Determinants of Growth in Consumption of Rural Household in Bangladesh: A Regression Analysis

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Abstract

The purpose of this study is to investigate the determinants of growth in consumption of rural households in Bangladesh in the post-liberalisation era. Using data from both primary and secondary sources, the study applied the ordinary least square (OLS) regression models to assess the determinants. It also used both economic and non-economic characteristics (endowments) simultaneously for considering their joint effects on determinants. The study found that non-farm household dummy was the largest positive determinant of household consumption followed by household land area in 2010. Conversely, net buyer dummy variable was the largest negative determinant followed by rice price in the same year. Food consumption was the largest determinant of growth in household consumption followed by household land area in 1985-86. Rice consumption was the largest negative determinant of growth in consumption in 1985-86 but was the largest positive determinant in 2005. This study argues that agricultural trade liberalisation contributed to an increase in rice production and consumption, leading to higher growth in household consumption in the post-liberalisation era. Three difference variables – changes in share of income from agriculture, business-commerce, and house rent – were the positive determinants of growth in both 1985-86 and 2005. However, income-from-rice and change-in-income-from-rice were not statistically significant. This analysis suggests that it was not the rice income but income from other sources were responsible for the growth in household consumption in both 1985-86 2005. The study suggests that while agricultural trade liberalisation positively impacted on rice production, resulting from technological transformation and leading to a substantial decrease in both producer and consumer prices of rice, farm households were not benefited much from rice income in determining consumption growth (welfare). This might be attributed to a greater decrease in the producer price than that in the consumer price. This study argues that some farmers may shift from rice to other agricultural or non-farm activities, thus jeopardising the country's food security and self-sufficiency efforts in food grain production. Therefore, it is crucial to formulate government policies to support farm households in the form of income transfer such as tax reduction and production subsidy in order to avoid food security and macroeconomic instability, resulting from high food prices due to a shortage of rice production.

Key words: Agricultural trade liberalisation, determinants of consumption, growth in consumption, rural households, Bangladesh

JEL classification code: C13, D60, F10

1. **Introduction**

Bangladesh is an agricultural economy. More than 80 percent of its population depend directly or indirectly on agriculture for their livelihoods. This segment of the population is also predominantly made up of rural households. The agricultural sector contributed around 20 percent to gross domestic product (GDP) and employed more than 60 percent of the total labour force of the economy in 2010 (Ministry of Finance, 2012; World Bank, 2011a, 2011b). The economy went through a series of deregulation and agricultural trade liberalisation measures in the late 1980s and early 1990s with a view to increasing productivity in agriculture and achieving self-sufficiency in food-grain production. Major reforms in agricultural policy included liberalisation of input markets, shrinking the role of government agencies in distribution of inputs, substantial reduction and rationalisation of tariffs, removal of quantitative restrictions, moving from multiple to a unified exchange rate, and from fixed to a flexible exchange rate system (Ahmed *et al.*, 2007: 9; Ahmed and Sattar, 2004: 11, 12; Hoque and Yusop, 2010: 39; Hossain and Verbeke, 2010: 78; Islam and Habib, 2007: 4; Moazzem *et al.*, 2012: 9; Salim and Hossain, 2006: 2569). Agricultural trade liberalisation generated significant impacts on major structural reforms and technological transformation in rice production, enabling the country to achieve self-sufficiency in food-grain production in the early 1990s (Ahmed and Sattar, 2004: 19; Faroque *et al.*, 2013: 2; Islam and Habib, 2007: 4; Klytchnikova and Diop, 2006: 3).

Despite this impressive growth performance, the rate of decline in the incidence of poverty over the two decades 1990-2010 was rather insignificant. The decline in poverty was an average of less than 1 percent (over the twenty-year period), leaving poverty at a remarkably high level – with more than 40 percent of the country's population and the majority of them in rural areas (Ahmed and Sattar, 2004: 18; BBS, 2007b: 57; Klytchnikova and Diop, 2006: 2; Ministry of Finance, 2010: 177). Thus, a significant question arises – to what extent has agricultural trade liberalisation influenced the determinants of consumption (welfare) of rural households in Bangladesh? Therefore, the focus of this study is to examine the determinants of consumption and growth in consumption in the post-liberalisation era.

Although other factors might also have affected the growth in consumption of rural households, agricultural trade liberalisation was the most important policy reform because of households' critical dependence on rice in terms of both income and consumption. The study assumed rice as the representative of agriculture, thereby, considering changes in the rice price to analyse the impact of agricultural trade liberalisation on consumption of rural households for two main reasons. Firstly, agricultural trade liberalisation influenced rice production significantly: agricultural trade liberalisation directly impacted on new technology for rice production (such as irrigation, fertilisers, and high-yielding-varieties seeds). Secondly, rice is the major agricultural product in Bangladesh, capturing the largest share of the agricultural sector. It accounted for 75 percent of the total crop production value, 63 percent of total crop sales, and 75 percent of total cultivated area of the country in 2005 (Klytchnikova and Diop, 2006: 13). In addition, rice is the staple food in the economy. Therefore, any change in rice production and the price of rice impacts directly on the livelihoods and welfare of most households in the country.

Bangladesh was a large country in terms of the size of its population (164 million) with a very high density of 1246 people per sq km in 2009. However, it was a small economy in terms of gross domestic product (GDP) (89.38 billion US dollars) and gross national income

(GNI) per capita (590 US dollars) in the same year (Ministry of Finance, 2012; World Bank, 2011a, 2011b). Agriculture plays an important role in supplying food as well as in maintaining food security of this very large and fast-growing population. The food security and self-sufficiency in food grain production of the economy depends mainly on how agricultural trade liberalisation impacted consumption (welfare) of rice farmers (farm households) in the post-liberalisation era and how they would response to rice production in the future.

The main objective of this study is to analyse the impact of agricultural trade liberalisation on the welfare of rural households in Bangladesh. The focus of this study is to explore the changes in welfare of rural households due to the changes in productivity and prices of rice as a result of agricultural trade liberalisation. The study focuses on a link between agricultural trade liberalisation measures and their impacts on technological transformation in agriculture, productivity growth, changes in producer and consumer price as well as on changes in household welfare. A change in agricultural productivity affects directly the welfare of farm households and may affect indirectly the welfare of both farm and non-farm households through changes in producer and consumer price of agricultural products. These changes may have impact on household income and consumption. Although other factors might also have affected the growth in real income or consumption of rural households, agricultural trade liberalisation is the most important policy reform because of households' crucial dependence on agriculture in terms of both income and consumption.

Therefore, this study is intended to examine the determinants of consumption and growth in consumption with a view to analysing the changes in welfare of rural households in the post-liberalisation era. It also intended to suggest a policy framework for the government to cope with food security and food production issues in the future. The framework of this study is presented in Figure 1.

The following sections include literature review, methodology and research design, result discussion and analysis, and conclusion.

2. Literature Review

According to advocates of trade liberalisation, agricultural trade liberalisation is likely to direct scarce resources into areas of Bangladesh's comparative advantage, promote specialisation resulting in higher productivity and growth, accelerate investment by allowing access to bigger markets and permit economies of scale, and encourage imports of previously unavailable or scarce capital goods and intermediate inputs for agriculture (Ahmed and Sattar, 2004: 1; McCulloch *et al.*, 2003: 15, 16; Montalbano, 2011: 1; Stone and Shepherd, 2011: 5; Zhang, 2008: 175). Liberalisation of import markets for fertilisers, pesticides and irrigation equipment might have facilitated farmers' access to the improved production technology, and enabled Bangladesh's agriculture to reallocate resources for specialisation in efficient rice crop cultivation (Ahmed and Sattar, 2004: 1; McCulloch*, et al.*, 2003: 15, 16; Montalbano, 2011: 1; Stone and Shepherd, 2011: 5; Zhang, 2008: 175). However, this argument assumes that resources such as land and labour would be fully employed in the first place; whereas in Bangladesh unemployment is persistently high. Therefore, agricultural trade liberalisation could result in labour temporarily going from low-productivity protected sector to zero-productivity unemployment (Chang *et al.*, 2005: 2; Chang *et al.*, 2009: 1; Krugman and Obstfeld, 2006: 405, 406; Panagariya, 2004: 1150; Stiglitz and Charlton, 2007: 25, 26).

Advocates of free trade argue that agricultural trade liberalisation would produce a knowledge spill-over effect through technological innovation that is embodied in imported machinery, leading to higher growth in Bangladesh's agriculture. This growth would enhance returns to the economy's relatively abundant factor of production – the unskilled labour – by raising real wages for them, thereby contributing to an improvement in income distribution (Ahmed and Sattar, 2004: 2; Gabre-Madhin *et al.*, 2002: 2; Islam and Habib, 2007: 4; Klytchnikova and Diop, 2006: 6; Lee and Vivarelli, 2006: 7).

On the contrary, the critics of trade liberalisation argued that trade liberalisation could reduce the wages of unskilled labour, thereby widening the income gap between the rich and the poor in the economy (Acharya, 2011: 60; Hoque and Yusop, 2010; Keleman, 2010: 13). Similarly, even if agricultural trade liberalisation brings about higher economic growth through technological transformation, the income gap between the poor and the rich might be widened in the long run because the poor could not afford investments associated with the adoption of new technology to increase production (Acharya, 2011: 60; Banerjee and Newman, 2004: 2; Keleman, 2010: 13; Rakotoarisoa, 2011: 147). Moreover, as the economy is open to global competition, the domestic economic factors are more likely to be influenced by international price shocks and other global variables than by domestic factors (Montalbano, 2011: 8; Sugimoto and Nakagawa, 2011: 12). Thus, there is greater pressure on policy-makers to ensure macroeconomic stability for sustaining economic growth.

Agricultural trade liberalisation may not produce similar welfare impact across all rural households. In practice, some households might have experienced benefit and others might have experienced loss from this liberalisation, resulting in diverse distributional consequences across rural households (Hossain and Verbeke, 2010: 77, 78; Isik-Dikmelik, 2006: 3; Klytchnikova and Diop, 2006: 4; World Bank, 2008: 29, 53). The reason for such possible diverse outcomes can be explained by the fact that agricultural trade liberalisation affects the prices of goods and factors. Thus the changes in prices of goods and factors may diversely affect the welfare of rural households due to their various degrees of involvement with goods and factors markets such as producers or consumers, farm or non-farm households, and net buyers or net sellers (Hossain and Verbeke, 2010: 77, 78; Isik-Dikmelik, 2006: 3; Klytchnikova and Diop, 2006: 4; World Bank, 2008: 29, 53).

In Bangladesh, amongst agricultural products, rice is dominant in terms of staple food, volume of production and cultivated areas. Therefore, farmers use the main proportion of agricultural inputs such as fertilisers, pesticides, irrigation, and seeds for rice cultivation. From the theoretical point of view, agricultural trade liberalisation may affect productivity of rice farmers through technological transformation. As a result, this may improve producers' welfare through the positive effect on their profits (Anderson, 2004: 1; Klytchnikova and Diop, 2006: 5; OECD, 2010: 11). However, productivity improvement may also translate into lower output prices, which in turn have a negative effect on producer welfare (Anderson, 2004: 1; Gabre-Madhin*, et al.*, 2002: 2; Klytchnikova and Diop, 2006: 5). Some studies such as Byerlee *et al.* (2005); Islam and Habib (2007); Mendola (2007); and Alauddin and Quiggin (2008) argued that gains from new agricultural technology might influence the poor directly by raising incomes of farm households and indirectly by raising employment and wages of functionally landless labourers, and also by lowering the price of food staples.

The majority of farm households in Bangladesh are involved in small and subsistence farming. Thus, at different times of a year, most of the farm households belong to two groups simultaneously: producers and consumers. However, over the course of the year they

can be defined as either net sellers or net buyers of rice (Deaton, 1989: 4; Isik-Dikmelik, 2006: 3; Karfakis *et al.*, 2011: 6, 25; Klytchnikova and Diop, 2006: 5; World Bank, 2008: 109). An increase in income of net sellers due to an improvement in productivity of rice depends on elasticity of output and elasticity of price. The income of net sellers will rise as long as elasticity of output is greater than elasticity of price with respect to technological change (Isik-Dikmelik, 2006: 3; Karfakis*, et al.*, 2011: 8; Klytchnikova and Diop, 2006: 5; Yu and Fan, 2011: 448). If output increases faster than the price falls in response to technological change, net sellers will enjoy a higher income and welfare, even if some of the gains accrue to net buyers. Therefore, the net effect will depend on whether the household is ultimately a net buyer (subsistence farmer) or a net seller (market-integrated farmer) (Isik-Dikmelik, 2006: 3; Karfakis*, et al.*, 2011: 25; Klytchnikova and Diop, 2006: 5; Yu and Fan, 2011: 448).

Like many other developing countries in the world, the agricultural labour market in Bangladesh is imperfect in terms of competition and mostly seasonal in nature (Ahmed, 1978: 1281; Hossain and Verbeke, 2010: 77; Klytchnikova and Diop, 2006: 6; Stiglitz and Charlton, 2007: 89). Therefore, disguised unemployment and under-employment are the common features of this labour market (Ahmed, 1978: 1281; Briones, 2006: 79; Hossain and Verbeke, 2010: 77; Klytchnikova and Diop, 2006: 6). Similarly, an important characteristic of Bangladesh's agriculture is that households often work on their own farm in subsistence agriculture, rather than working for a wage in the farm or non-farm sectors. Therefore, changes in rice price and productivity induced by technological transformation can affect the implicit trade-off between family work and wage employment (Dorosh and Shahabuddin, 2002: 3; Hossain and Verbeke, 2010: 77; Isik-Dikmelik, 2006: 15; Karfakis*, et al.*, 2011: 3; Klytchnikova and Diop, 2006: 6). By stimulating rice production and the demand for agricultural labour, the lower rice price may benefit the rural poor through the induced wage response and increased real income (Hossain and Verbeke, 2010: 77; Isik-Dikmelik, 2006: 15; Karfakis*, et al.*, 2011: 3; Klytchnikova and Diop, 2006: 6; Ravallion, 1990: 474). From theoretical standpoints, technological improvement is likely to increase productivity of factors and volume of output. However, this increased output is often valued at a lower price, induced by productivity improvement (Gabre-Madhin*, et al.*, 2002: 3; Isik-Dikmelik, 2006: 16; Klytchnikova and Diop, 2006: 6; Stiglitz and Charlton, 2007: 26). Thus, if marginal productivity of factors increases faster than prices fall in response to technological transformation in agriculture, employment and wages will rise simultaneously, benefiting agricultural wage earners (Gabre-Madhin*, et al.*, 2002: 6; Hossain and Verbeke, 2010: 77; Isik-Dikmelik, 2006: 15; Klytchnikova and Diop, 2006: 6). Therefore, agricultural wage earners in Bangladesh might have benefited from technological innovation because of agricultural trade liberalisation.

The impact of technological transformation on the rural livelihoods of Bangladesh's economy may come through an increase in real income or consumption resulting from productivity improvement and reduced rice prices (Karfakis*, et al.*, 2011: 4; Klytchnikova and Diop, 2006: 7; Rahman, 2000: 3, 4). With a given demand function of rice, an increase in the volume of rice production (supply) induced by productivity improvement may cause a decrease in the rice price, leading to an increase in real income. This argument is based on the fact that rice is basically a non-exported good in Bangladesh; the price of rice is thereby much more affected by domestic factors than by international price fluctuations (Hossain and Verbeke, 2010: 90; Karfakis*, et al.*, 2011: 23, 24; Klytchnikova and Diop, 2006: 7; Rahman, 2000: 3, 4). Therefore, an increase in the volume of rice production may induce a

decline in the rice price, under a given domestic demand function, to attain a new equilibrium in the domestic rice market.

Bangladesh has been pursuing the green revolution programme since its independence in 1971 with a view to increasing productivity in agriculture for attaining self-sufficiency in food production. Agricultural trade liberalisation and technological transformation in the 1980s and the early 1990s generated further momentum in Bangladesh's agriculture, resulting in a significant increase in the volume of rice production which led to self-sufficiency in food-grains by the early 1990s (Ahmed and Sattar, 2004: 19; Islam and Habib, 2007: 4; Rahman, 2008: 16).

Many studies have attempted to shed light on productivity of agriculture and income distribution in the rural economy. Mujeri (2002) argued that while Bangladesh's greater integration into the world economy was generally "pro-poor", the gains were relatively small due to structural bottlenecks and other constraints. In another study, Mujeri and Khondker (2002) found that trade liberalisation stimulated growth in the agricultural sector. The World Bank (2002) showed that the benefits of economic growth during the 1990s had not been distributed evenly across the regions. Dorosh and Shahabuddin (2002) found that agricultural trade liberalisation and market deregulation contributed to rice price stabilisation in the 1990s. They argued that price stabilisation following major production shortfalls was largely due to private sector imports. Hossain and Deb (2003) found that trade liberalisation improved productivity in the agricultural sector but Bangladesh did not have a comparative advantage on major agricultural products. Although it had a comparative advantage in the production of high yielding varieties (HYV) of rice, the unit cost of production was relatively high due to government policy. Hossain (2004) found that the long-term trend in agricultural production showed a cyclical pattern with a few years of rapid growth followed by a few years of stagnation. He argued that, since most of the land and other agricultural resources were tied up in rice production, agricultural diversification could not be achieved unless resources were released from rice cultivation. World Bank (2006) argued that trade liberalisation made available cheap imports of agricultural inputs such as pesticides, irrigation equipment, fertilisers and seeds. Salim and Hossain (2006) found that there were wide variations in productive efficiency across farms as a result of agricultural reforms. The efficiency differentials were largely explained by farm size, infrastructure, households' off-farm income, and reduction of government anti-agricultural bias in relation to trade and domestic policies. Klytchnikova and Diop (2006) found that reform in the agricultural sector contributed significant growth to the economy but its impact on the reduction of rural poverty was considered very insignificant. They argued that agricultural trade liberalisation improved the production of rice considerably, leading to a significant decrease in rice price. They found that net buyers gained and net sellers lost from this process. BBS (2009) found that during last decade significant changes took place in the agricultural sector. These changes included new production structures with a combination of irrigation, fertilisers, high yielding varieties of seeds and pesticides, and mechanisation in land preparation. All these changes contributed to an increase in production of food-grains in Bangladesh. Hossain (2009) found that agricultural trade liberalisation contributed to the development of minor irrigation dominated by shallow tube-wells leading to the expansion of Boro rice cultivation. Consequently, rice production increased significantly. Hossain and Verbeke (2010) found that agricultural trade liberalisation contributed to the integration of rice markets across the six regions (divisions) and therefore the long-run equilibrium was stable. Conversely, in the short run the market integration as measured by the magnitude of market interdependence and the speed of price transmission between the divisional markets was weak. Alam*, et al.*

(2011) attempted to analyse the welfare impact of policy interventions in food grain markets during 1980–2003. They argued that the loss in consumer surplus exceeded the gain in producer surplus from government control over food grain markets, resulting in a deadweight loss for the society. Conversely, they further argued that the gain in consumer surplus and government revenue from liberalisation of foodgrain markets was greater than the loss in producer surplus, implying a net welfare gain to the society. Similarly, Karfakis *et al*. (2011) attempted to identify the impact of rice price changes on household welfare. They argued that rural households exhibited higher welfare losses than urban households from an increase in the rice price. This study assessed determinants of consumption and its growth with a view to examining the impact of agricultural trade liberalisation on the welfare of rural households in the post-liberalisation era.

3. Methodology and Research Design

3.1 Data

The study used data from both primary and secondary sources. Secondary data was required to measure changes in variables from a base year to a current year for assessing determinants of consumption and growth in consumption.

Secondary Data

The study used secondary data on household income mainly from two household surveys of the Bangladesh Bureau of Statistics (BBS) including *Household Income and Expenditure* Survey(HHIES) 2005 (BBS, 2007b), and Household Expenditure Surveys (HHES) 1985-86 (BBS, 1988). It has selected 1985-86 as a the base year because of availability of data as well as the substantial agricultural trade liberalisation in the late 1980s. Similarly, it has selected 2005 as the current year due to availability of the latest household survey data. Therefore, changes in household income is measured using data of HHES 1985-86 as the base year and data of HHIES 2005 as the current year.

Primary Data

The study used a mixed method research design in primary data collection. Questionnaire and face-to-face interview techniques were used for collecting primary data. A structured survey questionnaire was designed with both closed-ended and open-ended questions. Therefore, the datasets included both quantitative (closed-ended) information through using a closed-ended checklist and qualitative (open-ended) information through interviews with participants. The choice of this method was warranted to achieve the objectives of the study.

The household head or a senior person of the household who had access to information of all household members answered this structured interview questionnaire. This structured interview was conducted through asking participants the questions and writing their answers. If a participant did not have information about all members of the household, the participant was not requested to participate in the survey.

The study used both probability and non-probability sampling methods for field survey to collect primary data. Using *convenience* and *judgment sampling*, non-probability sampling methods (Bartlett-II *et al.*, 2008: 47), it selected Comilla amongst the sixty-four districts of Bangladesh for conducting the field survey.

1. Comilla was a pioneer district in the field of the *Green Revolution* in Bangladesh. It was expected that it might have experienced significant technological transformation in agriculture as a result of agricultural trade liberalisation.
2. It is basically an agricultural district. It is neither a hilly nor a coastal area, representing the typical geographical feature, which is conducive to agricultural activities. Therefore, data would not be affected by geographical bias. The farmers of this district produce three crops of rice – Aus, Amon, and Boro, representing the basic characteristics of rice cultivation in Bangladesh.
3. The *Bangladesh Academy for Rural Development* (BARD), a research institute for agriculture and rural development, is located in the Comilla district. The BARD and other research institutes usually conduct surveys in this district and the participants are familiar with surveys and research. Therefore, it was expected that conducting a field survey in this district would present fewer logistical challenges.

According to the Bangladesh Bureau of Statistics (BBS, 2007a), there were thirteen upazilas (sub-districts) in the Comilla district. They are: 1) Barura, 2) Brahmanpara, 3) Burichang, 4) Chandina, 5) Chauddagram, 6) Daudkandi, 7) Debidwar, 8) Homna, 9) Comilla Sadar, 10) Laksam, 11) Meghna, 12) Muradnagar, and 13) Nangalkot.

The study selected Comilla Sadar Upazila, then Chouara Union from that upazila and finally Shrimontapur village from that union for conducting the field survey. Based on cluster sampling, the households of the selected village were divided into three clusters (A, B and C) and then, using the random sampling technique, the cluster C was selected for the field survey. The study surveyed all 60 households from this cluster. Therefore, the sample size of this survey was 60 households of that village. The details of observations are presented in Table 1.

If a participant did not have information about all members of the household, the participant was not requested to participate in the survey. Therefore, all 60 observations for all questions were found correct/valid and no sample was dropped from the original data set. The study also conducted a *Data Exploratory Analysis* to identify outliers and no outlier was found in this data set.

3.2 Theoretical Framework: Welfare Analysis and Its Dimensions

The study used consumption to measure economic welfare, as it capture the means by which households can achieve welfare (Strengmann-Kuhn, 2000: 2; Wagle, 2007: 75). In most empirical studies, income is the indicator used for household welfare and resources (Wagle, 2007: 75). This study used consumption to analyse household welfare as consumption reflects better reality of welfare that income in developing countries like Bangladesh. This is because of the fact that income is not recorded properly, thereby imposing difficulties in determining household welfare (Deaton, 1997: 36; Strengmann-Kuhn, 2000: 8).

The study investigated the changes in welfare of rural households in the post-liberalisation era. Here the changes in welfare were measured through the changes in determinants of consumption. The study assumed that households were uniform in terms of rational behaviour – they wanted to maximise their welfare subject to their budget and resource constraints. The term 'welfare' was treated as the meaning conveyed by the concepts 'satisfaction', 'well-being' and 'utility' that are used in economics and other social sciences (Conceição and Bandura, 2008: 2; Strengmann-Kuhn, 2000: 2).

Household welfare is dependent on their real income. The welfare function may differ across the rural households and across circumstances, indicating that the same amount of real income may produce different levels of welfare. Thus, the welfare function depends not only on the real income but in some cases also on age, health status, employment status and other socio-economic factors. Therefore, the study considered both economic and non-economic characteristics of household in determining household welfare.

The study examined the effects of changes in both consumer and producer prices of rice on the distribution of real income or consumption across different households of rural communities. It analysed the consumption and production patterns of rice in relation to household characteristics, particularly the types of households and their living standards, with a view to providing an easily comprehended map of the effects of price changes. As Deaton (1989) assumed, household expenditure per head (xpc) was used as a preferred measure of household living standards and was measured as total household expenditure on non-durables per month divided by the number of persons in a household. A simple representation of household living standards is given by the following indirect utility function.

$$u_h = \varphi(wT + b + \pi, P), \tag{1}$$

where u_h is utility (real income or consumption) of household h, w is the wage rate, T is the total time available, b is the rental income, property income, or transfers, P is the price vector of commodities consumed, and π is the household's profits from farming or other family business. Since profits are maximised, π is assumed as the value of a profit function, $n(p, v, w)$, where v is the vector of input prices, w is the wage rate, or vector of household wages, and p in this context is the vector of output prices for commodities such as rice that are produced by the household. A standard property of the profit function is that

$$\partial n / \partial p_i = y_i, \tag{2}$$

where y_i is the (gross) production of good i by the household. Given these functions, the effects of price changes on household real income are straightforward to derive. In particular, we have

$$\frac{\partial u_h}{\partial p_i} = \frac{\partial \varphi}{\partial b}\frac{\partial n}{\partial p_i} + \frac{\partial \varphi}{\partial b} = \frac{\partial \varphi}{\partial b}(y_i - q_i), \tag{3}$$

where q_i is consumption of good i, and the last step in the equation comes from the use of Roy's identity (Allenby *et al.*, 2004: 97; Deaton, 1989: 3; Landry and McConnell, 2007: 253, 256) .

Since the welfare of different households generally weighs differently in the rice price changes due to changes in productivity as a result of agricultural trade liberalisation, it is reasonable to move from household to social welfare by writing, for social welfare W:

$$\partial W / \partial p_i = \sum_h \theta_h (y_{ih} - q_{ih}); \quad \theta_h = \partial W / \partial b_n = \left(\partial W / \partial u_n\right)\left(\partial u_n / \partial b_n\right) \tag{4}$$

So that θ_h is a weight that represents the social value of transferring one taka (Bangladesh currency) to household h.

Instead of looking at the change in welfare associated with a price change, it can be measured by identifying how much money (positive or negative) the household would require to maintain its previous level of living standard. If the price change is dp_i, and the required compensation is *dB*, then

$$dB = (q_i - y_i)dp_i = p_i(q_i - y_i)d \ln p_i ; \tag{5}$$

so, if *dB* is expressed as a fraction of household expenditure x, we have

$$dB/x = \left(w_i - p_i y_i/x\right) d \ln p_i ; \tag{6}$$

where $\left(w_i - p_i y_i/x\right)$ is the budget share of good *i*, and $p_i y_i/x$ is the value of production of *i* as a fraction (or multiple) of total household expenditure. The term $\left(w_i - p_i y_i/x\right)$ is the *net consumption ratio,* which is the elasticity of the cost of living with respect to the price of good *i*.

The effect through changes in prices is two-fold: the effect on income (direct price effect on income from the commodity) and the effect on the expenditure through the consumption effect. Therefore, the first-order effect of a change in food prices on household welfare depends on the net trading position of the household. Deaton (1989) formalised this situation with the concept of net benefit ratio (NBR), which is a proxy for the net-trading position of a household, to estimate the first-order impacts of price changes on household welfare. The net benefit ratio for a commodity is the difference between the production ratio (PR) (value of production as a proportion of income, or expenditure) and consumption ratio (CR) (value of consumption as a proportion of income, or expenditure) of that commodity. It is the proportion of net sales to income or expenditure and is approximated by the difference between income share of the commodity and consumption share of the commodity.

Following the Deaton (1989) methodology, Klytchnikova and Diop (2006), and Isik-Dikmelik (2006) expressed the NB ratio as follows:

$$NB = (PR - CR) = \frac{p_i^p q_i}{X} - \frac{p_i^c y_i}{X} ; \tag{7}$$

where q_i is the production and y_i is the consumption, X is the total income or expenditure and p_i^p and p_i^c are producer and consumer prices respectively. The *NB* is used to determine net seller and net buyer households.

3.3 Changes in Rice Prices and Household consumption

The study focused on the impact of agricultural trade liberalisation on the changes in prices of rice. Proponents of trade liberalisation argue that it is supposed to make the factors more competitive and efficient resulting in an outward or upward shift in rice production possibility frontier, leading to a downward (right) shift of supply function of rice. Given the demand function, a downward shift of the supply curve should push the domestic price down to settle at a new equilibrium point because rice is a non-exported good in Bangladesh as the government imposed restrictions on rice exports. Thus, the study explored the implications of the changes in price of rice by focusing on two types of prices, namely: producer price and consumer price.

The study deflated current year prices to base year prices by using the producer price index and the consumer price index from various statistical yearbooks of the Bangladesh Bureau of Statistics (BBS). It examined the effects of changes in producer and consumer prices of rice on the distribution of real income or consumption across different groups of rural households.

3.4 Analytical Techniques

The literature review showed that agricultural trade liberalisation could produce diverse welfare-impacts across rural households. Some households might have experienced benefits and others might have experienced losses. This is because agricultural trade liberalisation affects both goods and factor prices, which in turn affect household welfare in different ways, depending on their different characteristics (Nicita, 2009: 19). Therefore, all rural household groups were classified into two main groups on the basis of their involvement in farming activities, namely:

    a. Farm households, and
    b. Non-farm households.

Other classification included:

    1. Farmers, who owned farm land, and
    2. Agricultural labourers.

Farmers were further divided into three sub-groups based on their farm size (as used by the BBS during the Household Income and Expenditure Survey 2005, and Agricultural Sample Survey 2005):

    a. Small Farmers (0.05-2.49 acres),
    b. Medium farmers (2.50-7.49 acres), and
    c. Large farmers (7.5 acres and above).

Finally, households were classified on the basis of their participation in the rice market either as

    1. Net buyers or
    2. Net sellers.

The study applied the Deaton (1989) methodology, as explained earlier, to identify a household either a net seller or a net buyer.

3.5 Empirical Frameworks of the Study

3.5.1 Determinants of Household Consumption

This study investigated the determinants of consumption to explore the basic sources of welfare of rural households. It examined what characteristics of rural households were associated with the growth in consumption. It used econometric models and the ordinary least square (OLS) regression estimation technique to establish relationships between consumption and various household characteristics. It considered both economic and non-economic characteristics of rural households to identify determinants of household consumption.

The economic characteristics include size of land owned by households, and income shares from agriculture, rice, wage-salary, business-commerce, gift-remittance-assistance, house

rent, and income from other sources. The non-economic characteristics include household size, household type, household head's age, gender and education. Some dummy variables were used to capture the impacts of specific household characteristics on consumption. These variables included whether the household was landless or not, farmer or not, small farmer or not, medium farmer or not, large farmer or not, and agricultural labourer or not.

Two separate OLS regression models were carried out – one for 1985-86 (base year) and another for 2005 (current year) – to make a comparison between the base year and current year's determinants of consumption. It was also assumed that the base year's household characteristics were initial endowments and the current year's characteristics were current endowments of rural households.

The study constructed regression models as defined and used by Dercon (2006), and Isik-Dikmelik (2006). The model for estimation is as follows:

$$\log(C_{h,t}) = \mu_h + \varphi X_{h,t} + \epsilon_{ht}; \tag{8}$$

where, $\log(C_{h,t})$, the dependent variable, is consumption (logarithm) of rural households; μ_h is the intercept of the regression line; and $\varphi X_{h,t}$ is the explanatory variables which influence household consumption. The last components of the model ϵ_{ht} represent the error terms. In the above equation, μ and φ are called the parameters, also known as regression coefficients.

This study extended the above model by separating household economic and non-economic characteristics (endowments). Thus, the model can be rewritten as follows:

$$\log(C_{h,t}) = \mu_h + \varphi_{(econ)} X_{(econ)h,t} + \varphi_{(non-econ)} X_{(non-econ)h,t} + \epsilon_{ht}; \tag{9}$$

The components $X_{(econ)h,t}$ and $X_{(non-econ)h,t}$ are the independent (explanatory) variables that represent household economic and non-economic characteristics respectively. Similarly, $\varphi_{(econ)}$ and $\varphi_{(non-econ)}$ are the coefficients of economic and non-economic variables respectively.

3.5.2 Determinants of Household consumption Growth

The study estimated the determinants of growth in consumption of rural households. It used OLS to estimate semi-log models as specified by Isik-Dikmelik (2006) for identifying determinants of the consumption-growth. It considered household characteristics for period 1 (base year) as initial endowments and for period 2 (current year) as current endowments of rural households. The dependent variable is the change in log of consumption that implies growth in consumption. The model specification is as follows:

$$\Delta \log C_{h,t} = \alpha + \beta X_{h,t_0} + \delta X_{h,t_1} + \gamma \Delta X_h + \varepsilon_{h,t}; \tag{10}$$

where $\Delta \log C_{h,t}$ is the difference between log consumption of current year and log consumption of base year; X_{h,t_0} is the matrix of household characteristics for period 1 (base year) or initial endowments (household size and type; household head's age, gender and education; land etc.), X_{h,t_1} is the matrix of household characteristics for period 2 (current year) or current endowments, ΔX_h is the matrix of changes in endowments (change in shares of income from different sources), and $\varepsilon_{h,t}$ represents the error terms. This specification

allows the study to examine the relationship between endowments and the change in welfare or growth in consumption of rural households.

4. Result Discussion and Analysis

4.1 Change in Prices of Rice and Household Income

Agricultural trade liberalisation contributed to the increase in productivity of rice, resulting in higher volumes of rice production during 1985-86 to 2005. Since the government put a ban on rice exports, the increased volume of rice production also increased the supply of rice in the domestic market, leading to a decrease in rice prices. An estimate using data from HHES-1985-86 and HHIES-2005 indicates that both producer and consumer prices of rice decreased during this period. The producer price declined by a total of 22.78 percent with an average of 1.14 percent per year and the consumer price decreased by 13.95 percent with an average of 0.70 percent per year over the same period as shown in Table 2. A decrease in the producer price implies a decline in welfare (income) of rice farmers whereas a decrease in consumer price suggests an increase in the welfare (income) of rice consumers. The magnitude of decrease in producer price is much greater than the decrease in the consumer price, indicating that rice traders or intermediaries between producers and consumers gained largely from this liberalisation process.

A disproportionate decrease in producer and consumer prices of rice affected the income distribution and welfare of rural households in accordance with their involvement with the rice market. The change in welfare of rural households was reflected in their income, which is analysed in the following sections.

4.2 Descriptive Statistics of Data

Table 3 presents the descriptive statistics of household consumptions. As in the case of household income, the standard deviations of household consumption were large for all groups of rural households, suggesting a large dispersion of data from the mean indicating large variations in consumption of each group and across groups of rural households.

The patterns of household consumption as shown in Table 4 suggest that the distribution of consumption by food and non-food shares remained very similar over the period between 1985-86 and 2005. In 1985-86 and 2005, the mean food consumption for all deciles of rural households was 68 and 63 percent respectively; and the mean non-food consumption for all deciles was 32 and 37 percent of total consumption respectively in the same years. The shares of food and non-food consumption for households belonging to the bottom nine deciles – from Decile 1 to Decile 9 – were very close to average consumption of food and non-food items for all rural households in both 1985-86 and 2005. Compared to other deciles of households, it is clear that in 1985-86 and 2005 the households of Decile 10 had a much lower average share of food consumption with 59 and 46 percent and a much higher average share of non-food consumption with 41 and 54 percent respectively. These data suggest that households in Decile 1 to Decile 9 are relatively poor and need to spend a larger share of their income on food than non-food consumption. On the other hand, households in Decile 10 are relatively rich households in rural communities and they spend a smaller proportion of their income on food consumption compared to their non-food consumption expenditure. This analysis supported the argument that households included in the top decile of rural communities belonged to the highest income group and were distinctly different in terms of income and consumption from households of other deciles.

Rice is the single major component of food consumption for all groups of rural households. The average share of rice consumption in 1985-86 and 2005 were 45 and 44 percent of total food consumption respectively. Similarly, the share of other food consumption was 55 and 56 percent in 1985-86 and 2005 respectively. It is evident that the shares of rice and other food consumption were fairly distributed around their respective mean values, suggesting that the distribution of food consumption for all deciles of rural households was normal and followed a similar trend during 1985-86 to 2005. As we moved from Decile 1 to Decile 10, the share of rice consumption slowly decreased and the share of other food consumption slowly increased. This is a clear indication that poor households spent a larger share of their food expenditure on rice than that of rich households.

4.3 Determinants of Household Consumption

The determinants of household consumption were analysed based on household characteristics. An OLS regression model was applied in specifying consumption determinants. This model allowed both economic and non-economic characteristics of households to interact simultaneously for determining household consumption in 2010. The study considered household size, household head's literacy, household land area, rice price and some dummy variables – non-farm household, rice mostly bought in peak season, access to desired market, and environmental impact as explanatory variables in this model. However, household size and household head's literacy were found not statistically significant, thereby excluded from the model. Similarly, the study used an environmental dummy variable to investigate as to whether environmental impacts from agricultural trade liberalisation influenced consumption of rural households. However, this variable also was not statistically significant, thereby excluded from this model.

As shown in Table 5, the positive determinants of household consumption were household land area and two dummy variables – non-farm household and access to most desired market to buy rice in 2010. Amongst the positive determinants, non-farm household dummy was the largest contributor to household consumption with a regression coefficient of 0.505 followed by household land area (0.489) and access to desired market to buy rice (0.129). Conversely, the negative determinants were rice price and two dummy variables – net buyer and rice mostly bought on peak season in the same year. Amongst the negative determinates, net buyer dummy variable had the largest negative influence on consumption with a regression coefficient of –0.293 followed by rice price (–0.244) and rice mostly bought on peak season (–0.186).

4.5 Determinants of Household Consumption Growth and Welfare

All groups of rural households experienced considerable growth in consumption during 1985-86 and 2005. Two separate regression models were carried out to identify the determinants and sources of household consumption growth. Both models – Model 1 and Model 2 – included economic and non-economic characteristics of rural households, difference variables (changes in the shares of income from different sources), and three major components of household consumption (food, non-food, and rice). Model 1 considered the base year's (1985-86) data – initial endowments of households. Similarly, Model 2 considered the current year's (2005) data – current endowments of households. Difference-variables were changes in shares of household income by sources. They captured the changes in household endowments during 1985-86 to 2005. The results of these models were presented in Table 6.

Non-economic characteristics of household considered in the OLS models were household size, and household head's age, gender and education. However, these explanatory variables were not statistically significant, thereby excluded from both models. This evidence suggests that household non-economic characteristics were not important in determining the growth in consumption of rural household between 1985-86 and 2005.

In 1985-86, the positive determinants of growth in household consumption were household land area, three difference variables (changes in shares of income from agriculture, business-commerce, and house rent) and food consumption. Amongst these determinants, food consumption was the largest contributor to the growth with a regression coefficient of 2.346 followed by household land area (1.294) and change in share of income from business-commerce (0.399) in the same year. Conversely, the negative determinants were net buyer dummy, share of income from five sources (wage-salary, business-commerce, house rent, gift-remittance-assistance, and other sources), two change variables (changes in shares of income from gift-remittance-assistance and other sources), and two consumption components (non-food and rice consumption). Amongst the negative determinants, rice consumption had the largest negative impact on growth with a regression coefficient of −2.782 followed by non-food consumption (−1.870) and share of income from other sources (−0.780). Considering household characteristics, household land area was the sole positive determinant of household consumption growth in 1985-86. Conversely, net seller dummy and shares of income from five sources including wage-salary, business-commerce, house rent, gift-remittance-assistance and other sources were the negative determinants of growth in consumption in the same year. Amongst the difference variables, change in the shares of income from agriculture, business-commerce and house rent had positive impact and changes in shares of income from gift-remittance-assistance and other sources had negative impact on household consumption growth. Amongst the three consumption components, food consumption had positive impact and non-food consumption and rice consumption had negative impact on growth. The excluded variables in Model 1 were landless dummy, share of agricultural income and change in share of wage-salary income, which were not statistically significant. It is evident from the above analysis that it was not rice consumption, but farm household characteristics related to rice income such as land, and change in share of agricultural income positively contributed to growth in household consumption in 1985-86.

Similarly, in 2005, the positive determinants of growth in household consumption were landless dummy, share of income from wage-salary, change in share of income from four sources (agriculture, business-commerce, house rent and other sources) and two consumption components (non-food and rice consumption). Amongst these determinants, rice consumption was the largest contributor to the growth with a regression coefficient of 2.594 followed by non-food consumption (1.494) and change in share of house rent (1.155). Conversely, the negative determinants of growth were household land area, share of income from four sources (agriculture, business−commerce, house rent, and other sources), change in share of gift-remittance-assistance and food consumption in 2005. Amongst the negative determinants, food consumption had the largest negative impact on growth in household consumption with a regression coefficient of −3.588 followed by share of income from business−commence (−0.919) and share of income from house rent (−0.910) in the same year. Amongst household characteristics, household landless dummy and share of income from wage-salary were the positive determinants of growth in household consumption in 2005. Conversely, household land area and shares of income from four sources including agriculture, business-commerce, house rent, and other sources were the negative

determinants of growth in the same year. Considering the difference variables, changes in share of income from agriculture, business-commerce, house rent, and other sources had positive impact and change in share of income from gift-remittance-assistance had negative impact on growth in 2005. The excluded variable in Model 2 were net buyer dummy, share of income from gift-remittance-assistance and change in share of wage-salary, which were not statistically significant.

Considering both models, three difference variables – change in share of income from agriculture, business-commerce, and house rent – had positive impact on growth in household consumption in both 1985-86 and 2005. Conversely, shares of three sources of income (business-commerce, house rent and other sources) and changes in share of gift-remittance-assistance were the negative determinants of growth in both years. Although household land area and food consumption were positive determinants in 1985-86, they were negative determinants of growth in 2005. Similarly, share of income from wage-salary, change in share of income from other sources, and two consumption components (non-food and rice) were the positive determinants in 2005 but they were the negative determinants in 1985-86. Net buyer dummy and share of income from gift-remittance-assistant had negative impact on consumption growth in 1985-86 but they were not statistically significant in 2005. Similarly, landless dummy had positive impact and share of agricultural income had negative impact on growth in 2005 but they were not statistically significant in 1985-86.

As discussed earlier, rice consumption was the largest positive contributor to growth in household consumption followed by non-food consumption in 2005, suggesting that agricultural trade liberalisation contributed to an increase in rice production and consumption, leading to higher growth in household consumption. On the other hand, food consumption had the largest negative impact on growth in consumption followed by share of business-commerce income, implying that the non-food component, rather than the food component as a whole, contributed to higher consumption growth. This analysis suggests that as income grew, households were more likely to spend greater shares of income on non-food consumption than on food consumption, which was evident in the post-liberalisation era. This analysis supported the explanation in sub-section 7.3.2.1 that as we moved from Decile 1 to Decile 10, food expenditure decreased and non-food expenditure increased.

The share of income from rice and changes in share of income from rice were considered in both regression models but were not statistically significant, thereby excluded from the models. Although the change in the share of agricultural income was a positive contributor to consumption growth in both 1985-86 and 2005, neither the share of rice income nor the change in the share of rice income was statistically significant. This analysis suggests that it was not the rice income but income from other sources were responsible for the contribution to growth in household consumption in both 1985-86 2005.

5. Conclusion

The above findings and analyses suggest that amongst three positive determinants of household consumption – household land area and two dummy variables (non-farm household and access-to-most-desired-market-to-buy-rice); non-farm household dummy was the largest contributor to household consumption in 2010. Conversely, the negative determinants were rice price and two dummy variables – net buyer and rice-mostly-bought-on-peak-season in the same year. Amongst them, net buyer dummy variable was the largest negative determinant of household consumption. Household's non-economic characteristics were not statistically significant in determining growth in consumption. This evidence

suggests that household non-economic characteristics were not important in determining the growth; rather economic characteristics contributed to the growth in household consumption between 1985-86 and 2005. As rice consumption was the largest positive contributor to the growth in household consumption in 2005, the study argues that agricultural trade liberalisation contributed to an increase in rice production and consumption, leading to higher growth in household consumption in the post-liberalisation era.

The study considered the share of income from rice and changes in share of income from rice in both regression models and found not statistically significant, thereby excluded them from the models. Although the change in the share of agricultural income was a positive contributor to consumption growth in both 1985-86 and 2005, neither the share of rice income nor the change in the share of rice income was statistically significant. This analysis suggests that it was not the rice income but income from other sources were responsible for the contribution to the growth in household consumption in both 1985-86 2005. The study suggests that while agricultural trade liberalisation positively impacted on rice production, resulting from technological transformation and leading to a substantial decrease in both producer and consumer prices of rice, farm households were not benefited much from rice income in determining consumption growth (welfare). This might be attributed to a greater decrease in the producer price than that in the consumer price.

This study argues that some farmers may shift from rice to other agricultural or non-farm activities, thus jeopardising the country's food security and self-sufficiency efforts in food-grain production. Therefore, it is crucial to formulate government policies to support farm households in the form of income transfer such as tax reduction and production subsidy in order to avoid food security and macroeconomic instability as a result of high food prices due to a shortage of rice production. The government should avoid a high food price shock that could adversely affect the performance of economic growth, price stability and unemployment – the three main objectives of government policies.

Endnotes

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Tables and Figures

Figure 1: Research Model: agricultural trade liberalisation and household welfare
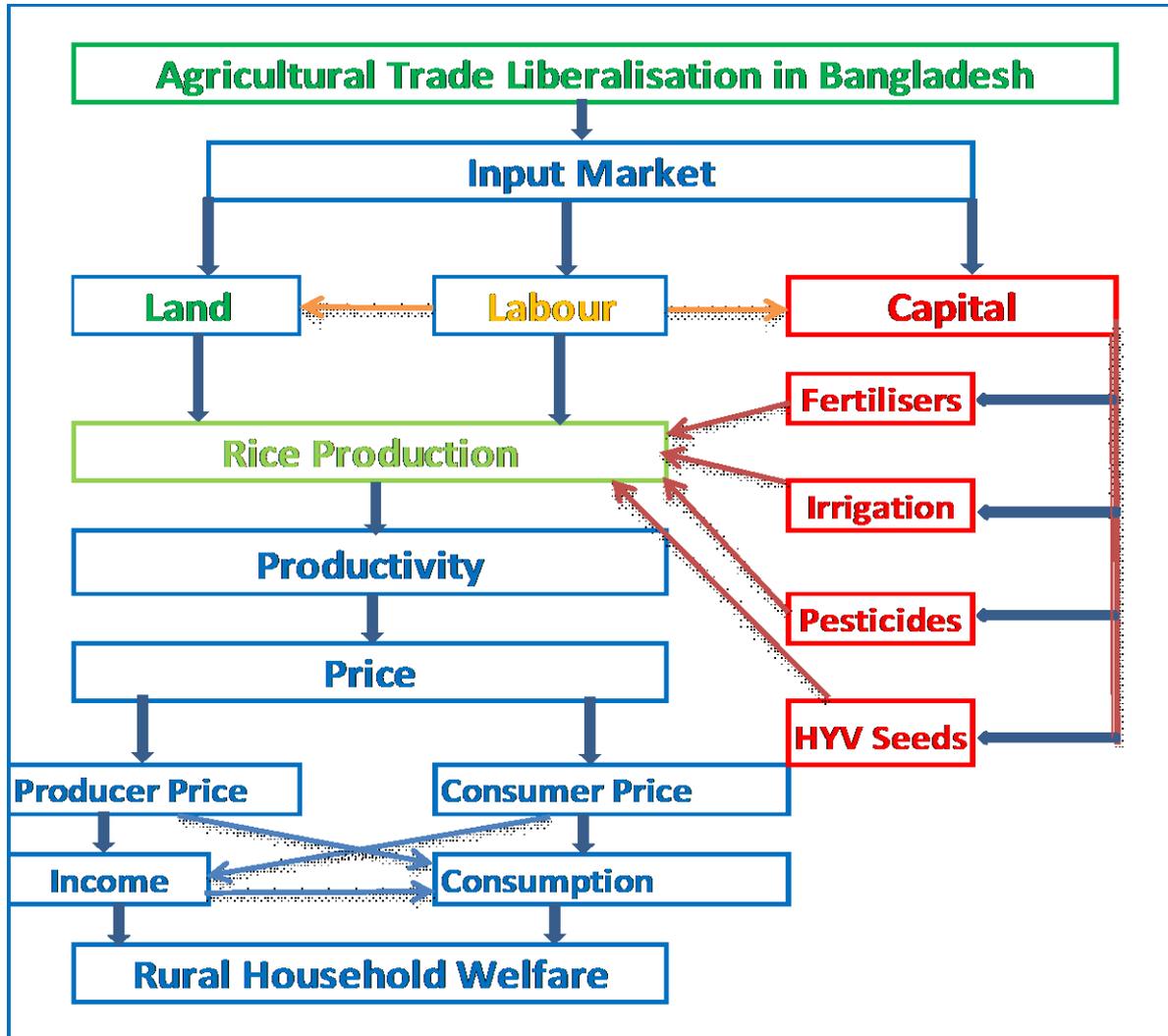
Source: Authors' drawing

Table 1: Distribution of observations by household types: HHS 2010

Households	Observations
Total	**60**
Farm	52
Non-farm	8
Distribution of Farm- households	
1. Farmer	38
2. Agricultural labourer:	14
Distribution of Farmers	
1. Small farmer	30
2. Medium farmer	7
3. Large farmer	1

Table 2 : Change in producer and consumer prices of rice during 1985-86 to 2005

Price type	Total change (percent)	Average change per year (percent)
Producer price	-22.78	-1.14
Consumer price	-13.95	-0.70

Source: Authors' calculation using data from BBS HHES 1985-86 and HHIES 2005

Table 3: Descriptive Statistics: household consumption by household types, 1985-86-2005

Household type	1985-86		2005	
	Mean	Std. Deviation	Mean	Std. Deviation
All rural households	2168.18	1498.52	5538.14	4898.83
Farm household	2499.00	1635.69	5891.01	5527.41
Non-farm household	1358.24	542.19	4630.75	2543.11
Large farmer	6907.80	2054.82	25286.50	18033.34
Medium farmer	3919.36	566.69	9048.33	4901.15
Small farmer	2129.65	471.73	4774.95	2055.32
Agricultural labourer	1108.82	309.60	2758.64	1109.19

Source: Authors' calculation using data from BBS HHES 1985-86 and HHIES 2005

Table 4: Patterns of household consumption expenditure by deciles: 1985-86 to 2005

Deciles	All consumption				Food consumption			
	Food		Non-food		Rice		Other food	
	1985-86	2005	1985-86	2005	1985-86	2005	1985-86	2005
Decile 1	68	68	32	32	54	52	46	48
Decile 2	70	68	30	32	52	51	48	49
Decile 3	70	67	30	33	50	48	50	52
Decile 4	70	67	30	33	47	47	53	53
Decile 5	70	66	30	34	46	45	54	55
Decile 6	70	65	30	35	43	43	57	57
Decile 7	68	64	32	36	43	42	57	58
Decile 8	67	61	33	39	41	39	59	61
Decile 9	65	57	35	43	39	36	61	64
Decile 10	59	46	41	54	32	37	68	63
All HH (mean)*	68	63	32	37	45	44	55	56

Note: * all rural household (mean)
Source: Authors' calculation using data from BBS HHES 1985-86 and HHIES 2005

Table 5: Determinants (related to rice) of household consumption 2010

(**Dependent variable:** Logarithm of household consumption expenditure)

Independent variables	Regression Coefficients
Household land area	.489 (.026)***
Non-farm household dummy	.505 (.137)***
Net buyer of rice dummy	-.294 (.111)***
Rice mostly bought in peak season dummy	-.186 (.115)**
Access to most desired market to buy rice dummy	.130 (.107)*
Logarithm of rice price	-.244 (.130)***
R-square: 0.788; df1: 6, df2: 53; F: 32.837, P-value: 0.000	

Note: Calculated from data of Household Survey 2010 conducted by the author
Figures in brackets are standard errors; * significant at 10%; ** significant at 5%; and *** significant at 1% level

Table 6: Household consumption growth: 1985-86 to 2005

Dependent variable: Growth in Consumption *(Log consumption 2005 – Log consumption 1985-86)*

Independent variables	Model-1 (1985-86)	Model-2 (2005)
Household land area	1.294 (.008)***	-.149 (.003)*
Landless dummy	excluded, not significant	.110 (.008)**
Net buyer dummy	-.313 (.010)***	excluded, not significant
Share of income from agriculture	excluded, not significant	-.334 (.220)*
Share of income from wage-salary	-.624 (.364)**	.201 (.112)*
Share of income from business-commerce	-.342 (.498)*	-.919 (.339)***
Share of income from house rent	-.182 (1.094)	-.910 (.824)***
Share of income from gift-remittance-assistance	-.367 (.382)***	excluded, not significant
Share of income from other source	-.780 (.288)***	-.475 (.267)***
Difference variables		
Change in share of agricultural income	.343 (.136)***	.544 (.187)***
Change in share of wage-salary income	excluded, not significant	excluded, not significant
Change in share of business-commerce income	.399 (.189)**	1.075 (.267)***
Change in share of house rent income	.110 (.185)*	1.155 (.808)***
Change in share of gift-remittance-assistance income	-.659 (.091)***	-.401 (.112)***
Change in share of other income	-.348 (.166)***	.494 (.113)***
Consumption components		
Log (food consumption)	2.346 (.183)*	-3.588 (.195)**
Log (non-food consumption)	-1.870 (.102)*	1.494 (.076)*
Log (rice consumption)	-2.782 (.146)***	2.594 (.143)***
	R-square: .849 **df1: 15, df2: 74** **F: 27.752; P: .000**	**R-square: .795** **df1: 15, df2: 76** **F: 19.689; P: .000**

Note: Model 1 represents base year's (1985-86) household endowments and Model 2 represents current year's (2005) endowments

excluded variables are not statistically significant.

figures in brackets are standard errors.

* significant at 10%; ** significant at 5%; and *** significant at 1% level