Adampur union from Kamalganj Upazila of Moulvibazar district were purposively selected. These areas were selected because vegetables are now commercially cultivated in these areas with an increasing trend. During the recent years, cultivation of cauliflower and tomato has been increased compared with other vegetables grown in this region. Data shows that during 2017-2018, the production of cauliflower and tomato were 6,500 metric tons and 4,292 metric tons in Sylhet district as well as 1,611 metric tons and 3,627 metric tons in Moulvibazar district (BBS, 2018). Therefore, considering the concentration of production, this study was conducted in Sylhet and Moulvibazar district.

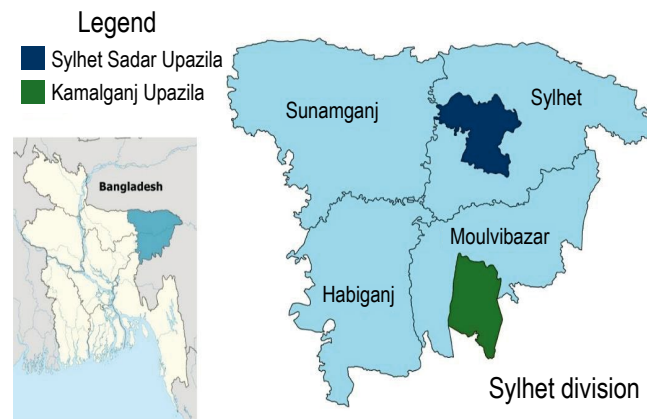


Figure 2. Location of the study areas.

4.2 Sampling and data collection techniques

The study used field level primary data. Two sets of structured survey schedules were asked to farmers and traders, respectively that included questions regarding various issues related with governance. In addition, questions were asked to traders about the factors they perceive influence farmer's choice of particular governance type. Before preparing the final schedules, preliminary survey schedules were pre-tested through preliminary field survey to test their reliability. Complete list of cauliflower and tomatoes farmers in the study areas was collected from Upazila Agriculture Office (UAO). A total of 100 farmers were selected from two districts by applying simple random sampling technique. Fifty farmers from Sylhet Sadar Upazila (25 farmers from each of Kandigaon and Hatkhola Union) of Sylhet district were interviewed. Similarly, 50 farmers from Kamalganj Upazila ((25 farmers from each of Alinagar union and Adampur union) of Moulvibazar district were selected. Moreover, 60 traders (15 from each category; Aratdar, wholesaler, retailer, and roadside retailer) were also selected purposively and interviewed. Thus, the total sample size of the study was 160. The researcher collected the relevant primary data through direct personal interview with the assistance from local Sub Assistant Agriculture Officer (SAAO). Although, our sample size is relatively small, this is not unusual for farmer-based surveys in third world countries, and in spite of this we are able to uncover interesting and statistically significant results. In particular, standard errors for our econometric model estimates are not unusually large and we conclude our sample size large enough to not seriously compromise our main conclusions.

4.3 Empirical model specification

Humphrey and Memedovic (2006) described governance as the definition and enforcement of instructions relating to what to be produced, how they are to be produced and when that can take different forms and types in a particular chain. Depending on marketing environment, transactional pattern, trust commitment and institutional environment; individual farmer selects only one particular type of GS during a particular period of time among all the possible alternatives. Several factors influence the choice of GS along the vegetables value chain. Econometric models such as multivariate logit/probit, multinomial logit/probit, conditional or mixed, or nested logit are useful models for the analysis of categorical choice dependent variables (Kassawet *et al.*, 2019) used a multinomial logit model (MNL) to determine the factors affecting farmers' choice of GS, because it allows us to analyze multiple categories simultaneously, and to estimate choice probabilities for different categories over a chosen base category (Al-Amin *et al.*, 2019; Madalla, 1983; Wooldridge, 2002), and this type of model is simple and easy to interpret using an odd ratio (Kropko, 2008; Long, 1997; Tse, 1987).

Like binary logistic regression, MNL regression uses maximum likelihood estimation to determine the probability of categorical membership. We used MNL because it proves to be more useful when compared

with log-linear regression and discriminant analysis (Dougherty, 1992). Farmers' choice of GS is generally based on utility maximization (Hensher *et al.*, 2005). The analytical model is constructed as follows.

Suppose that the utility to a farmer of alternative j is U_{ij} , where $j=0, 1, 2, \dots$. From the decision makers perspective, the best alternative is simply the one that maximizes net private benefit at the margin. In fact, farmers will choose a particular GS j if and only if $U_{ij} > U_{ik}$.

$$U(\text{choice of } j \text{ for farmer } i) = U_{ij} = V_{ij} + \varepsilon_{ij} \quad (1)$$

Where,

U_{ij} = the overall utility;
 V_{ij} = an indirect utility function; and
 ε_{ij} = a random error term.

The probability that farmer i select alternative j can be specified as follows:

$$P_{ij} = P_r(V_{ij} + \varepsilon_{ij} > V_{ik} + \varepsilon_{ik})$$

$$P_{ij} = P_r(\varepsilon_{ik} < \varepsilon_{ij} = V_{ij} - V_{ik}, \forall K \neq j) \quad (2)$$

Assuming that the error terms are identically and independently distributed with type j extreme value distribution, the probability that a farmer chooses alternative j can be explained by a MNL model (Greene, 2002) as following:

$$P_{ij} = \frac{\exp(\beta_j X_{ij})}{\sum_{j=0}^j \exp(\beta_j X_{ij})} \quad (3)$$

Where,

X_{ij} = is a vector of household of the i^{th} respondent facing alternative j ;
 β_j = is a vector of regression parameter estimates associated with alternatives j .

By following Equation (3), we can adopt MNL model fitting to this study as following:

$$P(\text{choice}_{ij} = j) = \frac{\exp(\beta_j X_i)}{\sum_{j=0}^j \exp(\beta_j X_i)} \quad (4)$$

Where,

i represent i^{th} farmers and $i=1, 2, 3 \dots$;
 j represents different GS. $j=0$ for choice of spot market, $j=1$ for choice of balanced network, $j=2$ for choice of outgrowing scheme and $j=3$ for choice of farmers association;
 P refers the probability of choice of GS j by farmers i ;
 $\text{choice}_{ij} = j$ refers that GS j is chosen by farmer i ; and
 X_i = is explanatory variables.

After normalizing Equation (3) by one of the response categories such that $\beta_j=0$, the MNL model can be alternatively specified as follows:

$$P_{(ij)} = \frac{\exp(\beta_j X_{ij})}{\sum_{j=1}^J \exp(\beta_j X_{ij})} \quad (5)$$

Marginal effects are calculated from parameter estimates for better explanation of the results (Greene, 2003; Milagrosa, 2007). The marginal effects of the attributes on probability of choice are determined by differentiating equation as follows:

$$\delta_j = \frac{\delta P_j}{\delta X_j} = P_j = P_j \left[\beta_j - \sum_{j=0}^j (P_j)(\beta_j) \right], j=1,2,\dots,J \quad (6)$$

P_j the probability that farmer's choice j of GS or of regression parameter estimates associated with alternative j .

To implement our GS model, we identified a number of important variables that we considered would affect the type of GS chosen by farmers. These include, farm and farmer's characteristics (age, education, experiences, distance, farm size, trust commitment, bargaining power), market attributes (marketing arrangement, diversification of preferences), transactional traits (transaction specific investment, transactional uncertainty, market stability) and institutional support (access to extension services, price information, access to producers cooperative) were identified as the factors influencing the farmer's choice of governance structure.

Specifically, we considered extension services and training, access to price information, and access to producer's cooperative under the institutional environmental. By establishing rules and building a solid structure for human interactions, a supportive institutional environment reduces uncertainty and keeps transaction costs low. The mission of extension services is to extend knowledge of agronomic techniques and skills to improve productivity, food security, and the livelihoods of farmers. Through this program, extension agents discuss with the farmers how to overcome their production and marketing issues. Arrangement of extension services may be a formal procedure, such as 'training'. In fact, in our study we use the terms 'extension service' and 'training' interchangeably. For example, training is given on how to maintain improved seeds, crop protection, soil quality, irrigation management and overall farming practices, which are again considered under extension services. From our perspective, farmers who have received extension services are considered to have also received training.

On the other hand, it is important for the farmers to have adequate access to market information. Smallholder farmers must be well informed about quality of inputs, current market prices, and proper selling location, etc. Poor producers obtain an unequal share of the market price if there is power imbalance and the farmers lack ability to participate in price negotiations. Extension services may help bridge this marketing gap by providing price information. However, price information may also come from private sources (e.g. traders), and farmer's own marketing history may provide them with additional information on market prices.

Spot market GS was considered as a reference or base category. The results focused on the effect of independent variables on selecting particular GS relative to the choice of spot market GS. In addition, a percentage perception index (PPI) was used to gauge whether there was an improvement of governance by maintaining different indicators (Moniruzzaman, 2019). Moreover, trader's notions pertaining to internal and external governance, along with good governance indicators, was ascertained by conducting a Mann-Whitney-U test.

5. Results and discussion

Smallholder farmers were the most disadvantaged group in the cauliflower and tomato value chain. Transparent fundamental rules, providing them access to a well-functioning market, and to improve their social and economic condition, are likely important. However, in practice the smallholder farmers often faced vague rules that were isolated them from the chain with no or very low access to market. The largest numbers of

farmers (31%) were aged between 41 to 50 years. Average age of the farmers was 44.70 years, and they were well-informed about the transactional environment and choose particular governance structure accordingly. The average farm size of the cauliflower and tomato farmers was 2.43 acres. Maximum number of farmers (52%) was illiterate, where 48% farmers received formal education up-to various levels. More than half of the farmers had 11 to 30 years of experience in vegetable cultivation. GS clarified whether the farmers were being exploited by any lead actor or not, whether they had equitable access to inputs, sufficient marketing facilities, equal distribution of benefits, extension services, timely and available market information, along with other actors in the chain. Cauliflower and tomato farmers were involved in maintaining good internal governance practices from their own perspective whereas the practices of good external governance were not appreciable particularly in context of ensuring quality inputs, technical extension services, dissemination of market information, facilities of warehousing, etc. Coordination mechanism, relationship and trust commitment among the actors was moderately good in cauliflower and tomato value chain.

5.1 Governance structure followed by the cauliflower and tomato farmers

A rational farmer prefers to choose that form of GS that best performing in minimizing production and transaction costs as well as benefited the farmers as a whole (Arlinloye, 2013). Each GS has its own attributes that differentiate it from other types by the relationships that chain actors have with each other and with lead actor. Farmers were asked about their exchange of interactions, traits of transactions, trust commitment among the actors, experiences of transactions, whether they were involved in any long- or short-term contracts, pattern of product exchanges, etc. It transpired that cauliflower and tomato farmers were mainly involved with practicing four types of GS on the basis of transactional environment and attributes as well as institutional perspective. The identified types are spot market GS, relational GS, outgrowing scheme-based GS, and farmer's association-based GS. Maximum number of farmers (45%) were engaged with practicing spot market GS. Relational GS was followed by 30% of the farmers while 15 and 10% of the farmers were found to follow farmer's association-based GS and outgrowing scheme-based GS, respectively (Figure 3).

■ Spot market

Selling of cauliflower and tomato was simple under spot market structure in the study areas. Knowledge and information sharing were not so dense between the buyers and farmers operating under spot market. Here, the actors (i.e. farmers, traders and even consumers) did not necessarily know each other. In spot market GS, as there is no explicit coordination, market price is the main source of information (Giovannetti and Marvasi, 2017) and it acts as central governance instead of a powerful lead actor.

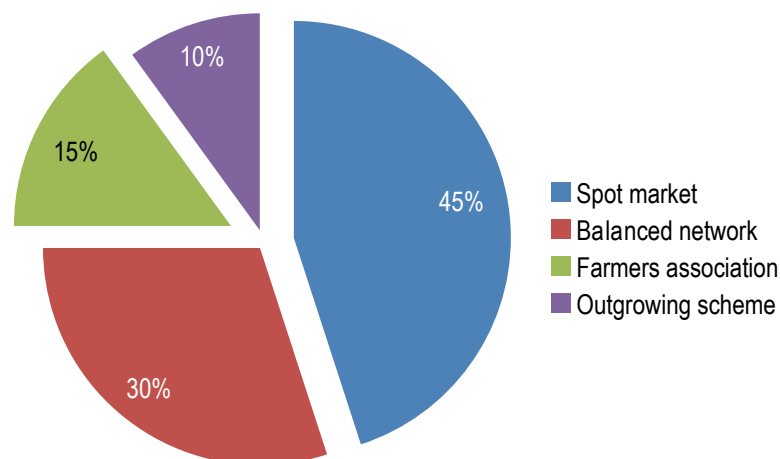


Figure 3. Governance structure followed by the farmers.

■ *Relational network*

In this network, transactions were characterized by high level of trust and commitment which brought the chain actors together. Information and knowledge exchanged was very dense while transactions were based on previous experiences between the buyers and farmers. The relational value chain is characterized by some degree of explicit coordination including collaborations and social sanctions (Giovannetti and Marvasi, 2017) where complex interactions between farmers and buyers often create mutual dependence.

■ *Farmer's association*

Cauliflower and tomato farmers got facilitations (long term contract) such as extension and financial assistance through monitoring, group selling, finding markets, etc. Usually, as a member of an organization they became claimants of this cooperation.

■ *Outgrowing scheme*

In outgrowing scheme GS, short- or medium-term bilateral contract existed between farmers and traders. This GS normally lasted for one harvesting cycle of cauliflower and tomato. The contract provides the farmers with a loan to buy inputs and also provides training as well as monitor performance (Bruntrup and Peltzer, 2006).

GS along a value chain varies depending on the ability of actors to facilitate exchange and the traits of transactional environment (Leiblein, 2003) whereas, the choice of its types is mainly influenced by the factors related to asset specificity, uncertainties both either environmental or behavioral that must be analyzed together but not in isolation (Grover and Malhotra, 2003; Ji *et al.*, 2012). Table 1 illustrates the explanatory variables used in the MNL model. The value of pseudo-R² indicated a good predictive ability of the model implying that the explanatory variables included in the fitted model, explained well the variations in the dependent variable. In addition, our model specification did not suffer from multicollinearity and heteroscedasticity.

Age of the farmers plays an important role in cultivating vegetables. Maximum and minimum age of the farmers was 67 and 22 years, respectively. Education is commonly used as a barometer of a community's socio-economic progress. Vegetables can be grown in a cost-effective manner by the educated farmers. Farm management and decision-making abilities are heavily influenced by the farmer's experience. Farmers with more expertise are believed to be more efficient in their management of the farm. They had an average of 16.5 years of expertise in growing vegetables (Table 1). Average distance from farmer's residence to the nearest market was 10.62 km. Transactions become extremely costly when transactions are undertaken in an uncertain environment. Mean value of the farmer's preference of diversification regarding selling vegetables was 0.39. The functions of good governance practices are aided by access to both extension services and price information. In addition, both of these services were well received by the majority of farmers (Table 2).

A-priori, we assumed older farmers would be knowledgeable about the transactional environment in their areas. However, we found that age did not significantly affect farmers choice of 'relational network', 'outgrowing scheme' and 'farmer's association' based GSs.

Education is believed to give necessary knowledge to the chain actors because it increases their marketing knowledge and strengthens their linkage with other actors. It is evident that, this variable influenced the choice of relational based GS positively and significantly at 1% significance level. If the farmer is literate, then the probability of choice of relational network and outgrowing scheme increased by 23.2 and 6.4%, respectively relative to the choice of spot market GS while farmer's association GS was negatively and insignificantly affected by education.

Farmers usually conducted their transactions based on previous experiences because it increases the knowledge of marketing and thus experience helps to improve the choice of particular governance type. The choice of

Table 1. Summary and descriptive statistics of the independent variables used in the model.

Variables	Description	Measurement	Expected effect			Descriptive statistics			
			Relational network	Outgrowing scheme	Farmer's association	Mean	Max	Min	Std. err. ¹
Age	Age of the farmer or household head	number of years	+	+	±	44.70	67	22	1.090
Education	Educational status of the farmer	1=literate, 0=illiterate	+	+	±	0.48	1	0	0.050
Experiences	Experiences in vegetables cultivation	number of years	±	-	-	16.05	40	2	0.793
Distance	Distance from residence to the nearest market	km to market from home	+	+	-	10.62	20	3	0.378
Farm size	Total farm size of the farmers	amount of farm size in hectare	±	±	±	2.43	12	0	0.177
Bargaining power	Bargaining and negotiation power of the cauliflower and tomato farmers	1=yes, 0=otherwise	-	±	-	0.80	1	0	0.040
Trust	Trust commitment between buyers and sellers	1=yes, 0=otherwise	±	±	±	0.44	1	0	0.050
Transaction specific investment	Whether farmers have made large investment (>50,000)	1=yes, 0=otherwise	-	±	-	0.66	1	0	0.048
Transactional uncertainty	Whether buyers always demand for stable quality of vegetables and buy a stable volume of vegetables	1=yes, 0=otherwise	±	±	+	0.46	1	0	0.050
Market stability	Whether market has accurate delivery time and place and requires consistent quality vegetables	1=yes, 0=otherwise	±	±	±	0.72	1	0	0.045
Marketing arrangement	Whether volume, quality and prices are pre-agreed	1=yes, 0=otherwise	±	±	±	0.13	1	0	0.034
Diversification of preferences	Whether the farmers are interested in a single market or prefer to sell to different market and different outlets	1=yes, 0=otherwise	+	+	+	0.39	1	0	0.049
Access to extension services	Access to extension services and training	1=yes, 0=otherwise	+	±	+	0.87	1	0	0.034
Access to price information	Whether farmers have access to adequate and timely market or price information	1=yes, 0=otherwise	+	±	+	0.86	1	0	0.035
Access to producer's cooperative	Whether the farmers belong to a producer's cooperative	1=yes, 0=otherwise	±	-	+	0.66	1	0	0.048

¹ Std. err. = standard error.

balanced GS was positively and insignificantly affected by farmer's experience of vegetables cultivation. As in case of relational, transactions are based on previous experiences and high level of trust commitment between actors and for those reasons, the choice of relational GS was increased by 0.4% compared with the choice of spot market type GS. However, it decreased the choice of outgrowing scheme and farmer's association type by 0.2 and 0.1%, respectively compared with the choice of spot market GS.

Table 2. Factors affecting choice of governance structure (GS).¹

Explanatory variables	Dependent variables (GS)					
	Relational network		Outgrowing scheme		Farmer's association	
	Estimated co-efficient	Marginal effect	Estimated co-efficient	Marginal effect	Estimated co-efficient	Marginal effect
Age	0.090*	0.005	0.103*	0.002	0.071	0.001
	(0.090)	(0.246)	(0.104)	(0.393)	(0.191)	(0.655)
Education	2.721***	0.232***	2.537**	0.064	0.726	-0.057
	(0.004)	(0.003)	(0.032)	(0.214)	(0.476)	(0.371)
Experience	0.029	0.004	-0.026	-0.002	-0.003	-0.001
	(0.648)	(0.481)	(0.710)	(0.466)	(0.960)	(0.848)
Distance	0.523***	0.052***	0.419***	0.009	-0.030	-0.023*
	(0.001)	(0.000)	(0.003)	(0.207)	(0.863)	(0.058)
Farm size	-0.934***	-0.013	-0.942**	-0.003	-2.290***	-0.138***
	(0.000)	(0.675)	(0.035)	(0.892)	(0.000)	(0.007)
Bargaining power	-0.511	-0.074	0.005	0.015	0.296	0.038
	(0.582)	(0.399)	(0.997)	(0.862)	(0.832)	(0.673)
Trust	-0.247	-0.017	2.068	0.177***	-2.782***	-0.232***
	(0.766)	(0.826)	(0.260)	(0.009)	(0.009)	(0.002)
Transaction specific investment	-2.028**	-0.128	-3.589***	-0.165***	-0.064	0.099
	(0.050)	(0.121)	(0.011)	(0.002)	(0.958)	(0.182)
Transactional uncertainty	0.634	-0.010	0.474	-0.017	2.372**	0.159***
	(0.515)	(0.904)	(0.675)	(0.734)	(0.019)	(0.007)
Market stability	0.198	0.066	-0.305	-0.016	-0.989	-0.079
	(0.813)	(0.419)	(0.764)	(0.774)	(0.308)	(0.188)
Marketing arrangement	0.665	0.082	0.047	-0.020	0.001	-0.021
	(0.630)	(0.502)	(0.981)	(0.852)	(0.999)	(0.834)
Preference of diversification	0.414	-0.055	2.000*	0.104*	1.207	0.058
	(0.546)	(0.416)	(0.095)	(0.075)	(0.149)	(0.238)
Extension service	3.725***	0.319***	0.892	-0.115	3.859***	0.173*
	(0.001)	(0.013)	(0.611)	(0.202)	(0.003)	(0.090)
Price information	4.330***	0.389**	1.418	-0.098	3.479***	0.119
	(0.004)	(0.036)	(0.373)	(0.380)	(0.008)	(0.239)
Producers' cooperative	0.250	-0.099	0.164	-0.043	4.001***	0.302***
	(0.786)	(0.348)	(0.885)	(0.457)	(0.002)	(0.004)
Constant	-15.542		-11.019		-9.316	
Number of observations		100	Wald chi ² (45)	98.35	Pseudo-R ²	0.446
Reference category		Spot market GS	Prob>chi ²	0.000	log pseudo likelihood	-68.384

¹ Figure within the parentheses indicates the *P*-value; *, ** and *** indicate the significance level at 10, 5 and 1%, respectively.

Distance to the market from farmer's house also determines their transaction pattern, that is how and which way they sell their produce and in doing this whether or not, there exists good relationship between buyers and sellers. Distance positively influenced the choice of relational types at the 1% level. The probability of the choice of relational GS was increased by 5.2% with an increase in distance from the nearest market. However, the choice of outgrowing scheme GS also increased by 0.9% with an increase in distance. As farmers usually get assistance through group selling and finding market after the formation of a group that functions like a cooperative under the farmer's association market structure where farmers sell their products to their buyers to meet their common goal in a certain period and therefore an increase in distance decreased the probability of choosing farmers association type by 2.37%.

As the farm size increases, the land allocated for cultivation may also increase that enables farmers to produce more and as product exchange is simple and standard, relations are not complex as well as market price is main source of information (Giovannetti and Marvasi, 2017), the farmers select the spot market type instead of considering other GSs. The result reveals that, with an increase in farm size, the choice of relational, outgrowing scheme and farmer's association-based structure was decreased by 1.3, 0.3 and 13.8%, respectively relative to the choice of spot market GS.

If the cauliflower and tomato farmers have the power of bargain and negotiation, then no lead actor can emerge and usually discriminate with them. Although access to bargaining power is an indicator of good governance practices, an increase of it decreased the choice of relational type GS compared to the choice of spot market type GS. This is because of the fact that, in spot market type products are exchanged between multiple buyers and sellers at current price at current time as well as transactions are also not so complex that allow the farmers to bargain and negotiate with their customers. For that reason, an increase in the bargaining power decreased the farmer's choice of relational GS by 7.4% relative to the choice of spot market. As short- or medium-term bilateral contract as well as long term contract exists in outgrowing scheme GS and farmer's association based GS, an increase in bargaining power increased its choice respectively by 1.5 and 3.8%.

Trust commitment between buyers and sellers – in other words whether farmers have confidence in their buyers, to regularly purchase vegetable from them – influences farmer-selling decisions. In terms of GS, when trust exists farmers are willing to make marketing decisions based on buyer's suggestions. The findings reveal that trust commitment had a statistically significant and positive impact on the choice of outgrowing scheme-based GS. Marginal effects showed that, the probability of selecting outgrowing scheme GS was increased by 17.7% relative to the choice of spot market, while relational based GS and farmer's association GS were negatively influenced by trust commitment between buyers and sellers. Being made by farmers with low trust and commitment towards buyers and other actors, relational based GS and farmer's association-based GS were decreased by 1.7 and 23.2%, respectively relative to spot market GS.

Transaction specific investment denotes whether farmers make large investment for cauliflower and tomato production, upgrading and delivering. Assets are specific to a particular use if the returns they provide are valuable only in that use and cannot be put to any alternative use (Arlinloye, 2013). Transaction specific investment negatively and significantly affected the choice of outgrowing scheme GS. There is a problem of hold-up and non-transferability faced by the farmers when asset have a high specificity (Williamson, 1983). As a result, asset specific investment was significantly and negatively correlated with the outgrowing scheme-based GS while it had statistically insignificant negative impact on the choice of relational based GS. Association based GS was also positively and insignificantly affected by transaction specific investment.

Frank and Henderson (1992) stated that, when transactions are conducted under uncertainty, it becomes very costly or impossible to anticipate all contingencies and therefore it is important to determine whether there is a stable arrangement of price and quality as well as stable amount of buying and selling of vegetables. The probability of choosing relational based GS and outgrowing scheme GS were decreased by 1 and 1.7%, respectively compared to spot market GS when transactional uncertainty increases. With other things being constant, if transactional uncertainty increases by a unit, the choice of farmer's association GS was increased

by 15.9% compared to the choice of spot market GS. These results are consistent with, 'the likelihood of contract-based arrangements is even higher when uncertainty coincides with the investments which cannot be redeployed' (Menard, 2004). As long-term contracts are involved with farmer's association-based GS, that enabled them to reduce the uncertainties associated with the transactions arrangement; farmers adopted a mode of governance that is close to association based GS.

Our study measured the market attributes under constructs of accurate delivery time and place of market and requirement of quality vegetables because the traits of market shape the way by which transactions are take place that eventually determine GS choices. Market stability had an insignificant impact on the choice of relational based GS.

Marketing arrangements considered whether the volume, quality and price of cauliflower and tomato were pre-agreed or not. In case of pre-defined marketing arrangement, contractual practice may arise. Findings revealed that, the choice of relational based GS was positively and insignificantly related with pre-agreed marketing arrangement. With the increase of pre-agreed market arrangement, the choice of relational based GS was increased by 8.2%, while it had a negative and insignificant impact on outgrowing scheme and farmer's association-based GS.

Whether farmers were concentrated in a single market, or they spread to various markets influenced the choice of GS. It is evident that, choice of relational based GS was negatively and insignificantly related with diversity of farmer's preferences to be involved in several exchange relationship. An increase in diversity of preferences; increased the choice of outgrowing scheme and farmer's association-based GS respectively by 10.4 and 5.8%.

Extension programs have been the primary means of disseminating knowledge about farm technologies, availability of credit and inputs as well as assisting farmers in improving their technical and managerial abilities on the farm. Farmers can benefit from agricultural extension services by receiving advice, information, and other support services, which enable them to improve the productivity of their crops. Farmers who have frequent access to extension services have better access to information. This information helps them to decide the best way they trade with other actors, and ensuring good governance practices. Extension service access and information had a statistically significant and positive impact on the choice of relational based GS (0.319) and farmer's association based GS (0.173). Marginal effects indicates that, with an increase in extension services the probability of choosing relational and farmer's association-based GS were increased by 31.9 and 17.3%, respectively compared to the spot market-based GS. However, extension services discouraged the farmers from choosing outgrowing scheme GS (-0.115) relative to the base category because they did not need to be involved with only short- or medium-term bilateral contract in spot market GS.

Availability and access of market information facilitates the functions of good governance practices. In order to be a competitive actor along the value chain, the farmers must have the power to participate in price negotiation which is governed by the governance system. Smallholder farmers need to be well-informed about demand and supply of their crops, market competitors, and existing market price of their products. The farmers who have timely access to accurate market information may well understand the market condition and can make better decisions regarding the selling of cauliflower and tomato in the way where farmer may not be exploited by other powerful actors. Availability and access to market information positively and significantly influenced the choice of relational based GS (0.389) at 5% level of significance. With an increase in the availability and access of market information, the probability of choosing relational and farmer's association-based GS were increased by 38.9 and 11.9%, respectively while it negatively influenced the choice of outgrowing scheme-based GS.

Access to producer's cooperative affected the choice of farmer's association-based GS positively and significantly at 1% level of significance implying that other things held constant with an increase in access to producer's cooperative, the choice of farmer's association-based GS was increased by 30.2%. Farmers

who were the members of ‘common interest group’ (CIG) conducted their farming activities and sold their vegetables as a member of an organization under farmer’s association-based GS. However, access to producer’s cooperative decreased the choice of relational based GS and outgrowing scheme-based GS by 9.9 and 4.3%, respectively compared to the choice of spot market type.

5.2 Governance followed by the traders

Four types of traders such as Aratdars, wholesalers, retailer, roadside retailers¹ were identified in cauliflower and tomato value chain. Their perceptions were also taken in order to determine how they viewed internal and external governance structure. Five categories (highly disagree, disagree, neutral, agree and highly agree) were formed to measure their perceptions on different indicators of internal and external governance.

In case of internal governance practices, most of the traders were agreed with ‘hygienic production processes’ (53.33%) and ‘timely deliveries of vegetables’ (58.33%). There were no facilities for storing of vegetables and most of the actors did not perform grading functions properly. They had to bear losses for lacking storage system. Only 30% traders were involved in taking market feedback and thus, large number (40%) of them were not interested regarding improvement of vegetables quality accordingly buyers’ feedback. Presence of the practices of good governance in the context of access and availability of market information was at a satisfactory level. Maximum number of traders had regular access of market information (Table 3).

In context of external governance practices, ‘disagree’ category got the highest percentage of perception about ‘technical assistance by Department of Agricultural Marketing’ (50%) and ‘checking contamination’ (45%); that reported a negative sign of good governance practices. Good governance existed in terms of local marketing facilities, trading rules, regulations, and buyers-sellers relationship. Though most of the actors got market information from the market, their fellow traders or via mobile phone or media, there was no arrangement for disseminating the information along with the technology for storing and processing.

A Mann-Whitney-U test was applied to determine the trader’s level of opinion regarding internal and external governance along the chain. Whether the traders differ in their cognition and practices of GS. For this purpose, the null hypothesis and alternative hypothesis can be specified as follows: null hypothesis, H_0 : traders are not indifferent in their opinion of internal and external governance practices and alternative hypothesis, H_a : traders are indifferent in their opinion of internal and external governance practices.

Table 4 shows that, Aratdar and wholesaler exhibited different opinions in context of various statements of both internal and external governance except for the case of ‘improvement in quality of vegetables’. Retailers and roadside retailers also differ in their practices of both internal and external governance. Thus, Mann-Whitney-U test established the fact that, traders in cauliflower and tomato value chain had their own perceptions and understanding of GS and accordingly they maintained it.

5.3 Governance indicators followed by different traders of value chain

Kaufmann *et al.* (2010) stated about the indicators of good governance that are: (a) voice and accountability; (b) political stability and absence of violence; (c) regulatory quality; (d) government effectiveness; (e) rule of law; and (f) corruption control.

By following percentage perception index (PPI) formula, we assessed the trader’s perceptions regarding the indicators of good governance in five categories such as ‘always’, ‘often’, ‘neutral’, ‘sometimes’ and ‘never’. Our results are presented in Table 5.

¹ Roadside retailers are those who mainly buy vegetables from retailers and then sell to final consumers. They also buy from wholesalers. Their volume of transaction is very low. They have no fixed establishment and sell their vegetables wherever they can.

Table 3. Internal and external governance followed by different traders.¹

	Extent of practice or perception				
	Highly disagree	Disagree	Neutral	Agree	Highly agree
Internal governance					
Hygiene production process	0	9 (15)	16 (26.67)	32 (53.33)	3 (5)
Timely deliveries of vegetables	0	9 (15)	0	35 (58.33)	16 (26.67)
Improved storage and refrigeration system	33 (55)	26 (43.33)	1 (1.67)	0	0
Maintain improved grading system	10 (16.67)	41 (68.33)	3 (5)	6 (10)	0
Improvement in quality of vegetables	0	24 (40)	24 (40)	12 (20)	0
Product development with market feedback	0	24 (40)	17 (28.33)	18 (30)	1 (1.67)
Always get market information such as customer demand, product quality and product price	1 (1.67)	4 (6.67)	0	35 (58.33)	20 (33.33)
External governance					
Provision of assistance by Department of Agricultural Marketing	15 (25)	30 (50)	1 (1.67)	14 (23.33)	0
Checking contamination	21 (35)	27 (45)	9 (15)	3 (5)	0
Electric power supplies and marketing facilities	0	0	2 (3.33)	37 (61.67)	21 (35)
Supportive rules and regulation	0	4 (6.67)	9 (15)	43 (71.67)	4 (6.67)
Good relationship exists between buyers and sellers	0	5 (8.33)	3 (5)	41 (68.33)	11 (18.33)
Timely dissemination of available market information	10 (16.67)	27 (45)	0	21 (35)	2 (3.33)
Dissemination of technology for storing and processing	34 (56.67)	25 (41.67)	1 (1.67)	0	0

¹ Figure within the parentheses indicates the percentage of total respondents.

Traders gave their highest percentage of perception about ‘voice and accountability’, ‘political stability and absence of violence’, ‘government effectiveness’ and ‘rule of law’ on ‘often’ group. For the first indicator of good governance, it is seen that ‘always’ and ‘often’ group got highest percentage that reflects existence of good governance in context of ‘voice and accountability’. Trader’s responses towards ‘political stability and absence of violence’ indicated that most of the times they got supportive prices though political instability such as Hartal adversely affects vegetables trading. Responses over sound ‘regulatory policy’ got highest percentage (53.3%) in ‘often’ category while 36.67% traders remained neutral on whether sound regulatory policies were implemented or not. Out of total traders, 53.33% sometimes received training while 46.6% did not get any training on vegetables trading which is an indication of bad external governance practices. Although traders gave highest responses in ‘often’ category for ‘government effectiveness’, about 45% of them hardly received any public or private services on trading from government organization. Traders often had confidence towards the rules imposed by the government but 40% of them told that sometimes all rules were supportive to all actors. Moreover, highest responses went on ‘sometimes’ category for the indicator of ‘corruption control’. Sometimes vegetable trading was largely affected by extent of corruption but while it happens, seldom the farmers could raise their voice against it. Off and on some lead actors or local influential

Table 4. Hypothesis test summary of Wilcoxon-Mann-Whitney-U test.¹

Governance	Null hypothesis	Mann-Whitney U	Wilcoxon W	Z	P-value
Internal governance					
Hygiene production process	Wholesaler and Aratdar are not indifferent in their opinion of internal governance	90.00	210.00	-0.988	0.323
Timely deliveries of vegetables		101.00	221.00	-0.534	0.594
Improved storage and refrigeration system		105.00	225.00	-0.359	0.720
Maintain improved grading system		108.00	228.00	-0.231	0.817
Improvement in quality of vegetables		63.50	183.50	-2.165**	0.030
Product development with market feedback		69.00	189.00	-1.913*	0.056
Always get market information		101.50	221.50	-0.521	0.603
External governance					
Provision of assistance by Department of Agricultural Marketing	Wholesaler and Aratdar are not indifferent in their opinion of external governance	106.50	226.50	-0.271	0.786
Checking contamination		95.00	215.00	-0.775	0.438
Electric power supplies and marketing facilities		75.00	195.00	-1.795*	0.073
Supportive rules and regulation		81.50	201.50	-1.662*	0.096
Good relationship exists between buyers and sellers		99.00	219.00	-0.673	0.501
Timely dissemination of available market information		95.00	215.00	-0.816	0.414
Dissemination of technology for storing and processing		97.50	217.50	-0.762	0.446
Internal governance					
Hygiene production process	Retailer and roadside retailer are not indifferent in their opinion of internal governance	103.00	223.00	-0.462	0.644
Timely deliveries of vegetables		106.50	226.50	-0.290	0.771
Improved storage and refrigeration system		86.50	206.50	-1.257	0.209
Maintain improved grading system		86.00	206.00	-1.322	0.186
Improvement in quality of vegetables		94.50	214.50	-0.818	0.413
Product development with market feedback		94.00	214.00	-0.823	0.411
Always get market information		112.00	232.00	-0.027	0.979
Internal governance					
Provision of assistance by Department of Agricultural Marketing	Retailer and roadside retailer are not indifferent in their opinion of external governance	106.00	226.00	-0.293	0.770
Checking contamination		108.50	228.50	-0.184	0.854
Electric power supplies and marketing facilities		100.50	220.50	-0.644	0.520
Supportive rules and regulation		81.00	201.00	-1.615	0.106
Good relationship exists between buyers and sellers		99.50	204.50	-0.294	0.769
Timely dissemination of available market information		97.50	217.50	-0.661	0.509
Dissemination of technology for storing and processing		108.50	228.50	-0.189	0.850

¹ ** and * indicate the level of significance at 5 and 10%, respectively.

Table 5. Governance extent by different actors.¹

Indicators	Extent of actor's perceptions					
	Statements	Always	Often	Neutral	Sometimes	Never
Voice and accountability	Freedom of expression and bargaining power	18 (30)	34 (56.6)	0	8 (13.33)	0
	Freedom of cooperation	7 (11.67)	45 (75)	0	8 (13.33)	0
Political stability and absence of violence	Formulate and implement sound policies by govt.	0	21 (35)	6 (10)	30 (50)	3 (5)
	Get supportive price at all levels	1 (1.67)	30 (50)	12 (20)	17 (28.33)	0
	Hartal hamper vegetables marketing	16 (26.67)	29 (48.3)	1 (1.67)	14 (23.33)	0
Regulatory quality	Sound regulatory policies implemented by the government	0	32 (53.3)	22 (36.67)	6 (10)	0
	Provide training to actors	0	0	0	32 (53.33)	28 (46.6)
Government effectiveness	Public and private services by government organization	0	21 (35)	5 (8.33)	27 (45)	7 (11.7)
	Degree of independence to run business	12 (20)	33 (55)	9 (15)	6 (10)	0
Rule of law	Actors have confidence to the rules imposed by govt.	0	32 (53.3)	18 (30)	10 (16.67)	0
	All rules are supportive to the actors	0	15 (25)	19 (31.67)	24 (40)	2 (3.3)
Corruption control	Lead actor or political farm capture the market	1 (1.67)	16 (26.6)	0	34 (56.67)	9 (15)
	Vegetable's trading is largely affected by the extent of corruption	5 (8.33)	15 (25)	8 (13.33)	28 (46.67)	4 (6.67)
	Form group and raise voice against it	2 (3.33)	21 (35)	4 (6.67)	17 (28.33)	16 (26.7)

¹ Figure within the parentheses indicates the percentage of total respondents.

politicians captured the whole market for the fulfillment of their unfair interests. As a result, small farmers and traders had to face extreme losses and dangers.

The result of Wilcoxon-Mann-Whitney-U test in Table 6 indicates that wholesaler and Aratdar differ from each other for having consciousness pertaining several indicators of good governance meaning that perceptions towards governance indicators was not same across these two trader categories. However, retailer and roadside retailer were identical in terms of attitudes towards freedom of expression and bargaining power, political outrage or lead actor's dominance in the chain and raising voice against corruption that affects vegetables trading while they showed different notion for other governance indicators.

6. Conclusions

Governance structure clarifies the farmer's position in the value chain and also determines their relationship with other actors. In addition to input suppliers there were four types of traders such as Aratdars, wholesalers, retailers and roadside retailers in cauliflower and tomato value chain. The study has shown that, the cauliflower and tomato farmers were mainly involved in practicing four types of GS such as spot market, relational network, outgrowing scheme, and farmer's association-based GS, respectively. Our results showed that farmers (45%)

Table 6. Wilcoxon-Mann-Whitney-U test statistics for governance indicators.¹

Statements of good governance indicators	Null hypothesis (H ₀)	Mann-Whitney U	Wilcoxon W	Z	P-value
Freedom of expression and bargaining power	Wholesaler and Aratdar are not indifferent in their perceptions or cognition of good governance indicators	111.00	231.00	-0.070	0.944
Freedom of cooperation		111.00	231.00	-0.080	0.936
Formulate and implement sound policies by govt.		97.50	217.50	-0.702	0.483
Get supportive price at all levels		93.50	213.50	-0.855	0.392
Hartal hamper vegetables marketing		101.50	221.50	-0.484	0.628
Sound regulatory policies implemented by the government		108.50	228.50	-0.195	0.846
Provide training to actors		90.00	210.00	-1.117	0.264
Public and private services by government organization		109.50	229.00	-0.132	0.895
Degree of independence to run business		102.50	222.50	-0.462	0.644
Actors have confidence to the rules imposed by govt.		100.50	220.50	-0.582	0.561
All rules are supportive to the actors		105.50	225.50	-0.307	0.758
Lead actor or political farm capture the market		94.50	214.50	-0.837	0.402
Vegetable's trading is largely affected by the extent of corruption		93.50	213.50	-0.901	0.368
Form group and raise voice against it		Retailer and roadside retailer are not indifferent in their perceptions or cognition of good governance indicators	101.50	221.50	-0.487
Freedom of expression and bargaining power	57.00		177.00	-2.687***	0.007
Freedom of cooperation	106.50		226.5	-0.337	0.736
Formulate and implement sound policies by govt.	94.00		214.00	-0.824	0.410
Get supportive price at all levels	111.50		231.50	-0.046	0.964
Hartal hamper vegetables marketing	95.50		215.50	-0.794	0.427
Sound regulatory policies implemented by the government	101.50		221.50	-0.505	0.614
Provide training to actors	90.00		210.00	-1.087	0.277
Public and private services by government organization	73.00		193.00	-1.810*	0.070
Degree of independence to run business	103.50		223.50	-0.410	0.682
Actors have confidence to the rules imposed by govt.	86.00		206.00	-1.184	0.237
All rules are supportive to the actors	86.50		206.50	-1.169	0.242
Lead actor or political farm capture the market	63.00		183.00	-2.341**	0.019
Vegetable's trading is largely affected by the extent of corruption	109.00		229.00	-0.150	0.881
Form group and raise voice against it	58.00	178.00	-2.410**	0.016	

¹ ***, ** and * indicate the level of significance at 1, 5 and 10%, respectively.

were most likely to choose the spot market GS because of its simplicity in transactions and relations followed by relational (30%), farmer's association (15%) and outgrowing scheme (10%), respectively. Education, distance from the nearest market, access to extension services and access to price information were found to be statistically significant in the context of the choice of relational based GS. Trust commitment, transaction specific investment and preference of diversification were found to significantly impact farmer's choice of outgrowing scheme GS. In addition, distance, farm size, trust, transactional uncertainty, extension service and access to producer cooperatives significantly affected the choice of farmer's association-based GS. Although some farmers formed the CIG, most of them were not well organized and also heavily depended on other actors along the chain. Due to fear of postharvest losses, sometimes farmers hardly negotiated price, and were in effect price takers.

Although traders had regular access to market information like customer's demand, product quality, product prices, etc. but there was a dearth of arrangements for disseminating information. They often had confidence towards the rules imposed by the government and maintained good relationship with the farmers. Mann-Whitney-U test results revealed traders differences concerning internal and external governance.

In sum, we conclude that farmer's bargaining power along with trust commitment towards other actors should be improved. To this end we suggest that the extension activities of the Department of Agricultural Extension and market monitoring of the Department of Agricultural Marketing should be made more frequent and regular. Importantly, concerned authorities should focus attention on disseminating market information and improving trust commitment between buyers and sellers. This could be achieved by establishing better linkages between buyer and sellers and so improve overall governance in the cauliflower and tomato value chains. Formation of producer's group or farmer's organization and contractual arrangements can play vital role in establishing strong linkages between buyers and sellers. They can hold meeting at some regular interval under these mechanisms, where sellers can know buyers demand, feedback, market information, buyers marketing advice, and thus farmers or sellers can initiate their product development strategy. Only after ensuring good governance in cauliflower and tomato value chain, the farmers can strengthen their situation and it helps them to grow and develop.

Conflict of interest

The authors declare no conflict of interest.

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