UDK:631.1.016(549.3)
Paper received: January 15, 2024
Paper accepted: February 23, 2024

Journal of Entrepreneurship
And Buisiness Resilience
Year VII • Vol 7, No 1.
pp. 31–62

ORIGINAL SCIENTIFIC PAPAER

IMPACT OF BANGABANDHU'S AGRICULTURAL DEVELOPMENT PHILOSOPHY ON FOOD SECURITY IN BANGLADESH

PhD Md. Shajahan Kabir
Department of Rural Sociology
Bangladesh Agricultural University, Mymensingh-2202

PhD Mirjana Radović Marković
Full Professor and Principal Research Fellow
University Business Academy, Novi Sad, Serbia.

PhD Dušan Marković
Business Informatics
Belgrade Academy of Business and Art Studies

ABSTRACT

Bangabandhu's vision was clear, challenging and reality-based. He decorated the agricultural policies based on the farmers and their economic conditions. The leader put special importance on practising integrated agriculture. This paper aims to synthesize the agriculture and food security policy in terms of Bangabondhu's development philosophy. The study has followed survey research with the qualitative and quantitative analytical techniques approach. The Charland area in Mymensingh district has selected 300 farm households with 60 women through a random sample technique. Average yearly income was 264000 tk, 167000 tk and 189000 tk respectively cereal crop, vegetables and poultry rearing activities. Crop producer average income was higher among all groups. The findings show that about 53% of female-headed households adopt and use more indigenous implements in

land preparation compared to 28 % of male-headed households. It is also revealed that male-headed households are the greater adopters and users of newly adopted equipment in land preparation 55% of male and 36% of female-headed households do the same. Household dietary diversity score of these three groups are cereal crop producers 8.86, vegetable producers 8.54 and poultry rearing 9.15. The family size of the household has a positive coefficient is 0.16 and is highly significant and the experience with modern technology of respondents has a positive coefficient of 0.492 and is highly significant. The data revealed that 67 per cent of respondents noticed soil quality is deteriorating due to modern technology although more food is produced, 88 per cent agreed with the statement that efficiency in production increases remarkably. Regarding women in the agriculture sector of the study area, the perception index scores indicate that women play a vital role in agriculture as 3rd statement has scored 252 and is ranked 3rd among all statements. Apart from this a large number of respondents positively agreed on having permission from their husbands to get engaged as economically active participants in agriculture as 2nd statement has scored 225 and is ranked 6th among all statements. To enhance technology adoption by farmers, policymakers and developers of new technology need to understand farmers' need as well as their ability to adopt technology. Various problems such as insufficient capital, lack of profit, inadequate training facilities, lack of adequate farm machinery etc. problems are faced by the respondents in those areas. These problems are barriers to the attainment of women's empowerment and food security.

Keywords: *Bangabondhu's agricultural development, Food security, Bangladesh*

JEL classification*: Q18, O13*

INTRODUCTION

Bangladesh is an agro-based third-world developing country endowed with a vast range of natural resources. It encompasses an area of 1, 47, 570 square kilometers with a total population of 169.4 million of which 84 million are males and 82.2 million are females [6]. The country is characterized to be a densely populated country where the majority (74%) of its population still lives in the rural areas [6] and highly depends on agriculture for life-sustaining articles because agriculture is the largest employment sector in Bangladesh. As of 2021 it employs 47% of the total labour force and comprises 16% of the country's GDP [6]. Agriculture is one of the most important sectors in Bangladesh and growth and sustainability of agricultural production are prerequisites for attaining the targeted growth of the economy [28].

Bangabandhu's vision was clear, challenging and reality-based. He decorated the agricultural policies based on the farmers and their economic conditions. Due to his dynamic efforts and future guidelines at that time (1972-1975); today Bangladesh has not only achieved food security but also become a role model for agricultural development globally. Through his ideology and principles, Bangladesh is moving rapidly forward to become a developed country by 2041. Food is the most fundamental need in the hierarchy of all needs, and it remains a persistently challenging issue for the health of people. Since achieving independence, Bangladesh has made significant strides in bolstering domestic food grain production [11]. Bangladesh would never be self-sufficient in food if Bangabandhu had not emphasized agricultural research to increase the production of high-yield rice varieties [39] Bangabandhu's long-term plan and sustainable policy positively affected the agricultural production from 1975 to till date. Bangabandhu desired to establish a Bangladesh devoid of hunger

and poverty. As 'Sonar Bangla,' he desired to see Bangladesh's agriculture and farmers flourish [9]. About 25–30 million tonnes of food were lacking. Following the independence war, Bangabandhu emphasized agriculture heavily. To achieve food self-sufficiency, he devised a long-term plan to develop the agricultural sector [43].
Therefore, we are now self-sufficient and surplus of foods like rice, fish, meat and vegetables [2]. Rice production increased by 3 times, oilseeds by 4 times, vegetables by 3.5 times and jute by 2 times till 1975 [17].
This paper aims to synthesize the agriculture and food security status of rural farmers in terms of Bangabondhu's development policy and philosophy; livelihood sustainability of marginal farmers through the adoption of agricultural technology formulates the strategic development plan in agriculture and food system.
The project is designed to follow specific objectives-

1. To identify the socioeconomic characteristics and food security status of the sample households' respondents.
2. To find out the current status of agriculture production trends and food security in terms of Bangabandhu's development philosophy
3. To analyze the factors affecting their income, food security and diversity of the selected household
4. To explore the perception of gender roles in agricultural farming practices.
5. To identify the problems of the agricultural farming system which is related to food security and formulate the strategic plan for this sector

METHODOLOGY

Study area and sample: Two charland areas namely Char Gobindapur and Char Neloukkhia of Mymensingh district were selected as the locale of study. The area was selected purposively and the study used the simple random sampling technique to select 300 (and 60 female) sample respondents for the household survey

under this study. Three types of agricultural production activities (Cereal crop, Vegetables, and poultry rearing).

Data collection: Primary data was collected through face-to-face in-depth interviews (using semi-structured questionnaires), Focus Group Discussion (FGD) and Case study. Secondary data was collected through Journals, Reports, Books and Articles. The data has been collected from February 2022 to April 2022.

Data analysis techniques: Descriptive analysis such as numbers percentages, and rank order was used. Multiple regression models were used to explore the relationship between the concerned variables.

The multiple regression models were as follows: The equation is - $Y_i = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + ...\varepsilon_i$

Problem Confrontation Index: Index (PCI) = Ph × 3 + Pm × 2 + Pl × 1 + Pn × 0 Where Ph = Total number of respondents expressed 'high' problem. Pm = Total number of the respondents. Each food group is assigned a score of 1 (if consumed) or 0 (if not consumed). Dietary diversity is measured through a dietary diversity score, namely the HDDS developed by FANTA [47]. The dietary diversity score counts the number of different food groups consumed by the household over a certain period [45].

The household score will range from 0 to 12 and is equal to the total number of food groups consumed by the household.

The average household dietary diversity score for the population of study can be calculated as follows:

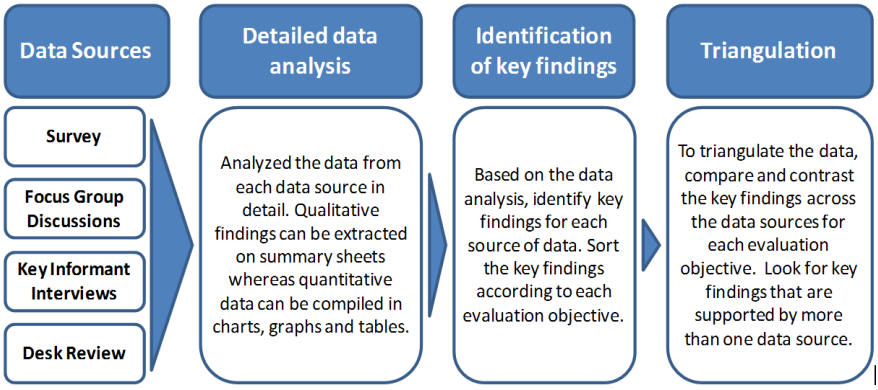
$$HDDS = \frac{\text{Sum (Household Dietary Diversity Score)}}{\text{Total number of households surveyed}}$$

Perception analysis on gender in adoption agricultural production, For measuring the perceptions of the respondents, a 5-5-point Likert Scale was used. There were 8 statements including only the favor judgments against the 5- point scale. Perception Index (PI) = 5×SA+4×A+3×U+2×DA+1×SDA (in favour).

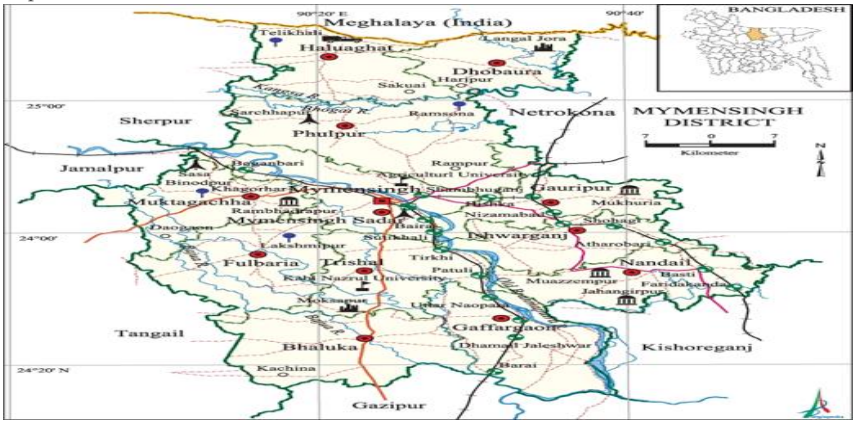
Problem Confrontation Index: Index (PCI) = Ph × 3 + Pm × 2 + Pl

× 1 + Pn × 0 Where Ph = Total number of respondent expressed 'high' problem.Pm = Total number of respondents expressed 'medium' problem.Pl = Total number of respondents who expressed 'low' problem. Pn = Total number of the respondent expressed 'not at all'

A triangulation matrix will be followed to derive the final results of the study



Integration of quantitative and qualitative analysis through triangulation process (Source: Rapid Asia, 2017



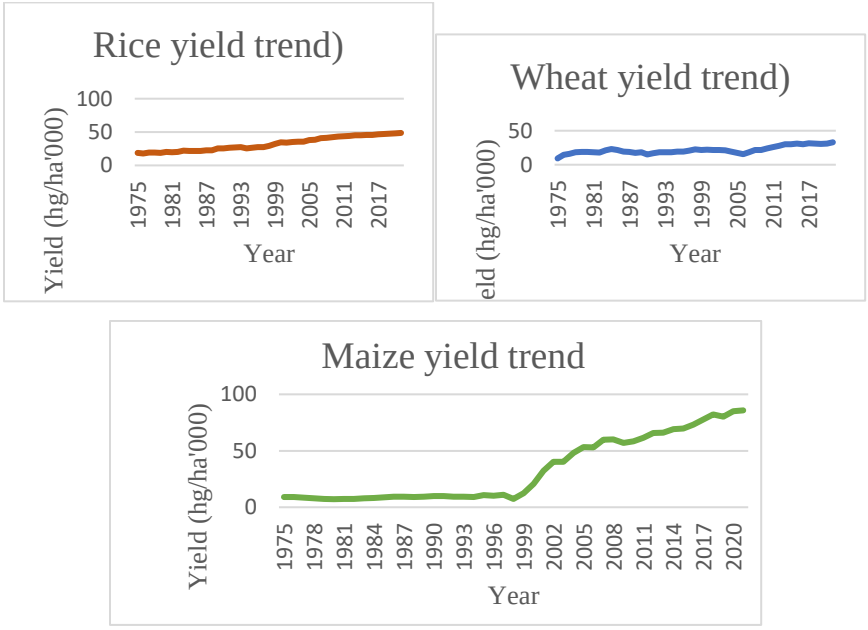
Location of the study area

RESULTS AND DISCUSSION

Bangabandhu thought on agricultural development

Bangabandhu Sheikh Mujibur Rahman is one of the world's most indisputable and charismatic leaders. Bangabandhu laid the foundation for Bangladesh's agricultural development. The inclusive development of agriculture in Bangladesh was sparked by his innovative ideas, policies, and plans. After achieving independence, Bangabandhu took significant measures for the improvement of farmers and the expansion of food production. Bangabandhu's contribution to the country's agriculture sector was phenomenal. The father of the nation, Bangabandhu, took effective policy measures to modernize the agriculture sector, which had been burdened by traditional practices. Simultaneously, he made some resolute decisions to guarantee farmers fair prices so they could live a decent life [22]. He also elevated the status of government officials working in the agricultural sector. Bangabandhu understood that agriculture would not only provide food to feed the people but also remain the majority of the people's primary source of income [38]. Consequently, he correctly prioritized agriculture and industrialization as the forces on which to rely. He took some prudent measures to ensure agricultural expansion. He established the Bangladesh Agricultural Council, the Horticulture Development Board, the Seed Certification Agency, the Bangladesh Agriculture Development Corporation, and the Bangladesh Tea Research Institute, among other organizations. During his tenure, the Bangladesh Agriculture Research Institute and Bangladesh Rice Research Institute were also upgraded and modernized. Bangabandhu took measures to improve and expedite agricultural practices [13]. Bangladesh would never be self-sufficient in food if Bangabandhu had not emphasized agricultural research to increase the production of high-yield rice varieties [39]. Bangabandhu’s long-term plan and sustainable policy positively affected

agricultural production from 1975 to till date. The following figures show that the yield of major crops (i.e., rice, wheat and maize) increases over time to time.



Figures 1, 2 and 3: *The following figure shows that the yield of major crops (i.e. rice , wheat and maize) increases over time to time.*

Bangabandhu thought on food security and food self-sufficiency

Bangabandhu adopted revolutionary methods to alleviate hunger and poverty among farmers. By constructing a dam along the coastline, he preserved the crops on 18 million acres of land. After instituting the green revolution in Bangladesh, Bangabandhu received a massive response. In 1973, he organized the rehabilitation of 22 million farmers. During his tenure, several low-lift pumps and deep tube wells were constructed. From the Philippines, farmers received hybrid paddy (IR-8) and wheat seeds, which were then shipped to them [35].

About 25–30 million tons of food were lacking. Following the

independence war, Bangabandhu emphasized agriculture heavily. To achieve food self-sufficiency, he devised a long-term plan to develop the agricultural sector [43]. Food is the most fundamental need in the hierarchy of all needs, and it remains a persistently challenging issue for the health of people. Since achieving independence, Bangladesh has made significant strides in bolstering domestic food grain production. Bangabandhu desired to establish a Bangladesh devoid of hunger and poverty. As 'Sonar Bangla,' he desired to see Bangladesh's agriculture and farmers flourish [9]. As a result of Bangabandhu's policies, Bangladesh has become a model for agriculture. Bangladesh has emerged as a global "role model" for dramatically increasing agricultural output over the past few decades, thereby achieving food self-sufficiency and increasing rice production.

The following figures show that because of his effective policy and instruction severe food security and the number of undernourished people has reduced over time. However, due to the Covid-19 outbreak, this downward trend of food insecurity has been hindered.

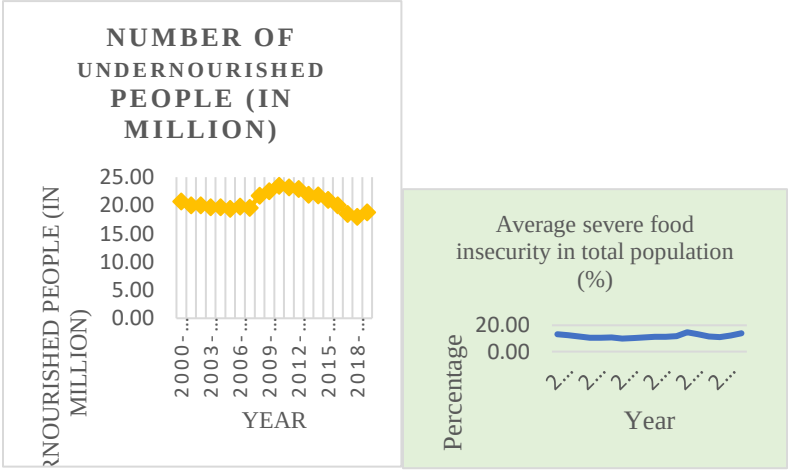


Figure 4,5: *The following figures show that severe food insecurity and the number of undernourished people has reduced over time. But due to the Covid-19 outbreak this downward trend of food*

insecurity has increased

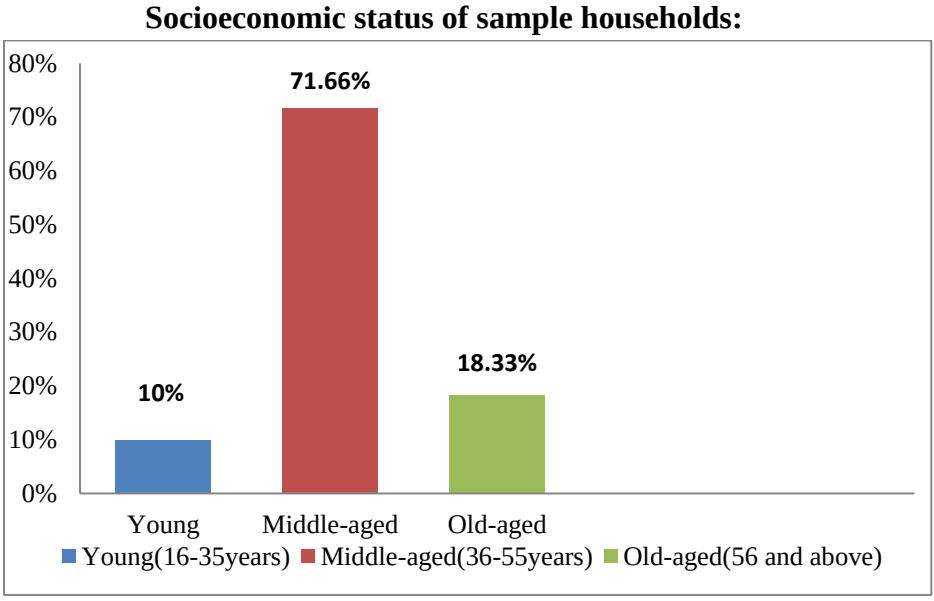


Figure 6: *Age of the sample respondents*

The age of the respondents in the study area ranged from 16 to 60 years. The mean age was 34.78 years, and the standard deviation was 9.457 years. The respondents were classified into three categories, such as 'young', 'middle' and 'old' age based on their age which has been presented in Figure 6. The findings indicate that the highest proportion of the respondents (71.66 per cent) were in the middle age category compared to 18.33 per cent old age category and 10 percent belonged to the young age category. Thus, a large proportion of the respondents (71.66 per cent) were middle-aged. Old-aged respondents might have valuable opinions on management practices. Moreover, middle-aged people are generally receptive to new ideas and thoughts. They would have possessed high knowledge of agricultural technologies, if necessary, step is taken to disseminate new technologies and practices by the extension personnel. Almost similar findings were found by Kausar [31],

Akter [1], Shorif [44] and Dhali [14] in the respective studies.

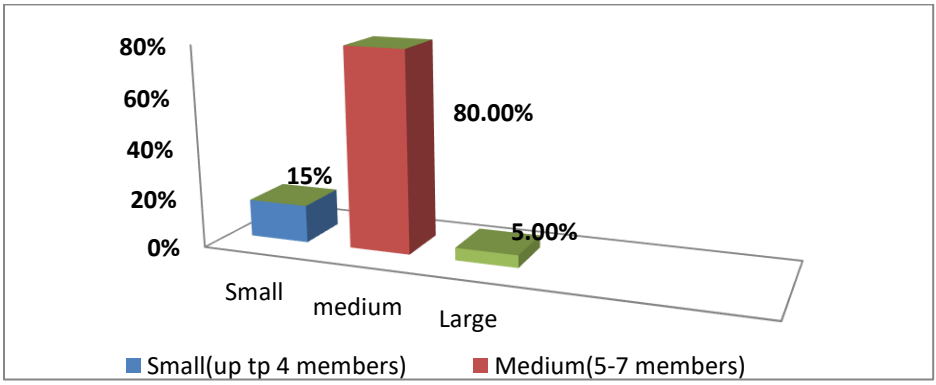


Figure 7: *Family size of the respondent's household*

The household size of the respondents in the sample ranged from 2 to 8. The mean household size was 5.68 and the standard deviation was 1.214. The respondents were classified into three categories, such as 'small', 'medium' and 'large' based on their household size which has been presented in Figure7 The findings indicate that the highest proportion of the respondent's household size (80 per cent) was medium category compared to 15 per cent small category and 5 per cent belonged to large size household category. Thus, a large proportion of the respondents (80 percent) was medium household size which is supportive of the average household size (4.6 members) in Bangladesh. [7].

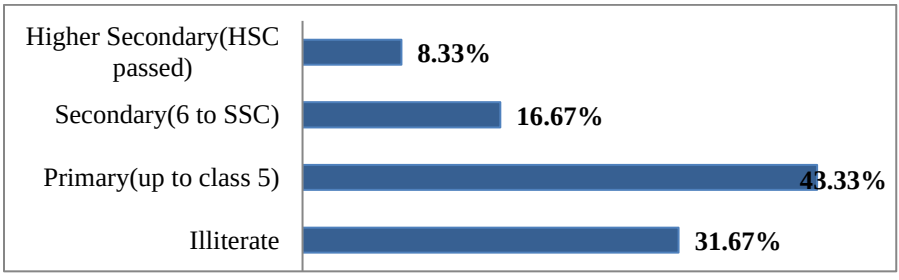


Figure 8: *Education status of the sample respondents*

The level of formal education of respondents in the study area

ranged from 0 to 14. The mean was 3.92 and the standard deviation was 3.832. The level of education of the respondents was classified into four categories: illiterate, primary, secondary and above higher secondary. The distribution of the respondent's education level is presented in Figure 8. Results indicate that the percentage of respondents was 31.67 illiterate. The primary level of education (43.33%) was higher than the secondary level of education (16.67%) in the study area. A very insignificant portion of respondents were found to pass the higher secondary level of education (8.33%) in the study area. Compared to the national average literacy rate (53 per cent) [8] it is visible that the respondent's education level is acceptable because the literacy rate seems to be higher than that of the national average. Thus, it is clear enough to note that higher educational attainment was one of the key determinants in withstanding higher occupation by women and it was largely responsible for the enhanced occupancy of women's economically active participation in agriculture and their tendency to adopt agricultural technologies. Similar findings were reported by Farhana [18], and Ahter [1] respectively in their studies.

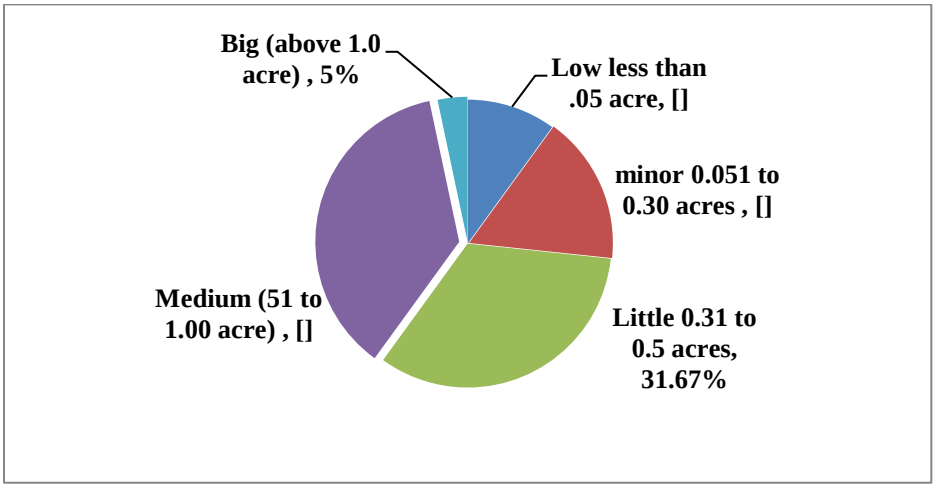


Figure 9: *Landholding status of the respondent's household*

Among the landowners, 16.67% households of the respondents held land in the range of 0.05 to 1.00 acres and thus enjoyed the status of marginal landowners. Then again, 33.33% of households of the respondents held land in the range of 1.01 to 2.00 acres and thus enjoyed the status of small landowners. Yet again, 36.67% of households of the respondents held land in the range of 2.01 to 3.00 acres and thus enjoyed the status of medium or intermediary land owners. Finally, only 3.33% of households of the respondents held land in the range of 3.01 and above acres of land and thus enjoyed the status of large landowners in the study area.

Prices for agricultural land reflect land productivity directly. Estimated land values are stated by the farmers for several of their fields. Additionally, there is a growing concern about the recollection bias of rural production ([15],[20],[21]). To test the robustness of the relationship between farm size and incomes we use household consumption of food and beverages as an alternative welfare measure for producers. While consumption is generally seen as a robust alternative to income as a welfare measure [35] the same holds for food consumption in areas such as Sub-Saharan Africa where households spend the largest share of their incomes on food [16].

Economic activity of respondent's household

The majority of the respondents did farm as their major economic activity. They were mainly engaged in crop and vegetable production. The distribution of the respondents by main economic activity performed is shown in Table 1

Table 1. *Agricultural production activities*

Production activities	Average Yearly Income (Tk)	Number	% Total
Cereal crop	264000	131	43.66

Production activities	Average Yearly Income (Tk)	Number	% Total
production			
Vegetables production	167000	93	31.00
Poultry rearing	189000	76	25.33
Total	620000	300	100

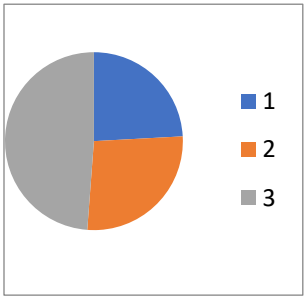
Source: Sample survey 2022

The findings show that involvement in crop production was about 43.66% of the respondents, 31% were involved in vegetable production, and 25 % poultry rearing. Average yearly income was 264000 tk, 167000 tk and 189000 tk respectively cereal crop, vegetables and poultry rearing activities. A crop producer average income was high among all this indicates, therefore, that there is a wide disparity among farmers in the study area on the amount of money they earned per year from involvement in crop production.

Table 2: *Changes in annual income of the household due to the adoption new agricultural technology*

Types of farming		**Change in %**
1.	Cereal crop	56.76
2.	Vegetables production	68.86
3.	Poultry farming	116.79

Source: Sample survey 2022



The above figures show that annual income has changed in 56.76% of cereal crop producers' and annual income has changed in 68.66 % of vegetable production. There has been a significant change in

income generation that occurred with the poultry rearing activities which are 116.56% after implementing new technology in their production process.

Table 3. *Annual income from other sources (Average)*

Other sources of income	Amount tk	Percentage
Petty trading	68090	31
Service (Govt. and None Govt.)	75000	21
Day labor	47300	32
Livestock farming	55900	49
Homestead fruits gardening	37500	36
Foreign earning	81000	28

Source: Sample survey 2022

An average of 49% of respondents reported that other sources of annual income from livestock is 55900 tk, 36% belong to homestead fruit gardening and 21 % are engaged with Government services. The above table reveals that there is a big contribution of other sources of income which has a great influence on technological adoption by purchasing new equipment, investing more in HYV seed, fertilizer etc.

Household dietary diversity

The household dietary diversity score (HDDS) is meant to reflect, in a snapshot form, the economic ability of a household to access a variety of foods. Studies have shown that an increase in dietary diversity is associated with socioeconomic status and household food security (household energy availability) ([24];[23]). Household dietary diversity (HDD) is an instrument for measuring the economic capacity of a household to access a variety of foods during a given [26]. The dietary diversity questionnaire described by

Kennedy [32]), which is used to create the Household Dietary Diversity Score (HDDS), is an easily applicable tool to assess access to food and is widely used to qualitatively determine food consumption, including the level of a variety of foods a household has access to [41]. Similar studies show that the diversity of agricultural production is positively associated with DD, although access to markets has an even greater impact on dietary diversification [33]. In addition, socioeconomic factors such as level of education, income and information on healthy eating also have a significant influence on DD [27].

Table 4: *Dietary diversity score of the sample household*

food items (0-12)	Average dietary score of different farmers h/h groups				
	Cereal crop producer farmers	Vegetable producer farmers	Poultry rearing farmers	Average score	Rank
Rice, wheat,cereal	1	1	1	1	1
Potato	.88	.83	.83	0.84	5
Vegetables	.84	.84	.88	0.85	4
Leafy vegetables	.85	.79	.75	0.80	7
Pulse, bean, nut	.81	.80	.76	0.79	8
Meat	.78	.75	.88	0.81	6
Fish	.88	.83	.85	0.85	4
Eggs	.27	.27	.83	0.45	11
Milk, mik products	.73	.71	.62	0.68	10
sugar	.89	.86	.82	0.85	3
Oil, ghee, butter	1	.97	1	0.99	2
Fruits	.81	.72	.75	0.76	9
HDDS	8.86	8.54	9.15	9.70	

Source: sample survey 2021

The household dietary diversity score of these three groups is cereal crop producers 8.86, vegetable producers 8.54 and poultry rearing

9.15, which means poultry producer groups' food security status is higher than other groups. Dietary diversity scores have been validated for several age and sex groups as proxy measures for macro and or micronutrient adequacy of the diet.

Dietary diversity (DD), especially between and within food groups and between different varieties of specific foods, is vital for a high-quality diet as it more or less guarantees an adequate intake of essential nutrients and important non-nutritive factors [19] DD is measured by counting the number of different foods or food groups in a diet. However, several different groups, classification systems, and reference periods have been used ([42] [10]).

Table 5: *Food intake per person per day (average)*

Main food item	Per person per day food intake (gm/person/day)	National average Per person per day food intake (gm/person/day)	Difference between national average (gm/person/day)
Rice	560.13	515.16	44.97
Potato	103.34	96.45	6.89
vegetables	115.05	109.58	5.47
Pulses	10.23	9.86	.37
Oil	6.06	5.75	.31
Meat	19.35	23.24	-3.89
Egg	6.15	8.03	-1.88
Milk	17.20	21.64	-4.44

Source: sample survey 2022

Access to sufficient and nutritious food is a crucial factor in reducing food insecurity ([12];[5]). Efforts to ensure food security are related to socioeconomic factors and the level of information available regarding a healthy and balanced diet ([34],[46]). Particular sociodemographic factors are also related to the amount of

consumption of foods such as fruits, vegetables and proteins, the consumption of which is related to the prevention of adverse health conditions [46]. Moreover, it has been identified that food consumption patterns outside the home can affect the dietary diversity of families [37]. In rural areas, food is based on existing resources in the environment and the ability to obtain food through agricultural production [12].More specifically, in agricultural production areas, the availability of a diversity of agricultural products for self-consumption increases the quality of a family's diet [12].Reducing farmers' obstacles to access to markets promotes dietary diversity in households ([3];[4]).

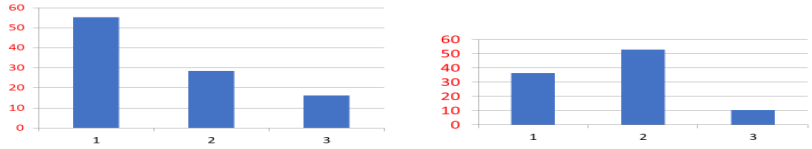
Table 6: *Multiple regression models for factors influencing income through the adoption of new technology*

Variables	Coefficient	P value
Constant	5275.45	.512
Level of education($X_{1)}$ (Years of schooling)	.300	.040**
Size of family ($X_{2)}$ (Number)	.16	.03**
Landholding size (acre) ($X_{3)}$ (acre)	.140	. 382
Technology using experience ($X_{4)}$ (Years)	.492	.000***
Training attainment on new technology (Number of days ($X_{5)}$ (Number of days)	.290	.040**
NGO's support of modern technology ($X_{6)}$ (yes/no)	.20	.34
Decision-making ability ($X_{7)}$ (yes/no)	.204	.042**
Where, Y_i= Income of household β_0 = Intercept; β_1 to β_7 = Regression coefficients of the independent variables; and ε = Disturbance term or error term	Observation =300	

The family size of respondents has a positive coefficient is 0.16 and highly significant. The experience on modern technology of respondents has a positive coefficient of 0.492 and highly significant at 1 percent level. So, this factor reveals that respondents who were

more experienced had much income. The training on new technology of respondents has a positive coefficient and it is 0.290. It is significant at the 5 percent level. That means rural farmers' income is greatly influenced by their training facilities. And decision-making abilities to use new technology also showing significant role on rural farmer's income in the study area and coefficient is .204.

Figure 10, 11 : Trends in gender variables in agricultural technology below. Indicating the components(male and female decided)



1. Newly adopted equipment's in production process
2. Traditional equipment/techniques for farm production
3. Use of modern technology

The above figure shows that about 53% of female-headed households adopt and use more indigenous implements in land preparation compared to 28 % of male-headed households. The bar diagram indicated that there is enough evidence that the implementation of agricultural technology between female and male-headed households is not the same. It is also revealed that male-headed households are the greater adopters and users of newly adopted equipment in land preparation 55% of male and 36% of female-headed households do the same.

Table 7: *Impact of modern technology on agricultural production*

Effects on agricultural production	Numbers	Per cent
Soil erosion/infertility increased	239	79%
More food produced	279	93%
Unsafe food produced	254	84%
Maintain soil fertility /depend on	176	58%

Effects on agricultural production	Numbers	Per cent
inorganic		
Increase efficiency in production	291	97%
Decrease work load	170	56%
Increase food diversity	287	95%S

Source: sample survey 2021

The above table 7 revealed that 79 per cent of respondent noticed soil quality is deteriorating due to modern technology though more food is produced 93 percent mentioned, 97 per cent agreed with the statement of efficiency in production increase remarkably. Unsafe food produced agreed with the statement 84 percent respondents. The number of (56 percent) respondent reported workload has decreased. The adoption and use of various types of agricultural technology does not depend on whether the household head is a man or a woman. They adopt and use agricultural technologies almost equally and the agricultural technologies adopted and used in male-headed households, are similar to those used in the households headed by females.

Perception on Women Empowerment in Adoption Agricultural Technology

Table 8: *Perception index analysis on women empowerment through agricultural technology adoption*

SL. no.	Statements	Nature of judgment					Perception index	Rank
		Strongly agree	Agree	Undecided	Disagree	Strongly Disagree		
i. women in agriculture								
A	Women's involvement in agricultural farming	11	9	11	16	13	169	11
B	Permission by husband to get involved in agricultural	26	15	3	10	6	225	6
C	Vital role played in agriculture by women	41	6	1	8	4	252	3

SL. no.	Statements	Nature of judgment					Perception index	Rank
		Strongly agree	Agree	Undecided	Disagree	Strongly Disagree		
i. women in agriculture								
ii. women's roles and extent of engagement in adoption agricultural technology								
D	Selection of crops to be produced in a season	23	13	2	14	8	209	7
E	Selection of production methods	9	4	4	30	13	146	14
F	Selection of machineries used for crop production	28	16	3	9	4	228	5
iii. women's asset and skill orientation								
G	Training is essential for women	31	23	1	3	2	262	1
H	Assurance of ownership for own lands	36	13	2	6	3	253	2
I	Lack of technology operating skills	37	10	3	5	5	249	4
iv. women's empowerment attainment								
J	Women's access and control over land and technology	8	17	5	19	11	172	10
K	Women's access and control over earnings	17	15	4	14	10	195	8
L	Women's autonomy in production	10	6	4	26	14	152	13
M	Women's capacity of using technology	15	14	2	18	11	184	9
N	Women's sense of using technology	15	3	3	24	15	159	12

Source: Sample survey, 2022

The perception index score ranked 1st in the 7th statement with a total score of 262 as the judgments of the respondents are favorably positive on 'training is essential for women'. The majority of the respondents involved with agriculture as economically active participants have significantly agreed on their high requirement for training facilities in the study area. From this, this study affirms the fact that respondents in the study area have a conscious sense of becoming evolved as skilled and efficient participants in agriculture by participating in training which agrees with the pathway pointed out by Kabeer [30] in the human resource domain under the women empowerment framework used by her. The 2nd rank of the

perception index score is occupied by the 8th statement with a total score of 253 as the judgments of the respondents are favorably positive on 'lack of land rights by women'. As a consequence, there is severe landlessness among the low and middle-class respondents which is an absolute barrier to women's empowerment attainment as noted by Okin [36] and Young [49] in the liberal feminist approach by the statement that without equal access and control over land by men and women, attainment of empowerment by women is hard to imagine.

Regarding women in the agriculture sector of the study area, the perception index scores indicate that women play a vital role in agriculture as 3rd statement has scored 252 and is ranked 3rd among all statements. Apart from this a large number of respondents positively agreed on having permission from their husbands to get engaged as economically active participants in agriculture as 2nd statement has scored 225 and is ranked 6th among all statements. The 1st statement under this heading is ranked 11th as few respondents responded to plan the farming operation.

The 5th rank of the perception index score is occupied by the 6th statement with a total score of 228 as the judgments of the respondents are favorably positive on 'Selection of machinery used for crop production'. The 5th statement under this heading is ranked 14th which indicates to the point that respondents have very limited scope in selecting agricultural production methods.

Regarding women's consequent empowerment attainment, the 8th rank of the perception index score is occupied by the 11th statement with a total score of 195 as the judgments of the respondents are favorably positive on 'women's access to control over earnings. The other four statements, 10th, 12th, 13th and 14th under this heading ranked 10th, 13th, 9th and 12th respectively which indicates the point that respondents have very limited scope in having access and control over land and technology, having autonomy in production, capacity of using technology and having a sense of using

technology.

Agricultural technologies have direct and indirect impacts on women's access to income, including technologies, improving their quality of life through the increase in production and productivity [29]. However, despite rapid technological development, there is strong evidence that women's rates of adoption of agriculture technologies remain low in comparison to men. The main challenges women face in accessing and adopting agricultural technologies include socio-economic constraints, limited information, knowledge and skills, beliefs about gender roles, time constraints, etc. [40] Different preferences for technologies stemming from different tasks and responsibilities also greatly affect the process of the adoption of technology [25].

Computation of Problem Confrontation Index (PCI)

The Problem Confrontation Index (PCI) is a measure of determining problems and constraints where problems are shown in tabulated form according to their severity. By using a structured questionnaire, the respondents were asked to give their opinion on some selected problems during data collection [29].

Table 9: *Computation of Problem Confrontation Index (Women - 60)*

Sl no	Problems	High Problems(3)	Medium Problems(2)	Low Problems(1)	Not at all(0)	PCI		Rank
1	Lack of capital	25(42)	18(30)	17(28)	0	128		4
2	Lack of adequate farm machinery	26(44)	20(33)	14(23)	0	132		2
3	Lack of Land	22(37)	19(32)	19(31)	0	123		5
4	Lack of Extension Service	18(30)	24(40)	18(30)	0	120		6

Sl no	Problems	High Problems(3)	Medium Problems(2)	Low Problems(1)	Not at all(0)	PCI		Rank
5	Lack of technical knowledge of farm equipment and machine	26(43)	24(40)	10(17)	0	136		1
6	Lack of training facilities	23(39)	26(43)	11(18)	0	132		3
7	Lack of transportation	0(0)	12(20)	48(80)	0	72		7

Source: Sample survey 2022

Interpretation of Problem Confrontation Index (PCI)

Lack of Capital

Out of 60 respondents, 25 women faced this problem to a high extent, 18 women faced this problem to a medium extent, and 17 women confronted this problem to a low extent. So that they could not large their farming as they needed. In this case, the computed value of PCI was 128 [(25×3) + (18×2) + (17×1)].

Lack of adequate farm machinery

Out of 60 respondents, 26 women faced this problem to a high extent, 20 women faced this problem to a medium extent, 14 women confronted this problem to a low extent and no one said that lack of farm machinery was not a problem. In this case, the compound value of PCI is 132.

Lack of Extension Service

A lack of extension service is holding many women back from

investing in new agricultural technology in the study area. Its PCI value is 120 [(18×3) + (24×2) + (18×1)] which scored 6th largest value in the problem index.

Lack of Training Facilities

Out of 60 respondents, 23 women faced this problem to a high extent, 26 women faced this problem to a medium extent, 11 women confronted this problem to a low extent and no one said that lack of training facilities was not a problem. In this case, the compound value of PCI is 132 [(23×3)+ (26×2)+ (11×1)].

Lack of Transportation

The main role of transport is to deliver agricultural products from farms to markets and cities worldwide. Lack of transportation was described as the lowest possible problem specifying seven problems faced by the rural women with PCI 72[(0×3) + (12×2) + (48×1)] which ranked the 7th problem of the study area.

Lack of technical knowledge of farm equipment and machine

The majority of the respondents pointed out that lack of technical knowledge of farm equipment and machines is the major problem in the study area. Out of 60 respondents, 26 women faced this problem to a high extent, 24 women faced this problem to a medium extent, and 10 women confronted this problem to a low extent. In this case, the computed value of PCI was 136 [(26×3) + (24×2) + (10×1)].

Lack of Land

Respondents pointed to the lack of land at the 5th largest rank. As they said they needed more land to increase their production. The PCI value is 123[(22×3) + (19×2) + (19×1)] which ranked the 5th

problem of the study area.

Acknowledgements

The authors would like to especially thank the Ministry of Education (Government of the People's Republic of Bangladesh) for research funding.

CONCLUSION

From the result of the study, it was observed that the perception of agricultural development of the relevance of the production system is affected by the level of knowledge and concern of technology. It was also discovered that the inherent characteristics of the technologies themselves affect their perception and their relevance. Both men and women farmers called to ask about the following information on agricultural technology: a procedure in using technology, planting methods, disease, and pest control, determining maturity, harvesting, storage and marketing. Farmers also used phones to get advice on other new farming methods and livestock production. This study has reviewed past studies on the factors influencing the adoption of agricultural technology. The perception of farmers towards a new technology is a key precondition for adoption to occur. Without a doubt, via sound agricultural and industrial policies, Bangabandhu was driving the country towards inclusive growth in the agricultural sector. He believed that by achieving sustainable agriculture production, this country would reclaim its former greatness. His objective was to treble agricultural production to feed the massive population. Therefore, to enhance technology adoption by farmers, policymakers and developers of new technology need to understand farmers' need as well as their ability to adopt technology to come up with technology that will suit them. We firmly believe that how our agriculture is moving forward at a tremendous pace with the support

and funding of the government, the agriculture of Bangladesh will occupy the best place in the world in the days to come.

REFERENCES

[1] Akter M.S, 2011: Vulnerability of Farm Households Due to Drought: Evidence from Rajshahi District. MS Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh, Bangladesh.

[2] Ali, S. 2020: Bangladesh now self-reliant in rice, fish production. In: The Business Standard. https://tbsnews.net/economy/agriculture/bangladesh-now-selfreliant-rice-fish-production-32223

[3] Alam, A.; Chowdhury, M.; Dibley, M.J.; Raynes - Greenow, C. 2020: How can we improve the consumption of a nutritionally balanced maternal diet in rural Bangladesh? The key elements of the “Balanced Plate” Intervention. Int. J. Environ. Res. Public Health 17, 6289.

[4] Abeywickrama, H.M.; Wimalasiri, K.M.S.; Koyama, Y.; Uchiyama, M.; Shimizu, U.; Chandrajith, R.; Nanayakkara, N. 2020: Assessment of nutritional status and dietary pattern of a rural adult population in Dry Zone, Sri Lanka. Int. J. Environ. Res. Public Health 2020, 17, 150.

[5] Armstrong, B.; Hepworth, A.D.; Black, M.M. 2020: Hunger in the household: Food insecurity and associations with maternal eating and toddler feeding. Pediatr. Obes., 15, e12637.

[6] BBS 2021: Statistical Yearbook of Bangladesh. Bangladesh Bureau of Statistics, Statistical Division. Government of Peoples Republic of Banladesh

[7] BBS 2014: Statistical Yearbook of Bangladesh. Bangladesh Bureau of Statistics, Statistical Division. Government of Peoples Republic of Banladesh

[8] BBS 2021: Statistical Yearbook of Bangladesh. Bangladesh Bureau of Statistics, Statistical Division. Government of Peoples Republic of Banladesh

[9] Billah, A. 2022: Thoughts of Bangabandhu Sheikh Mujibur Rahman on agricultural and industrial development in Bangladesh: An analysis. Global Journal of Business, Economics, and Management: Current Issues. 12(3), 306–315. https://doi.org/10.18844/gjbem.v12i3.7235

[10] Berti, P.R.; Jones, A.D. 2013: Biodiversity's contribution to dietary diversity: Magnitude, meaning and measurement. In Diversifying Food and Diets: Using Agricultural Biodiversity to Improve Nutrition and Health; Fanzo, J., Hunter, D., Borelli, T., Mattei, F., Eds.; Routledge: London, UK, pp. 186–206

[11] Burgess, V. 2019 The Illumination of Globalization in the Food Service Industry, "Journal of Entrepreneurship and Business Resilience (JEBR)", Vol. 2. No. (1), pp.49-56

[12] Chegere, M.J.; Stage, J.2020: Agricultural production diversity, dietary diversity and nutritional status: Panel data evidence from Tanzania. World Dev. 2020, 129, 104856.

[13] Chowhan, S. 2020: A review on Bangabandhu and agriculture: Future path for self-sufficiency in food production of Bangladesh. Archives of Agriculture and Environmental Science, 5(2), 200–204.

[14] Dhali B. M. R. 2013: Knowledge of Fish Farmers on Semi-intensive Aquaculture (unpublished master's thesis). Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh, Bangladesh.

[15] Desiere. S, and Jolliffe. D, 2018: Land productivity and plot size: Is measurement error driving the inverse relationship? J. Dev. Econ. 130 84–98

[16] De, Magalhães. L and Santaeulàlia-Llopi.s R, 2018: The consumption, income, and wealth of the poorest: An empirical analysis of economic inequality in rural and urban Sub-Saharan Africa for macroeconomists J. Dev. Econ. 134 350–71

[17] FAOSTAT,2020: Food and Agriculture Organization Corporate Statistical Database.
In: Crops. http://www.fao.org/faostat/en/#data/QC/visualize.

[18] Farhana, S. 2013: Use of Communication Media by the Fish Farmers in Commercial Fish Culture. (unpublished master's thesis). Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh, Bangladesh.

[19] Fanzo, J.; Hunter, D.; Borelli, T.; Mattei, F. 2013: Diversifying Food and Diets: Using Agricultural Biodiversity to Improve Nutrition and Health; Routledge: London, UK.

[20] Gourlay S, Kilic. T, and Lobell. D, 2017: Could the Debate Be Over? Errors in Farmer-Reported Production and Their Implications for the Inverse Scale-Productivity Relationship in Uganda World Bank Policy Research Working Papers 8192

[21] Gollin D. and Udry C, 2019: Heterogeneity, Measurement Error and Misallocation: Evidence from African Agriculture NBER Working Paper 25440

[22] Hasan, M. Z.A., Bhutto.2000: All power to people! democracy and social-ism to people! [In English], the mirage of power. (pp. 385–393). The Oxford University Press.

[23] Hatloy, A., Hallund, J., Diarra, M.M. & Oshaug, A. 2000: Food variety, socioeconomic status and nutritional status in urban and rural areas in Koutiala (Mali). Public Health Nutrition 3: 57-65.

[24] Hoddinott, J. & Yohannes, Y. 2002: Dietary diversity as a food security indicator. FANTA 2002, Washington DC. (available at http://www.aed.org/Health/upload/ dietarydiversity.pdf)

[25] Huyer S. 2016: Closing the gender gap in agriculture. Gender, Technology and Development, 20(2), 105-116.

[26] Huluka, A.T.; Wondimagegnhu, B.A.; Yildiz, F. 2019: Determinants of household dietary diversity in the Yayo biosphere reserve of Ethiopia: An empirical analysis using sustainable livelihood framework. Cogent Food Agric. 2019, 5, 1690829.

[27] Jebessa, G.; Sima, A.; Wondimagegnhu, B. 2019: Determinants of household dietary diversity in Bangladesh. Ethiop. J. Sci. Technol. 2019, 12, 45–68.

[28] Kabir M. S., Sajib S. H., 2022: Poverty, Food Security and to Covid-19 in Bangladesh, Journal of Entrepreneurship and Business Resilience, Vol. 5 No (1), pp. 75-82

[29] Kabir M. S., Radović Marković, M., & Radulović, D. 2019: The determinants of income of rural women in Bangladesh. Sustainability, 11(20), 5842

[30] Kabeer N. 2001: Reflections on the Measurement of Women's Empowerment: Theory and Practice. World Development, vol. 18(3), pp. 113-142.

[31] Kausar R. M. 2009: Fisheries Knowledge of the Pond Owners in Two Villages of Mymensingh District (unpublished master's thesis). Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh, Bangladesh.

[32] Kennedy, G.; Ballard, T.; Dop, M. 2013: Guía Para Medir la Diversidad Alimentaria a Nivel Individual y del Hogar; FAO: Rome, Italy, 2013; ISBN 9789253067497.

[33] Koppmair, S.; Kassie, M.; Qaim, M. 2017: Farm production, market access and dietary diversity in Malawi. Public Health Nutr. 2017, 20, 325–335.

[34] Lin, I.-H.; Van Duong, T.; Nien, S.-W.; Tseng, I.-H.; Wang, H.-H.; Chiang, Y.-J.; Chen, C.-Y.; Wong, T.-C. 2020: Dietary diversity score: Implications for obesity prevention and nutrient adequacy in renal transplant recipients. Int. J. Environ. Res. Public Health ., 5083.

[35] Meyer B and Sullivan J 2003: Measuring the Well-Being of the Poor Using Income and Consumption J. Hum. Res. 1180–220. Am. Econ. J: App. Econ.

[36] Okin S M. 1989: Reason and feeling in thinking about justice. Ethics, 99(2), 229-249.

[37] Ochieng, J.; Afari-Sefa, V.; Lukumay, P.J.; Dubois, T. 2017:Determinants of dietary diversity and the potential role of men in improving household nutrition in Tanzania. PLoS ONE, 12, e0189022.

[38] Reza, M. H., and Yasmin, N. 2019: Development of Malaysia under the leadership of Mahathir Mohamad: Turned Malaysia into a rich country. PEOPLE: International Journal of Social Sciences, 5(1), 498– 506, https://doi.org/10.20319/pijss.2019.51.498506

[39] Roy, M. 2020: Bangabandhu's vibrant thoughts on agricultural development. In: The Asian Age. https://dailyasianage.com/news/222970/bangabandhusvibrant-thoughts-on--agricultural-development

[40] Rola-Rubzen, M. F., Paris, T., Hawkins, J., & Sapkota, B. 2020: Improving gender participation in agricultural technology adoption in Asia: from rhetoric to practical action. Applied Economic Perspectives and Policy, 42(1), 113-125.

[41] Rodríguez, A.G. 2017: Agenda 2030 para el Desarrollo Sostenible y Sistemas Alimentarios Sostenibles. Una Propuesta para la Formulación de Políticas Integradoras; CEPAL: Santiago, Chile, 2017.

[42] Ruel, M.T. 2003: Operationalizing dietary diversity: A review of measurement issues and research priorities. J. Nutr. 133, 3911S–3926.

[43] Shahnawaz, M. 2015: Sheikh Mujibur Rehman: Founder of Bangladesh. African Journal of Political Science and International Relations, 9(5): 152–158.

[44] Shorif S. M. 2011: Knowledge of the Tribal Fish Farmers on Cage Culture in Dinajpur District (unpublished master's thesis). Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh, Bangladesh.

[45] Sibhatu, K.T.; Qaim, M. 2018: Farm production diversity and dietary quality: Linkages and measurement issues. Food Secur.82018, 10, 47–59,315.

[46] Singh, J.K.; Acharya, D.; Gautam, S.; Adhikari, M.; Park, J.-H.; Yoo, S.-J.; Lee, K. 2019: Socio-demographic and diet-related factors associated with insufficient fruit and vegetable consumption among adolescent girls in rural communities of Southern Nepal. Int. J. Environ. Res. Public Health, 2145.

[47] Swindale, A.; Bilinsky, P. 2006: Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide; Version 2; FANTA FHI: Washington, DC, USA, 2006.

[48] Vaitla, B.; Coates, J.; Glaeser, L.; Hillbruner, C.; Biswal, P.; Maxwell, D. 2017: The measurement of household food security: Correlation and latent variable analysis of alternative indicators in a large multi-country dataset. Food Policy 2017, 68, 193–205.

[49] Young, I M. 1990: Throwing Like a Girl: A Phenomenology of Feminine Body Comportment Motility and Spatiality. Human Studies, vol. 3 (2), pp. 137-156