

Country Report:

Situation of Nutrition and food sovereignty in Bangladesh

UBINIG (Policy Research for Development Alternative), Bangladesh

Introduction

The situation of nutrition in a country like Bangladesh can be understood in the context of development, people living in poverty and the state of food production, thereby from an understanding of food sovereignty in the country. Bangladesh is an agricultural based country mostly producing food crops; so it can produce enough to meet the food and nutrition requirement of its people. In terms of economic categories, Bangladesh is termed as a poor country with a great proportion of its population (31.5%) living below poverty line i.e. percentage of population less than 2 dollars per day. The per capita National income is 848 US dollars (2011-12) and life expectancy is 67.2 years and literacy rate 57.9%¹. However, the incidence of poverty declined from 40% in 2005 to 31.5% in 2010. Within the poorer population, the percentage of extreme poor is 17.6% which is about 56% of the total poor living below upper poverty line.

Over 71% of the population lives in the rural areas, most of them are engaged in agriculture directly or indirectly. Agriculture still is the largest source of employment (63.2%)² for rural population. In terms of monetary measurements, the poverty situation is analyzed by monthly household expenditure and particularly by food expenditures. The monthly household expenditure has increased from Tk. 4881 to Tk.11200 mainly due to rise in food inflation, more specifically food inflation during the period 2000 – 2005.³ During this period, the 12-month average food inflation increased by 26.45% per year, but the monthly household income annually increased by 4.66% only. So, the higher food inflation created difficulties for the low income households to continue with their daily basic expenditures by such little increment of household income. This was mostly in the case of urban poor population who depended on wage earnings to purchase food items. The food demand estimates are usually determined on the actual

¹ [Bangladesh Bureau of Statistics, Finance Division, Bangladesh Bank, Ministry of Health and Family Welfare, SEC, Ministry of Primary and Mass Education, Ministry of Communication, 2011](#)

² [Sustainable Development Networking programme \(SDNBD.org\)](#)

³ [Titumir, R. A. M. and Rahman, K. M. M. 2011, Poverty and Inequality in Bangladesh. Dhaka, Bangladesh: Unnayan Onneshan. Available at: \[http://www.unnayan.org/reports/Poverty_and_Inequality_in_Bangladesh.pdf\]\(http://www.unnayan.org/reports/Poverty_and_Inequality_in_Bangladesh.pdf\)](#)

consumption pattern which varies for different income groups and on urban-rural set up. The calorie intake decreased from 2240.3 kcal in 2000 to 2238 kcal in 2005 with a rate of decrease of 0.02% per year⁴.

Poverty and Nutrition

The nutrition situation in the context of poverty is calculated by daily intake of food measured by kilocalories (kcal). According to the Food and Agriculture Organization (FAO) the average minimum daily energy requirement is about 1,800 kilocalories (7,500 kJ) per person⁵.

There are two common approaches used to measure poverty in terms of food intake.

Direct Calorie Intake (DCI) : A Household is poor if its per capita calorie intake is less than the standard per capita nutritional requirement - 2,122 kcal per day.

Food Energy Intake (FEI) : Food poverty line is the monetary value of the food expenditure that allows households to just meet the stipulated calorie requirement. The rural households are more willing to consume food that is cheaper per calorie. This could result in urban households appearing to be poorer than rural households even if in fact they are better off.

Bangladesh has achieved the level of food energy intake by 2250 kcal, (less than Nepal 2350 kcal and more than Eritrea 1590 kcal)⁶. Being a poor country, it is assumed that poor means hungry people. However, studies showed that not every poor person is hungry, but almost all hungry people are poor. In 1991-92, the percentage of poor people living below the extreme food poverty line was 28 and the percentage for hungry people was 37.9. In 2012, the percentage of hungry people was 24, but this percentage would be 37.26 for the poor people who living below the food poverty line. In case of people in extreme food poverty line, it would be 17.38 percent. So, it is difficult to say that only the poor people living below the extreme food poverty line, who cannot afford to receive the minimum nutritional requirement of 1805 kcal per day, are considered as hungry. Rather it might be said that almost all poor people living below the extreme food poverty line are hungry, but every poor person living below the food poverty line (less than 2122 kcal per day) is not hungry⁷.

⁴ [Unnayan Onneshan, State of Poverty in Bangladesh 2013: An application of Monetary Approach, Measuring Multidimensionality, October, 2013](#)

⁵ ["Hunger Portal"](#). FAO. Retrieved 2012-09-28

⁶ http://www.fao.org/fileadmin/templates/ess/documents/food_security_statistics/FoodConsumptionNutrients_en.xls

⁷ [Unnayan Onneshan, State of Poverty in Bangladesh 2013: An application of Monetary Approach, Measuring Multidimensionality, October, 2013](#)

The most recent document published in May, 2014 by the development partners including four UN Agencies (FAO, UNICEF, WFP and WHO, partnering as UN REACH¹) and five leading donors (EU, DFATD Canada, DFID, USAID and World Bank) supporting the Government of Bangladesh's efforts to reduce under-nutrition gives a very interesting picture on the situation of under-nutrition in Bangladesh. It says, over the last two decades, Bangladesh has significantly reduced poverty. There have also been significant improvements in other development indicators such as education levels and increased rice production. However, in terms of nutrition there are several lacking which needs to be addressed in order to achieve increased economic growth and enhance social equity. The major findings are the following:

1. Under-nutrition costs Bangladesh more than 7,000 Crore Taka (US\$ 1 billion)⁸ in lost productivity every year, and even more in health care costs. Ensuring our investments in nutrition are effective now will lead to economic gains through increased productivity exceeding 70,000 Crore Taka (US\$ 10 billion) by 2021.
2. The under-nutrition situation remains serious: 41%, or approximately 7 million, of children under five are stunted, 16% are wasted (low weight for height) and 36% are underweight⁹.
3. According to Bangladesh Demographic and Health Survey (BDHS) 2011 data, among women, 24% are underweight and 13% are of short stature, which increases the likelihood that their children will be stunted.¹⁰
4. A striking finding of the BDHS 2011 data and confirmed elsewhere, is that overall indicators of economic growth and greater household wealth are not strongly related to improved nutrition. With one in four children (26%) under 5 years old stunted and 12% wasted even in the highest household wealth quintile, clearly under-nutrition is not restricted to the poor.
5. The BDHS data shows that under one-fifth of women aged 15-19 years old were married before the age of 15 (compared to over half of women aged 45-49 years in 2007). However, the survey did not show a significant decline in the same time period for girls marrying before the age of 18, and 60% of girls under 19 years old have begun childbearing. This puts them and their children at increased risk of under-nutrition.

⁸ Howlader, Sushil Ranjan; Sethuraman, Kavita; Begum, Ferdousi; Paul, Dipika; Sommerfelt, A. Elisabeth; Kovach, Tara. 2012. [Investing in Nutrition Now: A Smart Start for Our Children, Our Future. Estimates of Benefits and Costs of a Comprehensive Program for Nutrition in Bangladesh, 2011–2021](#). PRO-FILES and Nutrition Costing Technical Report. Washington, DC: Food and Nutrition Technical Assistance III Project (FANTA), FHI 360.

⁹ Stunting (measured by height-for-age) reflects chronic undernutrition during the most critical periods of growth and development; wasting (measured by weight-for-height) reflects acute undernutrition; underweight (measured by weight-for-age) is a composite form of undernutrition that includes elements of stunting and wasting. All these indicators are defined as the percentage of children aged 0-59 months below two (moderate and severe) and three (severe) standard deviation cut-offs from the median of the WHO Child Growth Standards ([UNICEF 2013: Improving child undernutrition](#)).

¹⁰ Bangladesh Demographic and Health Survey BDHS (2011). Available from: <http://measuredhs.com/pubs/pdf/FR265/FR265.pdf>

Malnutrition

Malnutrition refers to both under-nutrition and over-nutrition. In Bangladesh while rate of under-nutrition is still high, although slow, the rate of overweight and obesity in children and women is also increasing¹¹. Under-nutrition among children and women results from both macro (protein energy deficiency) and micronutrient including essential vitamins and minerals deficiencies. Malnutrition or under-nutrition is estimated to be an ‘underlying cause’ of about 60% of childhood deaths in Bangladesh¹². Improvement in overall child nutritional status has been slow over the years in Bangladesh. According to Food Security and Nutrition Surveillance Project (FSNSP) survey, in 2010 more than 7 million under-five children were stunted, almost 5 million were underweight and nearly 200,000 were wasted in Bangladesh¹³. Prevalence of stunting and underweight both remain unacceptably high in the country.

The Bangladesh Demographic Health Survey (BDHS) in 2007, shows that 43% of under-five children in Bangladesh were stunted and 41% were underweight. Age-specific data on stunting and underweight show a significant increase in the first 2 years of age, with little change thereafter. Wasting peaks in the first 2 years of age, with highest wasting rates seen in the 9–21 month age period¹⁴. Anemia peaks at 6–11 months of age¹⁵, demonstrating the importance of first 2 years age window for interventions¹⁶. Although there has been improvement in underweight prevalence, the current rate of reduction of 1.27 percentage points per year means that we are unlikely to achieve the nutrition target of Millennium Development Goal (MDG) 1¹⁷. The Food Security and Nutrition Surveillance Project (FSNSP) survey in 2010 shows a quarter (25%) of mothers with low BMI, which is almost 50% reduction between 1996 and 2007¹⁸.

Nutrition Specific Policies

There are several nutrition-specific policies and plans of the government of Bangladesh. The government is currently working to update the national nutrition policy and plan of action.

¹¹ Ahmed, T., Mahfuz, M., Ireen, S., Ahmed, A.M. S., Rahman, S., Islam, M. M., Alam, N., Hossain, M. I., Rahman, S.M. M., Ali, M. M., Choudhury, F. P., and Cravioto, A., 2012, *Nutrition of children and women in Bangladesh: trends and directions for the future*, *Journal of Health Population and Nutrition*, 30(1):0000

¹² Faruque, A.S.G., Ahmed, A.M. S., Ahmed, T., Islam, M. M., Hossain, M. I., Roy, S.K., Alam, N., Kabir, I., and Sack, D. A., 2008, *Nutrition: Basis for Healthy Children and Mothers in Bangladesh*, *Journal of Health Population and Nutrition*, 26(3):325-339

¹³ Helen Keller International (HKI) and James P Grant School of Public Health (JPGSPH). 2011. *State of food security and nutrition in Bangladesh: 2010*. Dhaka, BD:HKI and JPGSPH

¹⁴ *Bangladesh Demographic and Health Survey (BDHS), 2007*

¹⁵ Helen Keller International (HKI) Bangladesh: the burden of anaemia in rural Bangladesh: the need for urgent action. Dhaka: Helen Keller International, 2006. 4 p.(*Nutritional Surveillance Project bulletin no. 16*)

¹⁶ Sen, B., Menon, P., Ahmed, A. U., Chowdhury, F. P., 2010, Food utilization and nutrition security, Prepared for *Bangladesh Food Security Investment Forum May 2010*

¹⁷ Ahmed, T., Mahfuz, M., Ireen, S., Ahmed, A.M. S., Rahman, S., Islam, M. M., Alam, N., Hossain, M. I., Rahman, S.M. M., Ali, M. M., Choudhury, F. P., and Cravioto, A., 2012, *Nutrition of children and women in Bangladesh: trends and directions for the future*, *Journal of Health Population and Nutrition*, 30(1):0000

¹⁸ Helen Keller International (HKI) and James P Grant School of Public Health (JPGSPH). 2011. *State of food security and nutrition in Bangladesh: 2010*. Dhaka, BD:HKI and JPGSPH

Currently, a number of specific policies are in place relating to infant and young child feeding, micronutrient provisions and therapeutic treatment for severely malnourished children. These are the following¹⁹:

1. National Plan of Action on Nutrition 1997 aims ‘to improve the nutritional status of the people of Bangladesh to the extent that malnutrition would no longer be a public health problem by the year 2010, thereby, improving the quality of life’.
2. National Food and Nutrition Policy 1997 aims ‘to significantly improve the nutritional status of the people, particularly vulnerable groups and thereby contribute to the improvement in the quality of life in the socio-economic development’.
3. National Strategy on Infant and Young Child Feeding (IYCF) 2007 aims ‘to improve the nutritional status, growth and development, health and survival of infants and young children through optimal IYCF practices’.
4. National Strategy for Anemia Prevention and Control in Bangladesh 2007 aims at ‘Reduction of anemia in high-risk groups by one-quarter by 2015’.
5. National Guidelines for Management of Severely Malnourished Children in Bangladesh 2008 aims to ‘provide guidance for doctors, senior nurses and other senior health professionals responsible for inpatient therapeutic care of severely malnourished children in health facilities’. National guidelines are based on the global guidelines of the World Health Organization, which have been adapted, where necessary, to the context of Bangladesh.
6. National Communication Framework and Plan of Action on Infant and Young Child Feeding (IYCF) 2010, aims ‘to improve nutritional status, growth and development, health, and survival of infants and young children in Bangladesh through optimal IYCF practices’.
7. Health Population & Nutrition Sector Development Programme 2011-2016 aims to stimulate demand and improvement of access to and utilization of Health Population and Nutrition services in order to reduce morbidity and mortality; and reduce population growth rate and improve nutritional status, especially of women and children’.
8. National Food Safety and Quality Policy and Plan of Action Review of Food Safety and Quality Related Policies in Bangladesh 2012 DRAFT

Since 1997, improving nutritional status of the population was in focus by the development partners and the government. The main target groups were the vulnerable population, infants and young children, and anemia prevention among women. It is interesting to see that after 1997, the next policies and plans were taken after a decade in 2007, even though the MDG targets were set in 2000 with a time bound of 2015.

¹⁹ [Nutrition-Specific Policies and Plans, Scaling Up Nutrition \(SUN\), 2013](#)

So to achieve nutrition improvement which is a complex, social, economic, cultural as well as political issue, efforts were only taken in the mid-way towards achieving MDG goals by 2015. It talks about scaling up of Nutrition efforts taken up in 2008, 2010 etc. The Health Population & Nutrition Sector Development Programme (HPNSDP) 2011-2016 is now undergoing with important focus on Nutrition.

Nutrition-Relevant Legislations²⁰

There is some national legislation in place on food fortification and food safety. Many provisions for the International Code of Marketing of Breast-milk Substitutes (BMS) have been enshrined in law covering the age range 0-24 months. The maternity protection law ensures maternity leave of 24 weeks, which exceeds the minimum recommended length of leave of 14 weeks set by the International Labour Organization (ILO). The legislations are the following:

1. Implementation Code of the Marketing of Breast Milk Substitutes DRAFT 2012, adopting many provisions of the International Code of Marketing of Breast Milk Substitutes into law (scope of the code: 0-24 months).
2. The Breast-Milk Substitutes (Regulation of Marketing) Ordinance 1984, Amended as Act in 1990 (will be replaced by above Implementation Code when passed) promoting breastfeeding by regulating the marketing of breast-milk substitutes.
3. Maternity Protection Law (Government Notification on amendment of Bangladesh Service Rules) 2011 ensuring six months paid maternity leave for public sector employees, which exceeds the minimum recommended length of leave of 14 weeks set by the International Labour Organization.
4. The Prevention of Iodine Deficiency Diseases Act 1989 ensuring universal iodization of salt.
5. Food Safety Ordinance (Bangladesh Standards and Testing Institution) 1985 providing the legal basis for ensuring safety of foods as well as monitoring it and providing corrective measures.
6. The Bangladesh Pure Food (Amendments) Act 2005
7. The Food Safety Act, 2013 to set up a Bangladesh Food Safety Authority, a nodal agency to co-ordinate all food safety related activities in the country.

Micro-Nutrient Deficiencies

The major micronutrients deficiency problems addressed by the development partners and the government are Vitamin A, Iron, Zinc and iodine deficiencies according to a survey to assess the Micronutrient deficiency problems affecting Bangladesh. The population is still well short of the recommended Daily Allowance (RDA) of food intake for the key nutrients. The survey was done in 2011-

²⁰ [Nutrition-specific legislation, Scaling Up Nutrition \(SUN\), 2013](#)

12 in collaboration of ICDDR,B, UNICEF, Bangladesh, Global Alliance for Improved Nutrition (GRAIN) and the Institute of Public Health and Nutrition (IPHN). According to National Micronutrient Status Survey, 2011 -12²¹ the micro-nutrient deficiencies are the following:

Vitamin A

The prevalence of subclinical vitamin A deficiency was 20.5% in the preschool age children; the prevalence was 20.9% and 5.4% respectively in the school age children and the non pregnant non lactating (NPNL) women. The prevalence in the school age children in the slums was 27%.

Iron deficiency

The prevalence of anemia in the preschool age children was 33.1%.The prevalence of anemia in the school age children was 19.1 % and 17.1% respectively in the 6-11 year and 12-14 year groups. The prevalence of anemia in the NPNL women was 26.0%

The national prevalence of iron deficiency was 10.7% in the preschool age children and in the NPNL women it was 7.1%. It was 3.9% and 9.5% in the school age children aged 6-11 year and 12-14 year respectively.

Zinc deficiency

The national prevalence of zinc deficiency was 44.6% in the preschool age children. In the NPNL women the national prevalence was 57.3%. The amount of consumption of zinc was well below the recommended daily amount. Of the total consumption majority comes from plant origin.

B12 and folate

The B12 and folate status was estimated in the NPNL women. The national prevalence of folate deficiency was 9.1%. The prevalence of B12 deficiency was 23.0% at the national level.

Iodine

The prevalence of iodine deficiency as measured by the proposition of the school age children whose mean urinary iodine concentration was below the cut-off mark of 100mg/L was 40.0%. In the NPNL women, the prevalence of iodine deficiency was 42.1%. In both the cases iodine deficiency showed a rising trend.

²¹ [National Micronutrient Status Survey, 2011 -12](#), Final report, ICDDR,B, UNICEF Bangladesh, GAIN, Institute of Public Health and Nutrition, January, 2013, Bangladesh

Initiatives to remedy the micronutrient deficiencies

There are couple of initiatives on different approach to address the micronutrient deficiency. [Micronutrient Initiative](#), an international agency based in Canada has been working in some developing countries including Bangladesh since 1997. The organization advocated for and provided funding and technical assistance for salt iodization, distribution of multi-micronutrient powder, staple foods such as flour with vitamin A, iron and folic acid, and dietary supplementation with vitamin A, iron/ zinc and folic acid.

National Nutrition Services (NNS)

National Nutrition Service (NNS) or the Jatiya Pushti Sheba is taken up under the HPNSDP (2011-2016) to deliver nutrition services through the Directorate General of Health Services (DGHS) and Directorate General of Family Planning (DGFP), and play a coordination and advocacy role, ensuring active engagement with other key sectors including Infant and Young Child Feeding (IYCF). It is a multi-sector collaborative approach to address malnutrition with coordination mechanisms to be implemented between ministries to ensure the proper delivery of nutrition services. The general objective is to reduce the prevalence of malnutrition among the people of Bangladesh, with special emphasis on children, women, adolescents, and the underprivileged. The [National Nutrition Service](#) targets the following:

1. underweight reduced from 41% to 33%
2. Stunting reduced from 43% to 38%
3. Low birth weight reduced to 12%
4. Anemia in pregnant women, adolescent girls, and children reduced by one-third
5. Night blindness sustained at <1%
6. Iodine deficiency reduced by one-third
7. Exclusive breastfeeding increased to 60%
8. Appropriate complementary feeding increased to 65%
9. More food intake in pregnancy increased to 75%

It is good that the government of Bangladesh as well as the development partners are addressing the nutrition situation of the population specially those of the poorer segments of the population. The focus is on women, children and the youths. However, the approaches to solve the mal and under-nutrition are fragmented and somewhat technical with identification of micro-nutrient deficiencies. Except the Food Safety Act, the programmes on nutrition do not address the food production and food distribution policies. Rather it is considered only as a health issue, therefore is an important component of the Health Sector programme. It is evident from all economic measurements that situation of malnutrition is related

to social and economic justice to the poor who cannot earn enough to buy food that is required to meet the calorie requirements. On the otherhand, the rich segment of the population are also suffering from malnutrition, expressed as “over-nutrition” and are suffering from obesity and ill health.

Food Sovereignty and UBINIG perspective on nutrition

UBINIG is generally critical of quick technological fix of the complex problem of food and nutrition. Our commitment to biodiversity-based approaches to agriculture, health and nutrition opens up multiple ways we could address the problem. Since the biodiversity-based approach is grounded on the production of nutritious and healthy food the agricultural practice itself is a contribution to health and nutrition. Strictly adhering to the principal of not using any pesticide and herbicide or any chemical harmful to life and environment ensures a healthy environment, and reduces the possibility of ill health and nutritional hazards associated with harmful chemicals.

Ecological approach notwithstanding, UBINIG does not oppose technology and knowledge practice is that enhances our existing capacity. A critical understanding and consequences of various technological approaches in a concrete social condition is our approach to technology, particularly to the network of Nayakrishi farmers, Specialized Seed Networks and the network of Dai Mas (traditional birth attendants). All of these networks are firmly grounded on valuable local knowledge and their practice within diverse institutional set up and policy environment. They contribute to develop strong eco-systemic approach to agriculture, health and nutrition integrating social, economic and cultural concerns. Having strong ecological grounds, these community-based movements do not reduce nutrition and hunger only to few deficiencies, but to a holistic approach of ecology, biodiversity, food and life style.

In Bangladesh both chronic and acute malnutrition levels are higher than the WHO’s thresholds for public health emergencies. Micronutrient-related malnutrition is often termed ‘hidden hunger’ as the consequences are not always visible. However, this is a new concept in the context of hunger and malnutrition and is limited to few specific and "defined" deficiencies that are particularly relevant to public health: vitamin A, iron, iodine, and zinc. Nutritional deficiencies are more recognized as part of overall malnutrition problem and believed that a significant proportion of world’s population are suffering from or at risk of deficiencies of vitamins and minerals, commonly referred to as micronutrients. Southeast Asia, (including Bangladesh) is at high risk of Iodine deficiency, Vitamin A and Iron deficiency.

Micronutrient deficiencies are symptoms of a bigger problem. While some urgent measures are necessary, but quick technological fix may derail the priority, focus and achievement of the science and technology

in this area; this may knowingly or unknowingly blur our vision from determining factors causing the symptom. To remain alert on this possible lapse valuable local knowledge and practices must be taken into account. The recent [World Health Report \(2013\)](#) has cautioned that “currently most research is invested in new technologies rather than in making better use of existing knowledge. Much more research is needed to turn existing knowledge into practical application” ([WHO REPORT 2013](#)). This is a timely warning. UBINIG’s initiative would like to be a link between the procedural knowledge practices and the wealth of experiential knowledge.

Micronutrient deficiencies are responsible for some of the most wide spread and debilitating nutritional disorders, including birth defects, mental and physical retardation, weakened immune systems, blindness and even death. Inadequate consumption of fruits and vegetables, a major reason for such micronutrient deficiencies is estimated to cause about 31 percent of ischemic heart disease and 11 percent of strokes worldwide ([World Health Report 2002](#), reducing risks, promoting healthy life).

Generally it is recognized that micronutrients are essential but they are required only in small amounts to benefit human health and nutrition. If properly used, it can significantly contribute to reduce morbidity, malnutrition and mortality. Vitamin A, Iron, Zinc, Iodine, Calcium, Vitamin D and Vitamin B12 are some of the important micronutrients. However, ensuring their availability to the poor is a big challenge and requires a multidisciplinary approach and must go beyond technological solution in order to integrate the front line research in science, i.e., formal knowledge practice.

The diets of the majority people in Bangladesh like many other developing countries are usually dominated by staple foods such as rice, wheat and in some cases maize. However these are mainstream calculations of nutrition and ignore the food intake of the poor people which includes micronutrient foods such as fruits, leafy green vegetables, fish and various known and unknown items from uncultivated food sources. Consumption of micronutrients is also ensured through cultural norms and practices.

Different actors associated with UBINIG are differently interested in micronutrients. The traditional birth attendants, working with very poor and marginal rural families are more interested in nutritional sources that are available in and around the household which people can collect easily. Specialized Seed Network members would like to conserve and regenerate genetic resources that are potential sources of micronutrients. Nayakrishi, the biodiversity-based ecological agriculture, is interested in enhancing farmer’s capacity to select and adopt micronutrient rich crops and engage in research that can develop micronutrient-rich varieties through participatory breeding.

UBINIG is critically monitoring the recent efforts to reduce micronutrient-based malnutrition through bio-fortification. This is a process of breeding new varieties of staple food crops that provide more vitamins and minerals. So far conventional breeding is still the main focus. The Bangladesh Rice Research Institute (BRRI) breeders developed zinc rich rice variety, Brri dhan-62. Harvest plus supported this [bio-fortification](#). Deficiency of zinc in Bangladesh in soil is mainly due to continuous monoculture of aus, aman and boro rice in sequence under wet condition. Thus zinc deficiency is induced due to non-availability of zinc in the soil. The uptake of zinc by Brri dhan 62 in such problematic soil is yet to be seen.

BRRI dhan 62 was developed through hybridization between Jirakateri and BRRI dhan 39. It was advanced through pedigree selection and released through the National Seed Board (NSB) in 2013. It was released for cultivation in aman season. It has a crop duration of 100 days from seed to seed. Average yield 3.5 – 4.5 t/ha. The grains contain 19 mg/kg of zinc. A lot of research is yet to be done to translate the laboratory success into effective nutritional success. Nevertheless, the success of Brri dhan 62 demonstrates the capacity of Bangladeshi scientists to take up the challenge of breeding new varieties with higher nutritional value (www.knowledgebank-brri.org/Rice-Production - Training - Manual/Day-1/Module - 2/ Aman / BRRI - Dhan 62.pdf).

Iron and zinc content of local varieties of rice in Bangladesh

For Nayakrishi, the research on the nutritional content of local rice varieties is critical and more urgent since they can be the basis of ecological design to promote these varieties and encourage consumption. Some available information on the micro-nutritional content of local rice varieties are provided below.

Table 1: Iron and zinc content of local non-aromatic rice varieties

Varieties	Iron (mg/kg)	Zinc (mg/kg)
Pajam	9.18	21.71
Nizersail	10.24	20.51
Rajasail	7.25	18.33
Latasail	11.19	19.88
Binni	11.31	27.30
Ranga binni	10.32	25.67
Mean	9.91	22.23
SD	1.52	3.51

Table 2: Iron and zinc content of local aromatic rice varieties²²

Varieties	Iron (mg/kg)	Zinc (mg/kg)
Kalijira	10.56	24.69
Chinigura	10.31	24.30
Barisal Kataribhog	9.34	20.94
Kalosail	11.52	26.90
Bagerhat local	9.89	35.67
Bogra Kalosail	10.11	25.43
Sakkurkhora	13.56	26.51
Jira Katari	10.92	36.56
Kataribhog (232)	11.09	20.71
Kataribhog (4363)	13.01	20.58
Sada Sailla	11.82	25.61
Surjamukhi	10.51	21.46
Chiniatap	10.21	24.02
Barisal Kalijira	10.20	20.09
Lalsaila	9.60	25.43
Jura	11.22	22.32
Mean	1.91	25.08
SD		4.86

Iron and zinc content of high yielding varieties of rice in Bangladesh

Table 3: Iron and Zinc content of high yielding non-aromatic rice varieties²³

²² www.ifpri.org/sites/default/files/publications/alleviatingmal.pdf

²³ www.ifpri.org/sites/default/files/publications/alleviatingmal.pdf

Variety	Iron (mg/kg)	Zinc (mg/kg)
BR 4	7.88	21.40
BR 10	8.77	21.32
BR 11	5.50	15.39
BR 22	7.77	21.68
BR 23	6.71	15.33
BR 25	6.59	17.52
BRRD Dhan 30	8.77	24.43
BRRD Dhan 31	7.81	19.57
BRRD Dhan 32	6.90	17.33
BRRD Dhan 33	6.64	22.21
BRRD Dhan 37	8.68	18.41
BRRD Dhan 39	9.51	22.20
BRRD Dhan 40	10.00	17.43
BRRD Dhan 41	8.80	15.86
Mean	7.88	19.29
SD	1.29	2.93

Bio-fortification and diversification as sustainable solutions

Homestead food production (HFP) program is a familiar approach to solve micronutrient deficiency. National and international NGOs have promoted an integrated package of home gardening, small livestock production and nutrition education. It helped to increase household production, availability and consumption of micronutrient rich food. HFP has proved to be an effective approach to improved food and nutritional security for vulnerable people in diverse agro-ecological zones. This has been achieved through increased production and consumption of micronutrient rich foods, increased income from gardens and reduced expenditures on micronutrient rich foods, women's empowerment enhanced partner capacity and community development (www.ifpri.org/millionfed).

Agroecological Challenges

Micronutrient deficiency in soils is a fast emerging phenomenon and a challenging abiotic stress in agriculture. Most important micronutrients that the developing and enveloped world is concerned from point of view of sustaining grain productivity and malnutrition in human beings are iron and zinc. Bio-fortification of staple food crops with micronutrient by either breeding for higher uptake efficiency or fertilization can be an effective strategy to address widespread dietary deficiency in human population. Cereal species greatly differ in their micronutrient efficiency. Root morphology and characteristics and

interaction between micronutrients and other ionic radicals have been implicated as determinants of micronutrient efficiency.

Agricultural crops in general, require 16 essential elements for their growth and development. The elements include carbon(C), hydrogen (H) and oxygen (O), which are derived from air and water and comprise 94.0 to 99.5% of the fresh plant tissue. The remaining nutrients used by plants come from soil in the form of inorganic salts. Depending on their requirement for plant metabolism the nutrients are classified as macro and micronutrients. The macronutrients such as nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg) and sulphur (S), are taken up by plants either from native minerals or from fertilizer applied to soil. Legumes are an exception because they can also fix nitrogen from the air. There are some other essential elements that are needed by plants in relatively small amount- micronutrients i.e., iron (Fe), zinc (Zn), boron (B), chlorine (Cl), copper (Cu), manganese (Mn) and molybdenum (Mo). Crops, in general vary considerably in their response to various micronutrients²⁴.

Soil pH is one of the most important factors affecting the availability of micronutrients to plants. The availability of micro-nutrients, in general, is reduced at high pH, with exception of Mo whose availability increases as soil pH increases.

Bangladesh agriculture is now standing at a critical stage. The conventional agriculture spear headed by the green revolution has made significant improvement of harvest index but at the same time led to degradation of natural resources. This development was focused on monoculture of selected food grains and other commercial crops. Consequently the supply of food grains has increased substantially. On the other hand, the supply of non-staple food like pulses, vegetables, fruits, animal products and fish has fallen back. Now it is reflected that micronutrient malnutrition has been affecting a significant proportion of population, mainly women and children. Thus adequate supply of minerals and vitamins is a dire need of time for ensuring food sovereignty. The situation is more critical in case of zinc, iron, beta-carotene (vitamin A) and iodine.

The conventional planners were optimistic that commercial fortification and supplementation would be effective for reduction of micronutrient malnutrition. Very soon the approach proved to be cost prohibitive and unsustainable. The second thought was targeted to biofortification of major staples. To

²⁴ Bhupender Singh, Sena Nayak Dheeravathu, Kalidindi usha. 2010. Micronutrient Deficiency: A Global Challenge and Physiological Approach to Improve Grain Productivity under Low Zinc Availability. Global Science Books, Krishikosh. egranth.ac. in/bit stream/1/40186/1/NAPS-27-2009

that end rice was chosen for Bangladesh. Bangladesh Rice Research Institute (BRRI) under the patronization of Harvest Plus developed BRRI dhan 62. Yet, the problems remains that zinc decreases due to submergence.

The charismatic ideas of solving zinc deficiency with biofortification of rice through conventional breeding or genetic modification remains illusive. The solution probably lies in a holistic approach of ecological agriculture.

Nayakrishi Andolon, Bangladesh

While Nayakrishi is eager to learn from the experience of various other approaches to use agriculture as a means to solve micronutritional deficiency, our primary premise is that conservation of ecology and biodiversity and thus ensuring nutritional plants and crops in and around the household is the key frame within which all different approaches should be tested to maximize the benefit of different approaches, if the policy makers are indeed committed to eliminate hidden hunger. It means in order to address micro-nutrient deficiencies among the people in Bangladesh, the biodiversity-based farming practice should be promoted. Such farming practice is popularly called the Nayakrishi Andolon (New Agricultural Movement). It presents a holistic approach to solving the hunger, malnutrition and particularly micro-nutrient deficiencies. Over 300,000 farming households are involved in the movement and are contributing to the solution of hunger and malnutrition.

As a movement for ecological agriculture, it is based on principles like no use of chemicals, soil management through recycling of local resources rather than using chemical fertilizer, the practice of mixed cropping, crop rotation and reduction of risk due to crop failure. The central approach of the system lies in the conservation, management and use of local seed and genetic resources. Thus hundreds of crops have been maintained. More importantly Nayakrishi believes in building the capacity of the farmers to solve their nutrition problem and thereby gives more importance to seed preservation and networking among the farmers.

Community Food System in Nayakrishi

A Field study carried out by UBINIG in Badarkhali Union of Chokoria Thana & Shaplapur Union of Maheshkhali Cox's Bazar District revealed that the Nayakrishi community members consumed 153 food items. The food item were divided into five food groups including : (1) vegetables , (2) Fruits, (3) Cereal, grains and pulses, (4) meats, (5) fish and sea foods. These items were regular sources of macro and micronutrients including Beta carotene, zinc and iron (www.mcgill.ca/cine/resources/data/bangladesh).

Uncultivated food source in Bangladesh:

The importance of uncultivated food source in the survival strategies of the poor people is quite well known in the villages of Bangladesh. But what is the nature of this contribution? Collecting information on how poor people survive is not easy. It is even difficult to find them at home when we go looking for them. In the village when we ask, “where are they” the answer that come back is “chak” meaning they are in the open fields or out there, collecting her family’s daily nourishment from the roadside government lands or from the private land of others. The uncultivated food sources include leafy greens, fish, fruit, roots and tubers (www.mtnforum.or/sites/default/files/publication/files/3669.pdf).

Uncultivated food sources make up at least 40% of the daily diet. Far from being a minor supplement the leafy greens, tubers and small fish collected by people are a vital part of the daily diet. This particular aspect is a contribution of women to ensuring food sovereignty of the family and the community (commons.In.edu.hk/cgi/viewcontent.cgi?article = 1092 & context – by M HUQ-2011).

Women have the knowledge of seasonal crops, vegetables, fruits, fish and other food through sources of plants and animal, how they can solve specific nutrition deficiencies. Village family with monoculture crops and in the areas where non-food crop such as tobacco is grown suffer from such deficiencies more than the Nayakrishi village. Nayakrishi ensures not only food security but also nutritional security that includes micronutrient deficiencies²⁵.

Conclusion

Though a large number of people in Bangladesh are malnourished, there is still enough scope for the people to solve the problem through a comprehensive plan for food production that is farmer led and biodiversity-based. Achieving food sovereignty is key to overcome hunger and mal-nutrition in the country.

²⁵ - See more at: <http://www.ubinig.org/index.php/home/showAarticle/54/english#sthash.UAv2qxFT.dpuf>