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STATUS OF PRICE VARIATIONS OF FISH, LIVESTOCK AND POULTRY PRODUCTS: A CASE STUDY IN GAZIPUR DISTRICT OF BANGLADESH

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Abstract

This study examined the pattern of price variations of major fish, livestock and poultry products in Gazipur district of Bangladesh. The secondary data on the average wholesale and retail prices of ten important commodities for a period of six years (June 2014 to June 2019) were collected from the Department of Agricultural Marketing (DAM) under the Ministry of Agriculture of the Government. The averages were calculated from a total of 1900 wholesalers and 2450 retailers in Gazipur district. Polynomial trend model was used to understand the nature of changes in the prices of the selected commodities and to make short-term forecasting. The model revealed a different pattern of price change for different commodities in both wholesale and retail markets. In case of mutton, egg (chicken), egg (duck), beef, and *silver carp* fish, it was highly upward sloping which indicates that price of these commodities will increase at an increasing rate in the upcoming years. A moderately increasing rate of price change was observed for *katla* fish in both the markets while for broiler, indigenous chicken and *rohu* fish, it was found a downward sloping. On the contrary, the projection indicates that the price of *tilapia* fish would remain stable in the near future. Such a scenario suggest that market monitoring system should be strengthened by the government to control the extreme increase or decrease in prices so that none of the stakeholders would be the gainer nor looser from the pricing policy in Bangladesh.

Keywords: Bangladesh, retail price, poultry products, broiler, market monitoring, stakeholder.

Introduction

Bangladesh, a country with a population of about 160 million, has emerged as a developing country from the least developed country in 2018 due to massive progress in social and economic aspects in the past few decades. The per capita gross national income has increased from US$[1] 120 in 1972 to US$ 1827 in 2019 (WDI, 2019). Such changes in income coupled with rapid urbanization are causing changes in the dietary pattern of the consumers towards the consumption of high-value products like milk, meat, egg, fish, and vegetables.

Poultry and fish farming has been contributing to alleviate poverty through income and employment generation in one hand, on the other hand, it also contributes ensuring nutritional security as these products are relatively a cheap source of protein which enable people to consume them at the lowest cost (Raha, 2007; Alam *et al*., 2012a; Khatun *et al*., 2016). Hamid *et al*. (2017) reported

[1] *US$ 1 = Approximately Tk 85 as of November, 2019*

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that about 44% of the human daily intake comes from animal protein derived from the consumption of livestock products of which poultry sub-sector itself contributes about 22% to 27%. It also provides job opportunity to more than 6 million population in the country (Hamid *et al.*, 2017). Thus, the development of such mixed farming including crop, livestock, fisheries and poultry can contribute achieving the first goal of "no poverty" and second goal of "zero hunger" of the 17 Sustainable Development Goals (SDGs) by 2030.

However, the consumption of these commodities varies across income groups. Over the years, the consumption of these products with the pace of increasing production has also been augmented mainly due to affordable price. Any change in price might have great influence in consumption decision of these commodities mainly for lower and middle-income groups (Alam *et al.*, 2012a). Different determinants influence the marketing pattern and consumers' purchasing decisions of which galloping rise in daily commodity price is one of the main reasons. The frequent changes in the prices of regular food items generally have an adverse effect on the livelihood of the population in the country. Given that different sub-sectors of agriculture are closely linked with each other, the change in prices of one sub-sector may have a potential impact on the production and consumption in other sub-sectors. From that pursuit, an analysis of price variation over the years may help to understand the inter-sectorial pattern of price change which will further ensure the effective allocation of resources in the agricultural sector.

Not many studies are found to examine the price change of fish, livestock and poultry products in Bangladesh. Few studies have been conducted on the price variation of different agricultural enterprises such as fish (Omar *et al*., 2014a,b; Omar *et al.*, 2015; Alam *et al.*, 2015c), livestock (Islam and Jabber, 2010), and poultry (Islam, 2003; Alam *et al.*, 2012a; Alam *et al.*, 2013; Omar *et al*., 2013; Rahman *et al*., 2017; Islam *et al*., 2017; Hamid *et al*., 2017). However, most of these studies have specifically focused on a particular fish, livestock or poultry species and not the combination of different enterprises, thereby, indicates the limited study coverage. Moreover, it indicates that there is a lack of study examining the pattern of price changes both within a specific product category (e.g., chicken meat and egg) and also between the products' variety (e.g., chicken meat and beef or mutton, fish and chicken etc.). A deeper understanding of the price changes of different commodities will provide critical insights for the design of policies and strategies to support actors in the food system (Alam *et al*., 2012a). Therefore, this study has aims to understand the nature of price changes of major fish, livestock and poultry products in Gazipur district of Bangladesh.

It is expected that besides helping the policymakers in designing appropriate price policy of different commodities, this study will enable the ultimate consumers undertaking better purchasing decisions in accordance with the supply, demand and their budget constraints.

Materials and Methods

This study is based on the secondary data collected from the Department of Agricultural

Marketing (DAM) of Ministry of Agriculture, Government of the People's Republic of Bangladesh. Gazipur district, the adjacent district to the capital of Bangladesh, was chosen purposively for this study where people of different income group particularly low and middle-income ones live together. The data covered the average wholesale and retail prices of 10 important commodities which are chicken (broiler and indigenous), beef, mutton, egg (chicken and duck), and fishes including medium-sized *rohu*, *katla*, *tilapia* and *silver carp* for the period of 6 years from June 2014 to June 2019. These commodities are considered as the main source of protein needed for an active and healthy life. Moreover, the sample included a total of 1900 wholesalers and 2450 retailers of the selected commodities in Gazipur district. As the collected price data reveal a fluctuating nature, polynomial trend model was used to understand and make an inference of future rise or fall in prices of these selected commodities in Gazipur district of Bangladesh.

In time series modelling, the polynomial trend line provides simple but flexible and smooth variation in time. Through polynomial functions, a well-approximated trend of the dependent variable can be estimated and is often adequate for short-term forecasting[2] (West and Harrison, 1989; Mendenhall and Beaver, 1994). Data that is polynomial in nature is generally described by:

$$y = a + x^n$$

Where, a = intercept, x = independent variable, y = dependent variables, n = nature of polynomial trend lines (e.g. square, cubic, etc.) (Hayes, 2019). Other things remaining the same, it was assumed in this study that price is changed over the years. Therefore, the year acted as an independent variable whereas the dependent variable was the price of individual commodities selected under this study.

Results and Discussion

Price variation of broiler and indigenous chicken meat

Broiler meat is relatively a cheap source of protein for the lower and middle-income population in Bangladesh (Rahman *et al*., 2017). It is evident from Fig. 1 that the price of broiler meat has increased in both wholesale and retail markets over the years. The maximum price of Taka (Tk) 135 per kilogram (kg) was observed for the year 2017 in the wholesale market and Tk 150/kg in the retail market. On average, the price increased by Tk 12 per kg in the wholesale market while in the retail market, the price difference was Tk 10 per kg which is summarized in Table 1. Consistent with Hamid *et al.* (2017), the reason for such increased price could be explained as the lower availability than demand which has caused a deficit of chicken meat and egg and, thereby, increased price. The polynomial trend line in Fig. 1 reveals that in the upcoming years, the price of broiler has the possibility to slightly decrease in both the markets with ceteris paribus.

In regards to indigenous chicken, a noticeable price change is observed over the study period (Fig. 2). In the wholesale market, the average price of local chicken was Tk 360 per kg (June 2019) which was Tk 270 per kg in 2014. It implies that within six years period

2 *For further understanding of how to obtain the polynomial trend, please read: West and Harrison, 1989; Mendenhall and Beaver, 1994; Hayes, 2019.*

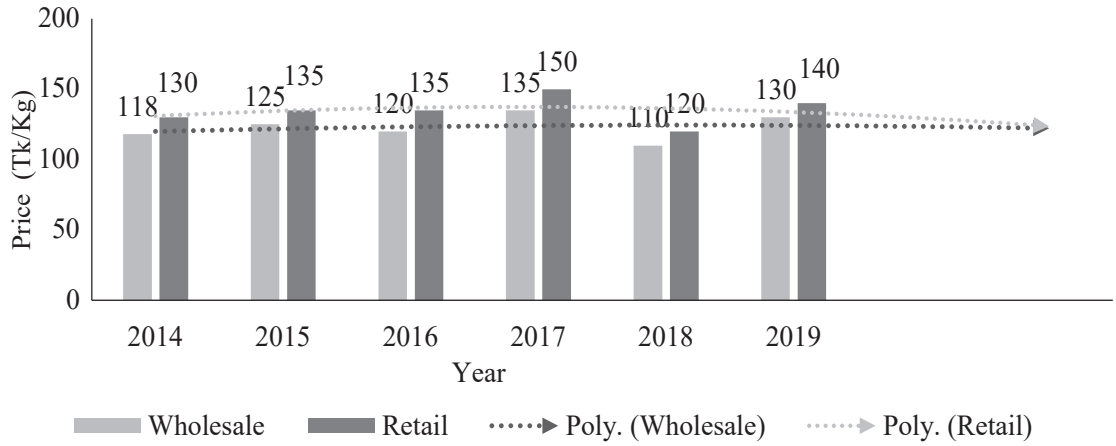

Fig. 1. Wholesale and retail price variation of broiler during 2014-2019.

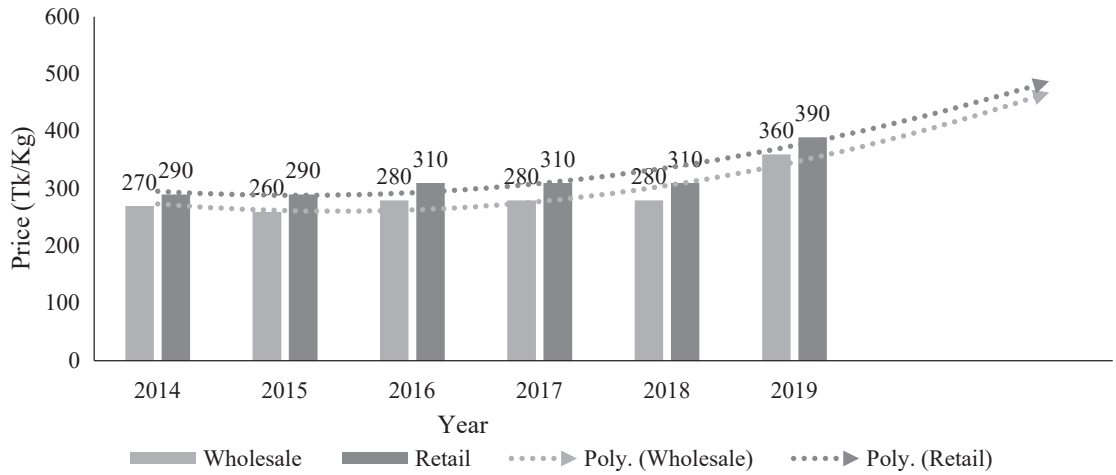

Fig. 2. Wholesale and retail price variation of indigenous chicken during 2014-2019.

the wholesale price of local chicken per kg has increased by 33%. The retail price reached the highest of Tk 390 per kg in the current year as compared to Tk 290 per kg in 2014 reflecting about a 34% change within five years period (Table 1). It is quite clear from the above discussion that the meat price of native chicken has increased remarkably than broiler over the study periods. The previous study also supports that the perception among a group of people regarding the better taste and quality of indigenous chicken than broiler meat resulted in the higher price for indigenous chicken (Raha, 2013; Alam *et al.,* 2013). In fact, this price of indigenous chicken has increased almost 3 times than broiler over that study period.

Price variation of beef and mutton

The price variation of beef also depicts an upward trend as shown in Fig. 3. It is observed that there was a remarkable increase in beef

prices by Tk 100 per kg at both the wholesale and retail markets of Gazipur between the years of 2015 and 2016. However, the maximum price in the wholesale market was Tk 470 which remained the same over the last two years while in the retail market, it reached up to Tk 480. The overall price difference in the retail market (Tk 205) remained slightly higher than the wholesale market (Tk 200) over the study years as summarized in Table 1. The upward sloping trend line in Fig. 3 demonstrate that the price of beef would increase in future but might not at an increasing rate.

In the case of mutton, a sharply upward sloping price change is observed in both the markets. In the wholesale market, the lowest price was Tk 450 in the base year while it rose dramatically to Tk 740 till June 2019. Similarly, in the retail markets, the price increased by Tk 290 over the years. Even though the pattern of mutton price change is more intense than beef price, yet, the rate of change is less than beef in both wholesale and retail markets (Table 1).

Following Islam and Jabbar (2010), the reason for the increase in the prices of beef and mutton can be justified as the increase in demand for animal products, particularly meat, due to the increase in per capita income and rapid urbanization in Bangladesh while the supply is not consistent with the demand in the market. In contrary, beef and mutton could be regarded as the substitute product. In that case, the increase in the price of beef can be accompanied by the increase in mutton price and *vice versa*.

Price variation of egg (chicken and duck)

Egg is a day to day use food commodity for most of the people in Bangladesh. Egg of chicken is mostly popular due to its

Table 1. Wholesale and retail price variations of different commodities during 2014-2019 in Gazipur district of Bangladesh

Items	Wholesale price		Retail price	
	Total price variation (Tk/kg)	Proportion of change (%)	Total price variation (Tk/kg)	Proportion of change (%)
Chicken-Broiler	12	10	10	8
Chicken-Local	90	33	100	34
Beef	200	74	205	75
Mutton	290	64	290	63
Egg-Chicken	7	28	7	25
Egg-Duck	18	56	20	57
Rohu Fish-Medium	40	19	30	12
Katla Fish-Medium	-	-	(10)	(3)
Tilapia Fish	20	18	10	7
Silver Carp Fish	30	25	30	21

Note: Figures in the parenthesis indicates negative values
Source: Own calculation from the available dataset

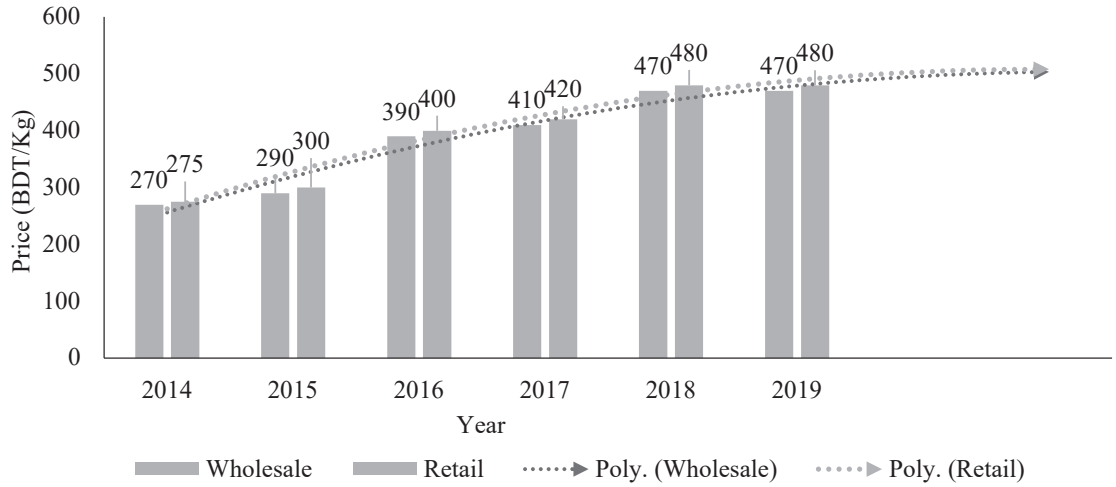

Fig. 3. Wholesale and retail price variation of beef during 2014-2019.

availability and less price (Alam *et al*., 2013). Slight fluctuation in the price of the chicken egg is observed over the years reaching a maximum of Tk 32 and 35 per four eggs in wholesale and retail markets respectively in 2019. The price difference is the same in both the markets which is estimated at Tk 7 per four egg. However, the proportional changes shown in Table 1 implies that the rate of change in wholesale markets (i.e., 28%) is higher than the retail market (i.e., 25%). The trend line depicted in Fig. 5 reveals that the price of the chicken egg will slightly increase in the upcoming years.

Similar to the chicken egg, the trend of price change is upward for duck egg in both wholesale and retail markets. It has increased

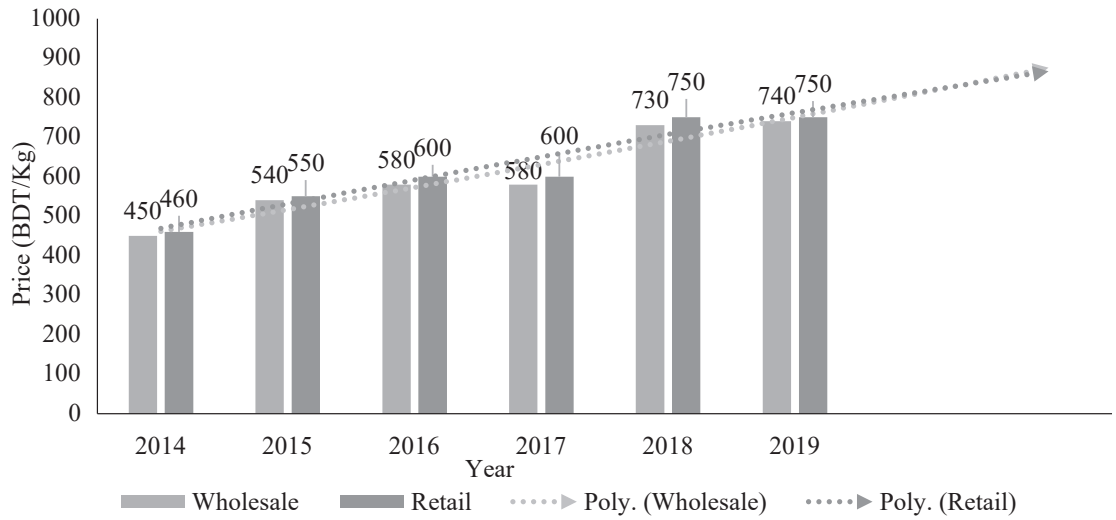

Fig. 4. Wholesale and retail price variation of mutton during 2014-2019.

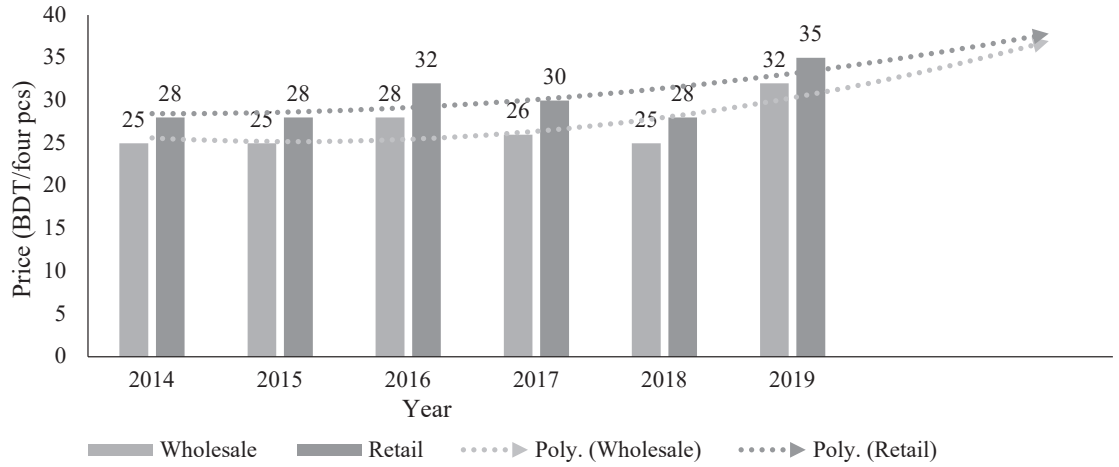

Fig. 5. Wholesale and retail price variation of egg (chicken) during 2014-2019.

substantially between the years 2018 and 2019 in both the markets by Tk 13 and Tk 10 per four eggs. However, the overall change is very negligible accounting 56% and 57% in the respective markets (Table 1). The polynomial trend line in Fig. 6 indicates that the price of duck egg will rise even more than previous years. While comparing the egg price of duck with chicken, it can be concluded that duck egg has a higher price and a higher tendency of price increase than the chicken egg.

It is true that increased egg price is good for the traders but it may inhibit the poor consumers in fulfilling their nutrient from this cheapest source of protein (Alam *et al.*, 2012a; Omar *et al.*, 2013). The more plausible reason for increased egg price can be interpreted in line with Rahman *et al.* (2017) and Hamid *et al.* (2017). According to the authors, the egg price hike has been caused by the stagnant production and supply of egg in the market than the increasing demand which

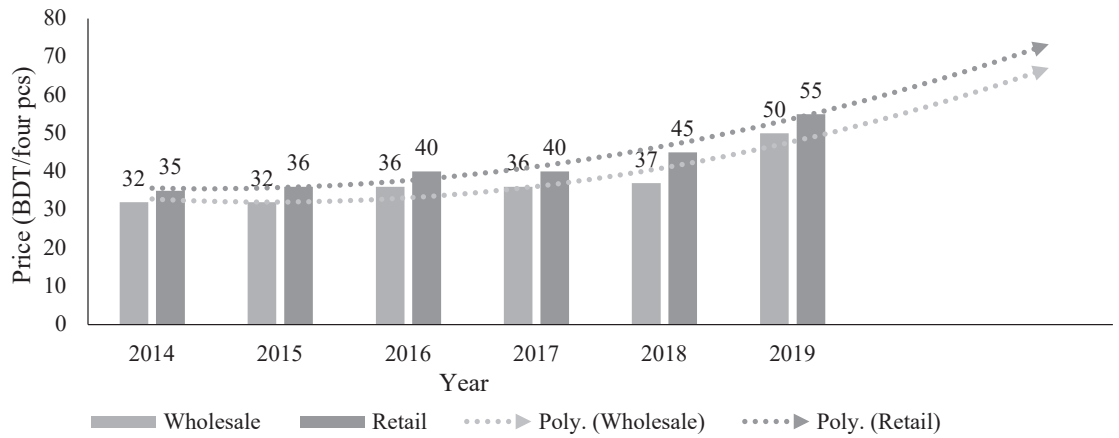

Figure 6. Wholesale and retail price variation of egg (duck) during 2014-2019.

is further influenced by the feed price hike and the outbreak of different diseases. Such an idea opposes the findings by Raha (2007) as the author noted that the supply exceeds the demand for poultry egg and meat in Bangladesh. In recent times, the rumor against the false egg and nutritional disparity between white and brown egg in the market may have caused many poultry farmers incurring a loss while it has increased the demand for duck egg. But, duck farming is not being reared on a large scale in Bangladesh (Alam *et al.*, 2012b). Therefore, the supply of duck egg is limited in respect of demand which caused the price to rise.

Price variation of *rohu* and *katla* fish (medium)[3]

Fish is an important source of protein. Bangladeshi people prefer to consume fish over any other protein-rich food items (Islam and Jabbar, 2010). Due to the fast-growing nature, *rohu* and *katla* fishes have become very popular in Bangladesh (Palash and Sabur, 2004). An examination of the price pattern of medium-sized *rohu* fish reveals that there was a notable rise in price during 2016 in both the markets. In 2014, it was sold at a price of Tk 210 in the wholesale market which suddenly rose by Tk 30 in 2016. Afterwards, a slight fluctuation is seen in the profit margins of the wholesalers for the next three years with a difference of Tk 10 per kg. The retail price analysis reveals the same scenario whereas the average profit margin earned by the retailers was Tk 40 per kg in 2014. In recent time, *rohu* fish is sold at Tk 280 per kg in the retail market. Overall, a 19% change is observed in the wholesale market while it is 12% in the retail market (Table 1). The downward sloping price trend line in Fig. 7 projected from the obtained data implies that the price would fall in both wholesale and retail markets in the upcoming days. However, the rate of reduction would be higher in the retail market than the wholesale market in Gazipur district which will ultimately help the consumers.

3 *Sometimes referred as rui and catla*

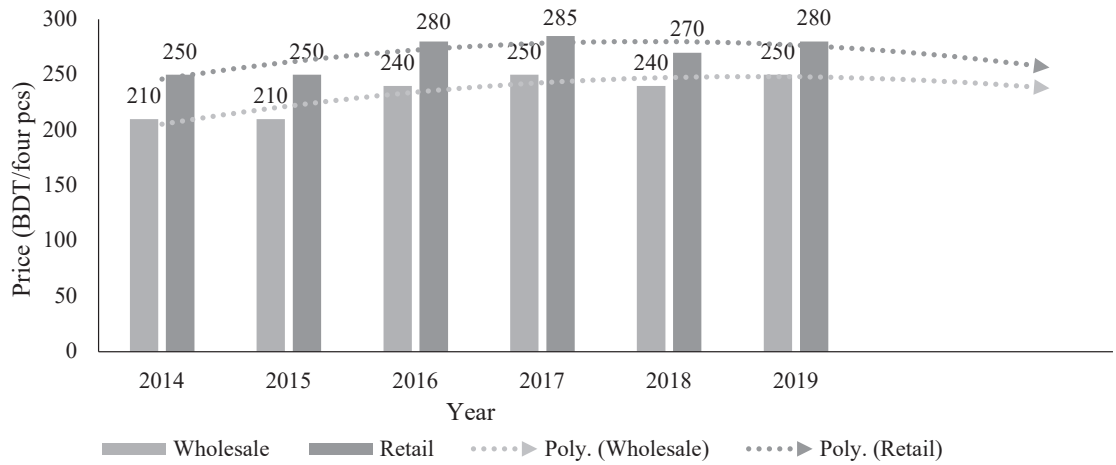

Fig. 7. Wholesale and retail price variation of *Rohu* fish (medium) during 2014-2019.

In contrary to *rohu* fish, a year to year moderately fluctuating prices of medium-sized *katla* fish is observed from Fig. 8. In the wholesale market, the price varied between Tk 270 and Tk 280 per kg revealing an upward trend in recent times while it remained between Tk 300 to Tk 320 in the retail market. However, the retailers received the maximum price in 2014 and afterwards, the price kept changing reaching Tk 310 per kg in the last year. In fact, the rate of change in the wholesale market over the study periods is about zero percent whereas in the retail market, the price has reduced by 3% than the base year (Table 1). Yet, the retail price of *katla* fish remained higher than wholesale price throughout the study periods leaving a price difference of approximately Tk 32 per kg.

Given the fact that the *rohu* and *katla* fish are cultured in freshwater in Bangladesh and are commercially produced on a large scale, they are able to better serve the country's requirement. Therefore, the price remains usually reasonable and affordable for all classes of people in the country (Alam *et al.*, 2012c). It could be a plausible reason for an almost stable change in prices over the study years.

Price variation of *tilapia* and s*ilver carp* fish

Tilapia and s*ilver* carp fishes are highly sold in the local markets due to its relatively low price and higher availability and increased popularity. In the worldwide position of cultured fish, *tilapia* stands second after carps (Omar *et al*., 2014b). For *tilapia*, the wholesale and retail price scenario demonstrates a wave-like movement. Wholesalers used to sell their fish at Tk 110 per kg in 2014 which continuously increased in the following two years by Tk 5 and Tk 10 per kg followed by the reduction in the next two years at the same rate and again increased by Tk 20 per kg reaching a maximum of Tk 130 per kg in the first quarter of 2019. It means that in the wholesale market, the price of *tilapia* fish has increased by Tk 20 per kg on an average (Table 1). Even though a similar change is also observed in the retail market, however, the price has increased by only Tk 10 per kg from the base years which was Tk 140

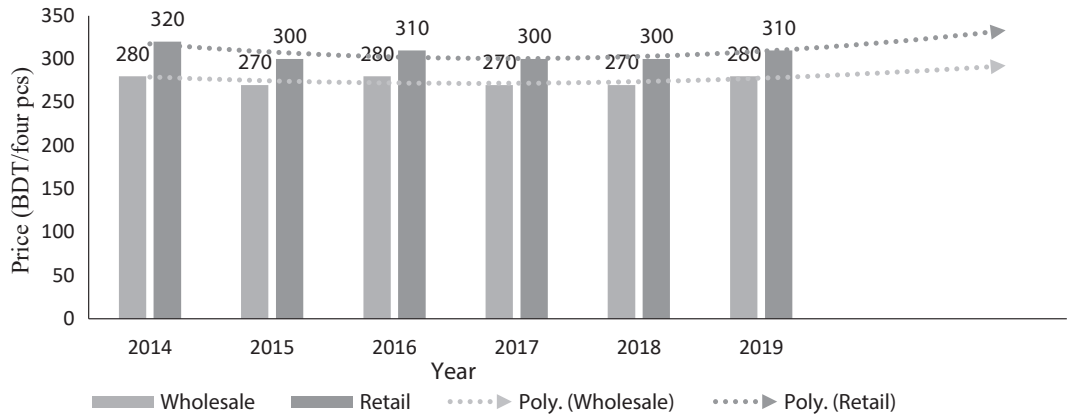

Fig. 8. Wholesale and retail price variation of *Katla* fish (medium) during 2014-2019.

per kg. As opposed to the general tendency, Table 1 reflects that the rate of price change in the retail market (i.e., 7%) is considerably lower than the wholesale market (i.e., 18%). Such a slight change in prices of *Tilapia* fish can be substantiated by Omar et al. (2014b) in a way that it is a preferable and affordable fish for all classes of people. Therefore, the fluctuations might be associated with the change in market condition, the availability of substitute products such as *pungus* fish, chicken, and meat in the market as well as different festivals.

The polynomial trend line in Fig. 9 exhibits that in the near future, the price of *tilapia* fish will increase in both markets but at a decreasing rate.

In the case of *silver carp*, both the wholesale and retail prices show an increasing trend over the last six years except 2015 in the wholesale market. In 2014, the wholesale price was Tk 120 per kg while the retail price was Tk 140 per kg. By 2019, the wholesale retail prices rose up to Tk 150 per kg and Tk 170 per kg respectively. Such a change indicates an equal amount of change (i.e., Tk 30 per kg) in both the markets. However, the rate of change is comparatively lower in the retail market than the wholesale market (Table 1). Like *tilapia* fish, an upward sloping straight line in Fig. 10 implies that the price of *silver carp* will sharply increase in the upcoming years.

Except for *rohu* fish, almost all other three fish categories selected in this study reveals an increasing pattern of price change with very minor fluctuations. As per Islam and Jabbar (2010), the demand for fish is price inelastic which implies that with the increase in price, the demand for fish does not fluctuate much as fish is the regular preferred item of consumption for Bangladeshi population. This study contradicts with Palash and Sabur (2004) where the authors' consumer behavior analysis revealed that consumers tend to consume less fish if the price increase and vice versa. Another finding of the former authors suggests that fish is a complementary good of

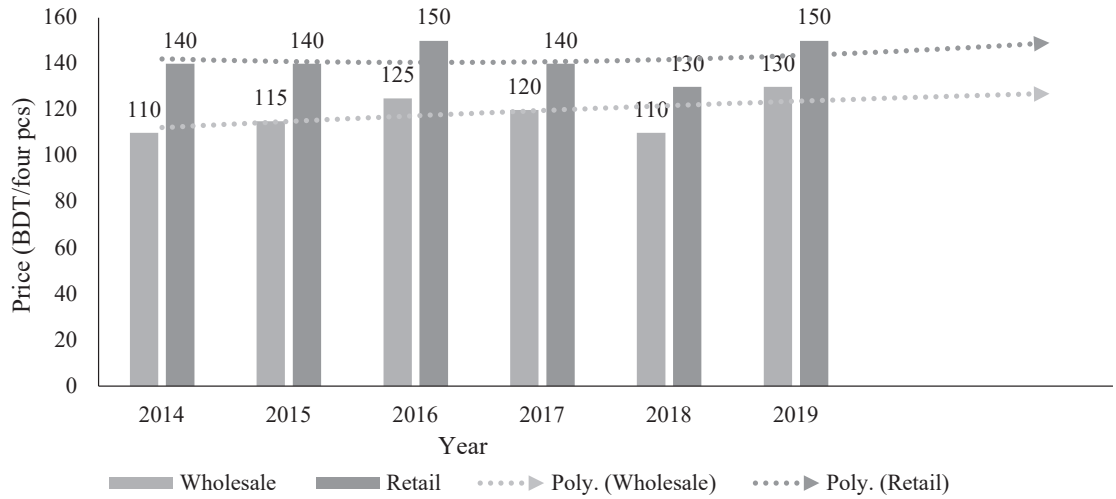

Fig. 9. Wholesale and retail price variation of *Tilapia* fish during 2014-2019.

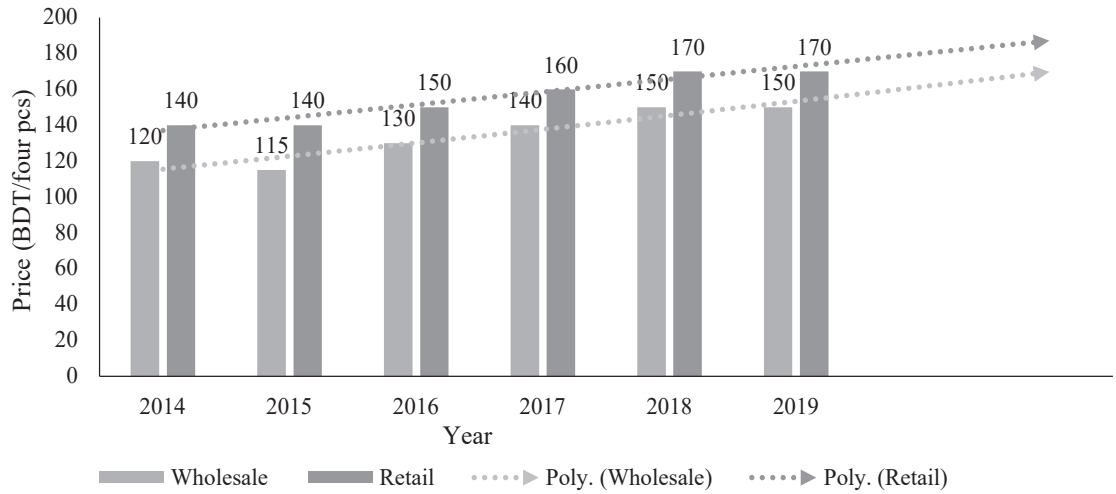

Fig. 10. Wholesale and retail price variation of s*ilver carp* fish during 2014-2019.

cereals. Therefore, a percent increase in cereal prices will decrease the fish price by 1.3%. Alternatively, it can be interpreted as a percent decrease in the prices of cereals results in the increase in the prices of selected fishes under this study.

In order to better highlight the overall changes in the wholesale and retail prices of the selected commodities, a table of comparison is presented in Table 2. For facilitating the discussion, the proportions in Table 2 is presented as an integer number.

Conclusions and policy recommendations

The sub-sectors of agriculture such as fisheries, livestock and poultry play a vital role in ensuring nutritional security and income of the households in Bangladesh. However, a considerable variation in the prices of these products is generally supposed to affect the production pattern and consumption decisions on a large scale. Price variations might be caused by a number of factors such as weather, nature of the product, the extent of disease attack, price of feed, the purpose of buying, infrastructural and market conditions, political instability, number of intermediaries in the market and so forth. The ultimate result of such variation is the imbalance between overall supply and demand causing the price to rise or fall in the market. This is what has been examined in the present study using the average price data of a total of 1900 wholesalers and 12450 retailers of the selected fish, livestock and poultry products in Gazipur district. The aim of the study was to understand the nature of price changes of these commodities so that farmers and traders are able to plan their business activities appropriately while consumers are able to adjust their food budget.

The analysis reveals that for some commodities such as mutton, chicken and duck egg and *silver carp* fish, there would be a substantial increase in the prices in the upcoming years in the wholesale and retail markets in Gazipur district. On the other hand, the price of beef would have a possibility to

Table 2. Wholesale and retail price variations of different commodities during 2014-2014 in Gazipur district of Bangladesh

Item	Wholesale Price						Retail Price					
Year	2014	2015	2016	2017	2018	2019	2014	2015	2016	2017	2018	2019
Chicken-Broiler (kg)	118	125	120	135	110	130	130	135	135	150	120	140
Chicken-Local (kg)	270	260	280	280	280	360	290	290	310	310	310	390
Beef (kg)	270	290	390	410	470	470	275	300	400	420	480	480
Mutton (kg)	450	540	580	580	730	740	460	550	600	600	750	750
Egg-Chicken (4 eggs)	25	25	28	26	25	32	28	28	32	30	28	35
Egg-Duck (4 eggs)	32	32	36	36	37	50	35	36	40	40	45	55
Rohu Fish-Medium (kg)	210	210	240	250	240	250	250	250	280	285	270	280
Katla Fish-Medium (kg)	280	270	280	270	270	280	320	300	310	300	300	310
Telapia Fish (kg)	110	115	125	120	110	130	140	140	150	140	130	150
Silver Carp Fish (kg)	120	115	130	140	150	150	140	140	150	160	170	170

Source: Department of Agricultural Marketing, Ministry of Agriculture, Government of the Peoples' Republic of Bangladesh

increase but at a decreasing rate. In contrary to such changes, *katla* fish price is projected to slightly increase while decreasing pattern is expected for indigenous and broiler-type chicken meat and also *rohu* fish. In the case of *tilapia* fish, the price may stay stable in the near future. Such price pattern suggests that the production of commodities having increasing price pattern might be profitable for the wholesalers and retailers but the consumers might need to restructure their budget as per their income. Such changes in price might affect the dietary and nutritional status of poor and middle-income earners in particular in the country. Considering all these situations the government should devise an appropriate strategy to control the extreme increase or decrease in prices so that none of the stakeholders would be the gainer nor looser from the pricing policy in Bangladesh.

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