

Leveraging Agriculture for Nutrition in South Asia

Bangladesh Country Evidence Paper

**Prepared by
Centre for Nutrition and Food Security, ICDDR,B
and
Research and Evaluation Division, BRAC**

November 2012

Contributing authors

**Dr. Santhia Ireen and Dr. Tahmeed Ahmed (ICDDR,B)
and
Dr. Mahabub Hossain, Dr. W.M.H. Jaim, Dr. Md. Moslem Uddin Mia,
Barnali Chakraborty and Adiba Sanjana(BRAC)**

Contents

1. Introduction	4
2. Undernutrition in Bangladesh	5
2.1 Trends in Undernutrition	5
2.2 Micronutrient Deficiencies	8
2.3 Breastfeeding and Complementary Feeding Practices.....	9
3. Nutrition Policies and Programs	10
3.1 Nutrition Policies and Strategies	10
3.2. Institutional Framework	12
3.3 Nutrition Programs	13
4. Growth Performance of the Economy and the Agriculture Sector	17
4.1 Economic and Agricultural Growth.....	17
4.2 Performance of the Crop Sector	19
4.3 Diversity in Food Intake	21
4.4 The disconnect between growth and progress in malnutrition	23
5. Agriculture Policy and Programs.....	24
5.1 Agriculture Policies	24
5.2 Program Responses	24
6. Pro-nutrition Agriculture Interventions.....	26
7. Leveraging Agriculture for Nutrition: Capacity to optimize.....	29
References	31

List of Tables

Table 1: Performance of the Economy and Agriculture since 1976-77.....	18
Table 2: Trend in the production of different crops, 1990/91 to 2008/09 (<i>In thousand metric tons</i>).....	20
Table 3: Changes in the consumption (gm/person/day) of different food items, 1983- 84 to 2010.....	22
Table 4: Protein and calorie intake in Bangladesh (per capita/day).....	23

List of Figures

Figure 1: Trends in prevalence of underweight among under-five children in Bangladesh.....	6
Figure 2: Undernutrition in under-5 children in Bangladesh.....	7

1. Introduction

Over the last two decades Bangladesh has achieved steady economic and agricultural growth. The Gross Domestic Product (GDP) annual growth rate in the 1990s averaged over 4%, accelerating to over 6% since 2006. While agricultural growth was below 2% per year between 1970 and 1989; the growth accelerated to about 3% in the 1990s, and to over 4% during the last five years (Khan and Hossain 1990, BBS 1998 and 2011). Overall poverty incidence declined from 58% to 32% between 1991/92 and 2010 (BBS HIES., 2003, BBS HIES., 2011). Over the past 30 years or so, the country has made significant achievements in food grain production and food availability (Hossain 2010). Furthermore, Bangladesh has achieved significant progress in reducing maternal and under-5 mortality for which the country received special recognition at the Millennium Summit in 2010.

However, despite these achievements, the persistence of under-nutrition as a serious public health problem is still striking. Approximately 60% of childhood deaths in Bangladesh are due to malnutrition or undernutrition as underlying causes (Faruque et al. 2008). In 2000, the World Bank estimated the cost of malnutrition in Bangladesh to be \$1 billion annually (World Bank 2000)¹. The conceptual framework developed by UNICEF frames nutrition as an outcome of multifaceted determinants (UNICEF, 1990). In Bangladesh, nutrition tends to be addressed through its proximal or underlying determinants such as dietary intake, feeding practices, health status and so on. The role of broader determinants such as agriculture and wider economic factors are relatively neglected. Taking that view into consideration, the paper intends to review different aspects of agriculture and nutrition as well as to highlight the linkages or disconnects between agriculture and nutrition in Bangladesh. The paper first focuses on the undernutrition situation and different policies and programs related to nutrition in Bangladesh. It then gives a broad overview on economy's performance and the agriculture sector, agricultural policy and programs, and pro-nutrition agricultural interventions. Finally, the capacity to optimize in relation to leveraging agriculture for nutrition is discussed to minimize the gap between these two important sectors.

¹Undernutrition is the underlying cause of 3.5 million deaths and 35% of the disease burden in under-five children worldwide (Black et al., 2008). Of the total global disability-adjusted life years (DALYs), 11% is due to child malnutrition alone (Black et al., 2008).

2. Undernutrition in Bangladesh

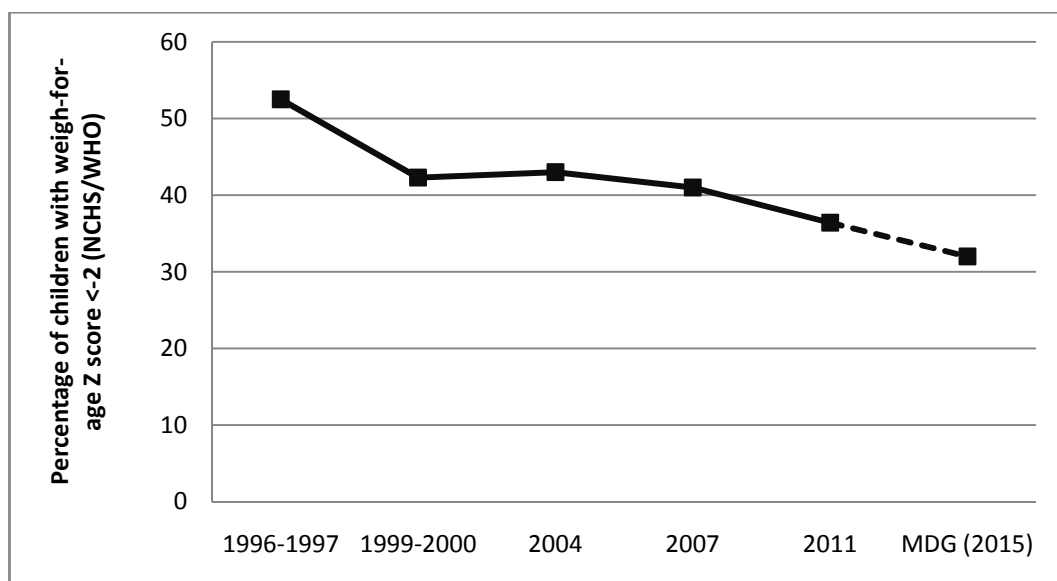
2.1 Trends in Undernutrition

The primary forms of undernutrition in Bangladesh are childhood undernutrition, maternal undernutrition and clinical and sub clinical disorders of micronutrient deficiencies among both children and adults.

In 2009, Bangladesh was included in the World Health Organization's landscape analysis of nutrition governance; the country was judged to have strong nutrition governance and appeared to be on track toward reaching MDG1 (UNS: SCN., 2009). The country made significant progress in reducing undernutrition over past decades in relation to all anthropometric indicators, but the progress markedly slowed down after 2000 (BDHS 2009).

After a period of stagnation (figure 1), the past four years have seen an improvement in underweight status. Between 2007 and 2011, the prevalence of underweight declined from 41% to 36% (BDHS, 2012).

Figure 1: Trends in prevalence of underweight among under-five children in Bangladesh

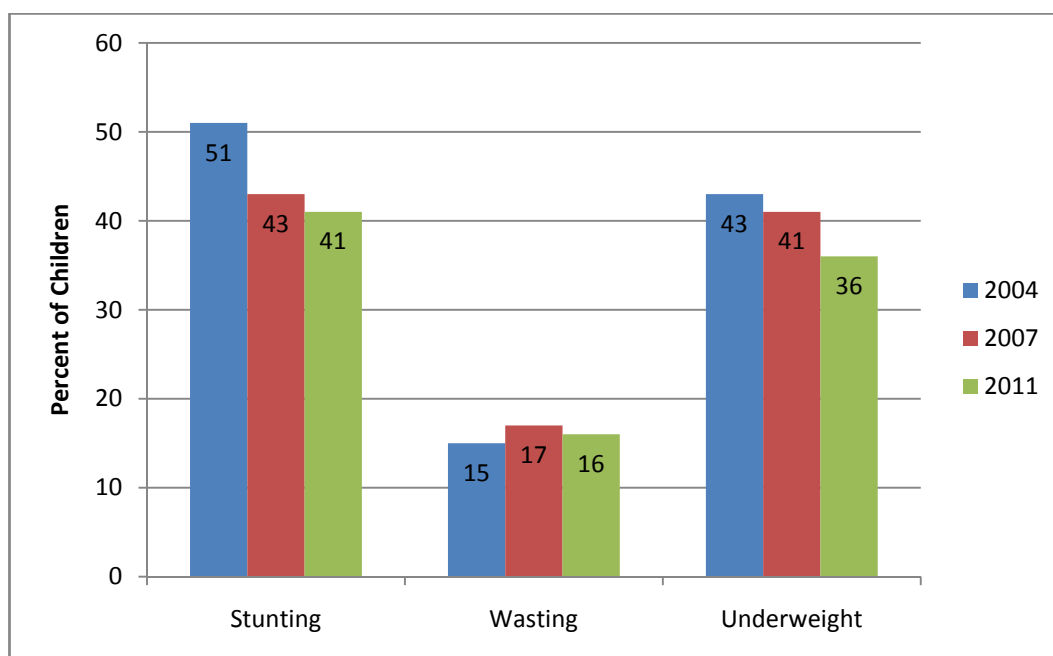


Source: BDHS 2011 and Planning Commission, 2009

However, stunting of children under 5 years of age, the indicator representing long term undernutrition, shows a less encouraging picture. Since 2007, stunting has declined by only 2 percentage points, from 43% to 41% (Figure 2). About 44% of male children and 43% of female children were stunted in 2007 and certain analyses suggest that gender differentials become larger as children grow older (beyond two years of age) (Sen et al. 2010). In rural areas, the proportion of stunted children is 24% higher than in urban areas, although in urban areas there is a much greater prevalence of undernutrition among urban slum children - about 44% higher than among rural children. Furthermore, the undernutrition rate is close to double among children under five from the lowest quintile compared to those from the highest quintile (BDHS2009).

Furthermore, the prevalence of wasting, an indicator of nutritional status, shows a rather alarming trend. Between 2000 and 2011, wasting has increased by approximately 50% (from 10% to 16%). Between 2007 and 2011, wasting reduced by only one percentage point (from 17% to 16%, Figure 2)(BDHS, 2012).

Figure 2: Undernutrition in under-5 children in Bangladesh



Source: Bangladesh Demographic and Health Surveys 2011

The prevalence of wasting is still above the 15% emergency level that warrants implementation of a public health intervention as recommended by WHO (WHO, 2000). Furthermore, 4% of children under 5 (0.6 million) are suffering from severe wasting (SAM – Severe Acute Malnutrition). Despite this high level of wasting, there has been little recognition of this to date and there is no program response to address severe acute malnutrition. These findings bring into question the WHO landscape analysis assessment that the country is on track to achieve MGD 1. Nevertheless, even if Bangladesh achieves the target, the prevalence of underweight will still be unacceptably high at more than 33% in 2015 (Planning Commission, 2009).

Birth weight, particularly Low Birth Weight (LBW) at less than 2500g, is an important indicator of overall nutrition and health status of mothers and newborn children. Rates of LBW among Bangladeshi infants are still among the highest in the world, ranging between 20% and 22% (de Onis *et al.*, 1998, Ahmed *et al.*, 2005, UNICEF, 2008). This is more than the 15% cut-off that signifies low birth weight as a public health problem. After controlling for independent effects of other covariates, maternal BMI and height were shown to be powerful predictors of LBW in Bangladesh (Ahmed *et al.*, 2005).

Unlike children, the nutritional status of women in Bangladesh shows a better trend. In 1997, 52% of women had chronic energy deficiency (CED), defined as a Body Mass Index (BMI) of less than 18.5 kg/m². There has been a sustained reduction in prevalence of CED, with a prevalence of 25% in 2010 (HKI&JPGSPH 2011). However, Alam *et al.* (2010) reported that in rural Bangladesh nearly one third of adolescent girls (aged 13-18 years) suffered from chronic energy deficiency and almost half of them were stunted (Alam *et al.*, 2010).

Bangladesh faces a double burden of malnutrition; overnutrition, the prevalence of obesity, is also emerging as a public health problem. Rahman *et al.* (2006) reported that the prevalence of obesity in upper and middle class urban people was 9 to 11%. The mean Waist Circumference (WC) was 74.2 and 70.0 cm in rural males and females respectively, with a downward trend in mean WC from upper urban classes, to intermediate and lower classes (Rahman *et al.*, 2006). Another recent study showed that between 2000 and 2004, 9.1% of urban poor and 4.1% of rural women were overweight (BMI ≥ 25 kg/m², p < 0.001). In addition, 9.8% of urban poor and 5.5%

of rural women were found to be 'at risk of overweight' (BMI 23.0-<25 kg/m²) (Shafique *et al.*, 2007).

2.2 Micronutrient Deficiencies

Micronutrient malnutrition is often termed as 'hidden hunger' as the consequences are not always visible. Deficiencies of micronutrients are widespread in Bangladesh but there are four that are of particular relevance to public health: vitamin A, iron, iodine and zinc. The following sections describe the micronutrient deficiency situation in Bangladesh.

Vitamin A Deficiency

Bangladesh has been fairly successful in achieving vitamin A supplementation coverage and eliminating night blindness. There was a dramatic reduction in prevalence of night blindness among preschool children between the mid-1980s and 2004, as a result of the successful vitamin A supplementation program launched in 1973 (HKI, 1985, HKI, 1999, IPHN, 1989, HKI, 2005). Keratomalacia, the most severe form of VAD, is now seen occasionally among children hospitalized for severe acute malnutrition. However, in a recent study in rural Bangladesh, sub-clinical VAD (serum retinol <0.7 µg/dL) was found in 18.5% of 200 examined pregnant women (Lee *et al.* 2008). Nearly half of the pregnant women's vitamin A intake was less than the recommended dietary allowance. Furthermore, only about one in five women receive postpartum vitamin A supplementation (Ahmed *et al.* 2012).

Iron Deficiency

Iron-deficiency is believed to be the most common cause of anemia in pregnant women and children. Anemia contributes to low birth weight, which in turn decreases immunity and impairs growth and brain development of children. Surveys conducted in 2003-4 show that 92% of 6-11 month old infants in Bangladesh suffer from anemia (HKI&IPHN 2006). The prevalence remains high in pre-school children (68%) and adolescent girls (40%). Four out of ten pregnant women still suffer from anemia, particularly in rural areas. This high burden of anemia impacts on the economy of the country; an estimated 7.9% of the gross domestic product in Bangladesh is lost due to iron deficiency alone (Horton and Ross, 2003).

Iodine Deficiency

In 1993, the goiter prevalence in Bangladesh was 47.1%, cretinism (mental and growth retardation that occurs in early childhood due to iodine deficiency) 0.5% and

sub-clinical iodine deficiency (low urinary concentration of iodine, $<100\mu\text{g/L}$) was 69% (Yusuf *et al.*, 1996). The recent Iodine Deficiency Disorder (IDD) survey showed that the goiter prevalence among 6-12 year old children was 6.2% and 11.7% among women 15-44 years age (IPHN/UNICEF/ICCIDD, 2007). However, more than one-third of children and women suffer from sub-clinical iodine deficiency. The IDD survey reported that in 2004-05, more than 80% of households used salt that was iodized at low levels (≥ 5 parts per million, ppm) and only close to 50% households used salt that was adequately iodized (≥ 15 ppm) (IPHN/UNICEF/ICCIDD, 2007). Another recent national survey, reported that more than 40% of households used iodized table salt that had low iodine (less than 15 ppm) (Ahmed *et al.*, 2005). This calls for improving the quality of salt iodization as well as its coverage.

Zinc Deficiency

At the population level, the risk of zinc deficiency can be assessed based on two indirect indicators, i.e. the prevalence of stunting and the adequacy of absorbable zinc in the food supply at the country level (Black *et al.*, 2008). A stunting rate of more than 20% in under-five children is indicative of high risk of zinc deficiency at the country level (Black *et al.*, 2008). Although there is no national level estimate of zinc deficiency till date, a 41% prevalence of stunting among under-five children indicates a high level of zinc deficiency in Bangladesh. Rice is the main source of zinc in the rural population and inadequate intake of zinc is high among both children and women in rural Bangladesh (Arsenault *et al.*, 2010).

2.3 Breastfeeding and Complementary Feeding Practices

Breastfeeding is common in Bangladesh; 99% of infants less than 12 months old are breastfed. However, the incidence of breast feeding has remained constant for a long time. The Preliminary Report of the Demographic and Health Survey however indicated that there was an improvement in the exclusive breastfeeding rate from 43% to 64% between 2007 and 2011 (BDHS, 2012). Presumably, the main factor behind this recent trend is the change in the age pattern in the sample, with a higher proportion of infants 0-3 months in the 2011 sample compared to the 2007 sample. Conversely, the situation has deteriorated in the 2-23 month age group. Only 21% of children between 6 and 23 months are fed appropriately according to the recommended Infant and Young Child Feeding (IYCF) practices compared to 42% in 2007 (BDHS 2007). The large reduction in the incidence of breast feeding among

older children indicates the necessity of renewed efforts towards large scale nutrition programs targeting behavior change communication towards the protection and promotion of proper infant and young child feeding practices.

A study done in Bangladesh showed that the amount of energy from complementary food (CF) offered to infants was about 74% of the recommended amount (Kimmons *et al.*, 2005). Mean intakes of vitamin A from breast milk and complementary food together were 44% and 48% of the required nutrient intakes (RNI) for 6-8 and 9-12 months old children respectively. Intakes of vitamin D were 12-13% of RNI, and zinc was 40-45% of RNI. Iron intakes were very low, accounting for only 8-9% of the RNI. Similarly, breast milk concentrations of essential fatty acids are also very low as a result of maternal low fat intake (Yakes *et al.*, 2011). Furthermore, a recent study reported high contamination in CF with E. Coli, mainly attributable to food preparation practices. The consumption of contaminated CF appeared to be associated with a higher frequency of diarrhea and malnutrition in children (Islam *et al.*, 2012). The findings imply that it is difficult to improve micronutrient intakes of children by simply increasing the amount of complementary food currently consumed in Bangladesh. Other interventions including home fortification of food or complementary food that has added micronutrients and hygienic preparation of food need special consideration.

3. Nutrition Policies and Programs

3.1 Nutrition Policies and Strategies

The government of Bangladesh has approved several documents on food and nutrition since 1982. In 1997, a comprehensive document was approved by the government entitled “**National Food and Nutrition Policy**”, which included statements on goals, objectives, policies and strategies. The Government endorsed and finalized the National Plan of Action for Nutrition (NPAN) in 1995. Nutrition is now embedded in the National Food Policy (NFP 2006) and the associated Plan of Action (NFPPoA 2008-2015). Nutrition is now one of the three core objectives as set out in the NFP, providing strategic guidance for the way to address the key challenges facing Bangladesh in achieving food security in all its dimensions (availability, accessibility and nutrition/utilization). NFP and its Plan of Actions replace the earlier policy guidelines on nutrition and identifies 26 strategic areas of intervention and

priority actions to ensure food and nutrition security for all. The nutrition objective as laid out in the NFPPoA is adequate nutrition for all individuals, especially women and children. The key areas of intervention include: i) long term planning for balanced food, ii) balanced and nutritious food at minimal cost for vulnerable groups, iii) nutrition education for dietary diversification, iv) food supplementation and fortification, v) provision of safe drinking water and sanitary latrines for improved sanitation, vi) safe and quality food supply, and vii) improving health of women and children.

Besides the NFP and NFPPoA, there are several national guidelines and strategies available that's specifically target undernutrition. These guidelines and strategies are developed and published by the Institute of Public Health Nutrition (IPHN) under the Directorate General of Health Services (DGHS), Ministry of Health and Family Welfare (MoHFW) Bangladesh, with technical support from experts like icddr, UNICEF and the like. In 2001, the Institute of Public Health Nutrition developed the **National Guidelines for the Prevention and Treatment of Iron Deficiency Anemia**, which recommends iron supplementation, dietary improvement, food fortification and helminths control in preschool-aged children, school-aged children, adolescent girls, and women of reproductive age. In 2007 the **National Strategy on Anemia Control and Prevention** was published, aimed to reduce by one quarter the prevalence of anemia among high-risk groups in Bangladesh by 2015.

To protect and promote proper infant and young child feeding practices, a **National Strategy for Infant and Young Child Feeding** in Bangladesh was developed in 2007 with goals to: a) increase the national percentage of newborns who are breastfed within one hour of birth from 24% to 50%, b) increase the national percentage of infants aged less than 6 months who are exclusively breastfed from 42% to 60%, c) maintain the national percentage of children aged 20-23 months who are still breastfed at 90% and d) increase the percentage of children aged 6-9 months who are breastfed and receive appropriate complementary foods to 50%. **The Infant and Young Child Feeding (IYCF) National Plan of Action (2009-2011)** was then developed to identify activities, indicators and possible stakeholders for the protection, promotion and support of infant and young child feeding under different operational targets as set in accordance with the national strategy on IYCF. With support from the Alive and Thrive project (supported by the Gates Foundation), which operates in 50 upazilas (sub-districts) in Bangladesh, **the National Communication Framework and Plan for Infant and Young Child Feeding** in Bangladesh was published in 2010.

This plan has been prepared for 2010-2013 and will be reviewed and extended to 2016 to fit the national Health, Population and Nutrition Sector Strategy Plan for the period of 2011-2016. **The National Neonatal Health Strategy** promulgated in 2009 is also supportive of the IYCF Plan of Action.

To address the burden of severe acute malnutrition, **the National Guidelines for the Management of Severely Malnourished Children** in Bangladesh were developed in 2008 with technical support from icddr,b. These national guidelines are intended for doctors, senior nurses and other senior health professionals responsible for inpatient therapeutic care of severely malnourished children in health facilities. Nevertheless, considering the importance of management and treatment of acute malnutrition at the community level, the **National Guidelines for Community Based Management of Acute Malnutrition (CMAM)** in Bangladesh have already been developed by the Institute of Public Health with expert support from icddr,b. This CMAM guideline will be officially launched in 2012.

3.2. Institutional Framework

During 1974 and 1975, the Government of Bangladesh established the Institute of Public Health Nutrition (IPHN) and the Bangladesh National Nutrition Council (BNNC) to assist in formulating policies and strategies for nutrition related activities and programs, and to conduct research, training and surveillance. IPHN, reporting through the Director General of Health Services, has the responsibility of addressing all public health and nutrition problems of the country. Some of the programs under this unit include de-worming and distribution of Vitamin A capsules. In the past it has also partnered with Helen Keller International (HKI) on nutritional surveillance but this has now ceased. HKI and BRAC have been jointly implementing the **Food Security and Nutritional Surveillance Project (FSNSP)** and have now recommended that the FSNSP should have an institutional home in the Bangladesh Bureau of Statistics (BBS). IPHN manages the program to combat *iodine deficiency disorder*, long recognized as a public health problem, together with UNICEF, the Ministry of Industry and the national public health laboratory. The Global Alliance for Improved Nutrition (GAIN) is also partnering with UNICEF in the Universal Salt Iodization Project. GAIN is also providing support for the Fortification of Edible Oil project in Bangladesh.

3.3 Nutrition Programs

Vertical Nutrition Programs

The Government of Bangladesh has for many years employed various different strategies and programs to combat the problem of malnutrition in the country. The national nutrition actions have been largely dominated by vertical programming, for instance, the Bangladesh Integrated Nutrition Program (BINP) and the National Nutrition Program (NNP). The first major nutrition program in the country was **the Bangladesh Integrated Nutrition Program (BINP)**, implemented from 1995 to 2002. The core component of BINP was community based nutrition activities implemented through partner NGOs. The community based nutrition services included: a) behavior change and communication activities; b) growth monitoring and promotion for children under two years of age; c) food supplementation to children under 2 years of age and pregnant women; d) micronutrient supplementation (vitamin A and iron-folate); and e) de-worming. The project covered 61 upazilas (sub-districts) covering 16% of the rural population. BINP ended in 2002 and the same activities were continued under the **National Nutrition Program (NNP)**. Based on lessons learned in BINP, NNP had been implemented in 167 upazilas as of July 2011, covering one fourth of the population. In spite of various successes and positive outcomes, BINP was heavily criticized in terms of cost effectiveness and low impact towards achieving MDG target for reducing malnutrition by 2015 (White, 2005, Hossain *et al.*, 2005). Despite development of national and community level infrastructure for implementation of nutrition interventions, an evaluation of the NNP revealed weakness in the implementation of the program due to selection of partner NGOs without proper screening of their capacity and integrity and loose supervision of their activities by the government.

Considering the multifaceted underlying factors of malnutrition as well as the importance of an integrated approach for better nutrition, the new **Health, Population and Nutrition Sector Development Program** has replaced NNP by instituting the **National Nutrition Services (NNS)** (HPNSDP, 2011). Nutrition has now been mainstreamed within the existing service delivery channels of the Directorate General of Health (DGHS) and the Directorate General of Family Planning (DGFP) under the Ministry of Health and Family Welfare, officially in operation since July 2011.

Vitamin A Supplementation Program

Two rounds of vitamin A capsule supplementation to children aged 6-59 months are carried out every year by the Institute of Public Health and Nutrition (IPHN). Along with vitamin A supplementation, anti-helminthes tablets (albendazole 400 mg) are also administered to children ages 12-59 months. About 86% of the children who receive vitamin A fall into this age group who received albendazole in the past rounds. The latest data shows a coverage rate of 94% in 2008 up from 85% in 2007. On the other hand, postnatal Vitamin A supplementation is part of prescribed postnatal care, but given most women deliver at home and only about 21% of pregnant women have a postnatal visit, coverage is very low. The coverage of postpartum vitamin A was 20% in 2007(BDHS, 2009).

Control and Prevention of Iron Deficiency

Control and prevention of iron deficiency and other nutritional anemia is broadly operated through the country's entire health service delivery network and the National Nutrition Service (NNS). The key component is the distribution of iron-folic acid (IFA) supplementation to target groups, primarily pregnant and lactating women. IFA supplementation is a part of antenatal care for pregnancy but only about 50% women make one antenatal visit to the health facilities and reportedly often do not receive IFA. Hence the IFA coverage is inadequate. Furthermore, infants and preschool children are not given interventions routinely to prevent and control anemia, despite high prevalence of anemia and its potential consequences on cognitive development. De-worming of children of 24-59 months with albendazole through the six monthly NVAC has been an indirect effort to prevent anemia in this group. Other contributors to anemia (e.g. riboflavin, copper deficiency, vitamins A and B12, folate) have not received adequate attention (TN Inception Report 2012).

Control of Iodine Deficiency Disorders

The Institute of Public Health and Nutrition (IPHN) provides training to doctors and other health staff on controlling iodine deficiency disorders. To contribute to the quality control of salt iodization, training is given to managers, chemists and personnel from salt factories in collaboration with the Bangladesh Small and Cottage Industries Corporation (BSCIC). IPHN also developed and distributed different **Information, Education and Communication (IEC)** materials on control of iodine deficiency disorders.

Zinc Deficiency

Zinc supplementation during treatment of childhood diarrhea has recently gained importance under the leadership of icddr,b and the Ministry of Health and Family Welfare. All Integrated Management of Childhood illness (IMCI) programs are providing free zinc tablets to children with diarrhea.

Treatment of Severe Acute Malnutrition

Although the burden of Severe Acute Malnutrition (SAM) is very high in Bangladesh, there is little program response to tackle the problem. At the national level the management and treatment is done only at the facility level and only tertiary level hospitals are equipped to treat children. In this regard, icddr,b is the champion and developed a treatment protocol that can reduce mortality significantly in hospital settings (Ahmed *et al.*, 1999). The currently closed down National Nutrition Program did not include an effective mechanism to identify or treat children with SAM. The current National Nutrition Services has kept an objective of community based management of SAM, but it is yet to be implemented.

Two major impediments in scaling up community based management of SAM are lack of identification of children with SAM and proper referral mechanism, and lack of appropriate product required for the treatment. Besides, the community based management is very costly as has been estimated by Horton *et al.* at USD 200 per child per episode (Horton *et al.*, 2010). With this view in mind, icddr,b scientists, in recent years, have been conducting series of experiments to test the feasibility and appropriateness of an Ready to Use Therapeutic Food (RUTF) made from local food ingredients. In this connection, a scale up plan has been developed by icddr,b with support from DIFD to show the proof of principle that community based management of SAM is possible in routine health system.

School Feeding Program

In order to diminish hunger in the classroom as well as to promote school enrollment and retention rates, the Government of Bangladesh and the World Food Program (WFP) launched the **School Feeding Program (SFP)** in chronically food insecure rural areas of Bangladesh in 2002. The program was intended to distribute fortified biscuits to elementary school children in the targeted schools six days a week during the school year. The biscuits provide 300 kilocalories (about 15% of daily calorie requirements), and a range of micronutrients, contributing about 75% of the daily requirements of vitamin A, zinc, folate, and iron. In 2011, the Government of

Bangladesh together with WFP launched the **National School Feeding Program**. This program will be scaled up based on the WFP model to reach 1.2 million primary school children in 2012.

Compulsory Breast Feeding and Supplementary Feeding

Alive & Thrive (A&T) is a 6-year initiative (2009-2014) funded by the Bill and Melinda and Gates Foundation (BMGF) to improve infant and young child nutrition by increasing rates of exclusive breastfeeding and improving complementary feeding practices. A&T aims to reach more than 16 million children under 2 years old in Bangladesh, Ethiopia, and Vietnam. A&T is working in partnership with the government of Bangladesh, non-governmental organizations, and private initiatives to support implementation of the National IYCF Strategy and Action Plan. BRAC is delivering A&T's community interventions within its Essential Health Care (EHC) Program and its Maternal, Neonatal, and Child Health (MNCH) Program. BRAC's frontline health workers deliver age appropriate IYCF counseling and support services during home visits, antenatal and postnatal sessions and health forums.

Institutional challenges

Institutional anchoring for nutrition has been cluttered across several directorates under the Ministry of Health and Family Welfare (MOHFW). Although nutrition services were provided through a vertical program, the closed down National Nutrition Programme (NNP) was one of the 38 Line Directorates under the MOHFW; and, as discussed in previous sections, nutrition activities were not the sole responsibility of the NNP. Presently, although the National Nutrition Service has come under the Institute of Public Health Nutrition, nutrition services will still be delivered through health care staff of the Directorate General of Health Services and the Directorate General of Family Planning under the MOHFW. These MOHFW field workers were very negligibly involved in the service delivery of the NNP. This has created an obvious gap in the existing health system with regard to appropriate skills and adequacy of the human resources for nutrition care, preparedness of managers and supervisors. Furthermore, there is the long standing issue of lack of co-ordination between the health and family planning functionaries.

Furthermore, nutrition is not limited within the boundary of health sector only. Several other sectors, for example agriculture, fisheries and livestock, have responsibilities and interventions that directly or indirectly address the problem of

malnutrition. There are missed opportunities for coordination between health sector interventions and those of other sectors. A number of food security and livelihoods interventions are undertaken by various agencies with which MOHFW could coordinate to strengthen its nutrition activities. At the policy level, the National Food Policy and its Plan of Action (NFPPoA) has been developed and launched by the Ministry of Food and Disaster Management, which has the least coordination with the Ministry of Health.

4. Growth Performance of the Economy and the Agricultural Sector

4.1 Economic and Agricultural Growth

At independence in 1971, the economic viability of Bangladesh was questioned due to over population, a poor natural resource base, vulnerability to natural disasters, and an undiversified agrarian economy dependent on the production of rice and jute, and a manufacturing industry dependent on jute textiles. Despite these adverse initial conditions, Bangladesh has managed to increase the growth of national income to over 6.0 percent per year over the last four decades, feed its growing population with a declining amount of cultivable land, substantially curtail population growth, and expand economic and social infrastructure (Khan and Hossain, 1990; Quibria, 1997).

The first decade after independence saw hardly any economic progress. National income grew at 3.2% per year, which was largely absorbed by a population growth rate of 2.4 % per year. The 0.8 growth in per capita incomes hardly trickled down to the bottom. As a result, the incidence of poverty increased sharply, to more than 70% in the 1970s from less than 50% in the pre-independence period. The country witnessed a famine in 1974-75 (Khan 1977, Hossain 1991).

Starting in the mid-1980s, economic growth accelerated however, and has been quite impressive since 2000 (Table 1). The economic growth rate accelerated to over 6.0% per year and the population growth has declined from 2.35% in year 1981 (BBS 2010) to 1.36% in 2009 (BBS 2011). The per capita income growth of over 4.5% per year has contributed to the reduction of the incidence of poverty from 58% in 1990 to 32% in 2010. It promoted the expansion of the market for the agricultural products with elastic demand (fruits, fisheries and livestock), contributing to diversification of agricultural growth and promotion of service sector activities.

As in other fast growing economies, the share of agriculture in the national economy in Bangladesh has declined from nearly half at independence to only 20 percent in recent years. Agricultural activities center on crop cultivation which accounts for 56 percent of the agricultural value added, a decline from two-thirds in the 1970s. Another 14 percent of the agricultural value added originates from livestock and poultry farming activities that are supplementary to crop husbandry, carried out by using homestead land and surplus family labor, mostly women. Fishery and forestry, independent agricultural activities, respectively account for 22% and 8% of the agricultural value added.

Table 1. Performance of the Economy and Agriculture since 1976-77

Sector	1975-76 to 1990-91	1990-91 to 2000-01	2000-01 to 2009-10
Agriculture	2.0	3.4	4.0
Crop farming	2.0	2.3	3.6
Livestock and poultry farming	3.4	2.8	5.0
Fisheries	0.0	7.1	4.2
Forestry	3.6	3.9	4.9
Non-agriculture	4.8	5.4	6.8
Gross Domestic Product	3.6	5.0	6.2

Source: Bangladesh Bureau of Statistics and Ministry of Finance

After two decades of slow growth, the sector recorded an acceleration of growth. From 2.0% during the first two decades after independence, the growth rate of the agricultural sector increased to 3.4% in the 1990s, and to 4.0% over the last decade. Over the last three years the sector has been growing at 5.0% due to favorable agricultural prices (Table 1). The growth of the crop sector was 2.0% between 1976 and 1990; it improved marginally to 2.3% in the 1990s, but accelerated to 3.4% in the last decade. The growth of the livestock sub-sector followed almost the same pattern as the crop sector. There was some setback of the fisheries sector in the last decade due to a decline in production in marine and capture fisheries in estuaries and rivers,

and a slowdown in the growth of brackish water shrimp farming. But recently it has been doing well due to rapid growth of the pond aquaculture.

4.2: Performance of the Crop Sector

Rice, the dominant staple food crop, occupies over three fourths of the cropped area. The other major crops are jute, wheat, potato, and different pulses, oilseeds and spices, vegetables, sugarcane, tobacco and tea. None of these non-rice crops occupy more than 4% of the total cropped area. The cropped area did not increase much over the last four decades due to extreme scarcity of land, but there has been substantial reallocation of land among different crops depending on the potential for increases in productivity and profitability (FAO/WFP, 2008; Hossain and Deb, 2011). The cropped area under boro rice, wheat, maize, potato and vegetable has increased at the expense of *Aus* rice, pulses, oilseeds and most of the industrial cash crops. Wheat, which was an insignificant crop at independence, started growing very fast in the late 1970s until the 1990s. Now it is being replaced by hybrid maize which was introduced in the late 1990s in response to the scarcity of feed for the fast growing poultry industry.

The trend in production of major crops over the last four decades can be seen in Table 2. Rice production has tripled from 11 million tons (milled rice) to about 32 million tons since independence in 1971. Growth in rice production accelerated from 2.8% per year in the 1980s, and 3.5% per year since 1990/91. Most of the growth has occurred since the late 1980s, through adoption of improved rice varieties supported by rapid expansion of ground water irrigation. Over 80 percent of the increase in rice production during the last two decades came from the expansion irrigated boro rice in the dry season, with reallocation of land from low-yielding rainfed *aus* rice (Hossain 2010). Over three-fourths of the rice area is now cropped with improved varieties developed in the Bangladesh Rice Research Institute in collaboration with the International Rice Research Institute (IRRI).

Wheat, the minor food staple, also experienced respectable growth until the late 1990s, but has recently given way to **maize** because of favorable agro-ecological environment for maize which has higher productivity compared to wheat, and a stable and expanding market for maize as feed for the expanding poultry sector. The production of maize was negligible until the end of the 1990s, but has grown very fast in the current decade and has now overtaken wheat. Since maize is used as poultry feed, the substitution of wheat by maize has had a negative impact on the

supply of staple food for people, and has put more pressure on rice to meet the growing demand.

Table 2: Trend in the production of different crops, 1990/91 to 2008/09
(In thousand metric tons)

Crops	1969-70	1990-91	2000/01	2009-10	Growth rate (%/ year): 1969-70 to 1990-91	Growth rate (%/ year): 1990- 91 to 2009-10
Rice	11,716	17,785	25,086	32,257	2.3	3.6
Aus	2,863	2,261	1,916	1,709	-0.9	-1.3
Aman	6,949	9,165	11,249	12,207	1.4	1.5
Boro	1,903	6,357	11,921	18,341	8.5	6.4
Wheat	103	1,004	1,840	922	15.0	-0.4
Maize	3	3	10	730	0.0	28.2
Pulses	305	521	365	221	2.3	-5.6
Oilseeds	208	448	384	377	3.5	-1.8
Spices	266	319	394	1,240	0.9	9.7
Jute	742	962	821	922	1.3	-0.2
Sugarcane	7,171	7,682	6,742	4,491	0.3	-2.5
Tea	30	46	57	59	2.2	1.4
Tobacco	41	34	37	55	-0.8	2.7
Potato	851	1,237	3,216	8,168	1.9	11.5

Source: Bangladesh Bureau of Statistics: Statistical Yearbook of Bangladesh, and monthly Statistical Bulletin; various issues, Ministry of Finance: Economic Survey 2011.

Over the last two decades, good progress has also been achieved in the production of **potatoes and vegetables**. This growth has been particularly impressive in the last decade. The major problem faced by potato and vegetable production is the volatility in prices leading to large year to year fluctuations in production. The production of most other crops including **pulses, oilseeds, jute and sugarcane** has either remained stagnant or has declined. The production of pulses and sugarcane has consistently

declined over time. The production of oilseeds and jute has picked up in recent years due to favorable markets, some progress in recent years in the development of higher yielding varieties, and identification of a favorable agro-ecological niche for these crops.

4.3 Diversity in Food Intake

The recent acceleration in economic and agricultural growth has made a positive impact on the total food intake and the diversity of food intake in favour of quality food (Table 3). The per capita intake of food has increased by 5.5% between 2005 and 2010, from 948 grams per person per day to 1000 grams in 2010 (BBS HIES., 2011). The rates of increase in rural and urban areas are 6.2% and 3.5%, respectively. The per capita consumption of rice and wheat has been declining for some time in urban areas, and the 2010 HIES report shows that it has started declining in rural areas as well. The consumption of vegetables, fruits, fish and livestock products has increased moderately in 2010 compared to previous years; the most significant increase has been in the consumption of vegetables and tubers (BBS HIES., 2011).

However, although per capita intake of food has increased the level of consumption of other major food items, the average diet in Bangladesh- except for cereals (rice and wheat) - hardly meets the requirement for other essential and important foods like pulses, animal protein and milk (Table 3). Per capita calorie consumption meets the recommendations for Bangladeshi people, although protein intake shows a dismal pattern. The HIES surveys conducted at five year intervals by the Bangladesh Bureau of Statistics report a consistent increase in protein intake over the last decade. Thus, low consumption of protein and energy seems not to be serious for the average population, but there are distribution problems. Also, although the amount of protein intake at the national level is higher than the recommended allowances, more than 50% of this protein is coming from cereal sources and only about 24% is coming from animal sources (Table 4).

Table 3. Changes in the consumption (gm/person/day) of different food items, 1983-84 to 2010

Food item	Minimum intake required for balanced nutrition	Rural area				Urban area			
		1983-84	2000	2005	2010	1983-84	2000	2005	2010
Rice	390	421	479	460	442	351	377	379	344
Other cereals	100	65	24	26	18	79	47	41	40
Vegetable & potatoes	225	140	196	218	258	179	196	226	268
Pulses	30	26	15	13	13	22	19	19	17
Fruits	50	17	26	33	43	21	27	33	51
Fish	45	29	38	42	37	39	41	52	42
Meat & eggs	34	10	15	18	20	22	31	31	43
Milk	50	22	29	31	32	34	33	37	39
Total	934	741	899	946	830	761	871	952	952

Sources: Bangladesh Bureau of Statistics (series), Report of the Household Income and Expenditure Survey, various years. Bangladesh National Nutrition Council for the norm of minimum food intake required for balanced nutrition, as cited in GDB (1999)

Table 4: Protein and calorie intake in Bangladesh (per capita/day)

Items	1990-1992 [±]	1995-1997 [±]	2000-2002 [±]	2005-2007 [±]	2000 ^º	2005 ^º	2010 ^º	Recommen- -ndation
Kcal	1960	1930	2170	2250	2240	2239	2318	2197 ^a
Protein (g)	42	42	47	49	62.5	62.5	66.26	42.7 ^b
<i>(% Animal)</i>	-	-	-	-	(21.4)	(21.8)	(24.8)	-
<i>(% Veg)</i>	-	-	-	-	(20.3)	(24.0)	(22.2)	-
<i>(% Cereal)</i>	-	-	-	-	(58.2)	(54.2)	(53.0)	-
Fat (g)	18	21	25	29	-	-		42.5 ^c
Iron (mg)	-	-	-	-	-	-		7.6 ^d
<i>Animal</i>	0.5	0.6	0.7	0.9	-	-		
<i>Vegetable</i>	5.9	5.7	6.4	7.2	-	-		

[±] FAO Food Balance Sheet, ^º HIES 2005

^aFAO/WFP 2008, ^bFAO/WHO/UNU Expert Consultation on Energy and Protein requirement, 1985

^cFAO/WHO Joint Expert Committee on Fat and Oil consumption, 1995

^dINFS 1998

4.4. The disconnect between growth and progress in malnutrition

It was noted in section 2 that micronutrient deficiency and hidden hunger is still a big issue in Bangladesh. There has been some progress in terms of reducing the proportion of underweight children, but there has been marginal change in the incidence of stunting, which still remains at an unacceptable level of around 40%. The incidence of acute malnutrition (wasting) fluctuates widely without much progress. A study on the effects of the rice price hike in 2007-08 conducted by Matin et al. (2009) shows a substantial negative impact on acute malnutrition.

Is there a disconnect between economic growth, agricultural progress and reduction in child malnutrition in Bangladesh (known as the South Asian 'enigma')? The economic growth and the progress in agriculture should have positive impacts on reducing malnutrition. As per capita income increases, purchasing power to access high cost nutritious food like pulses, oils and fat, and fish and livestock products should also increase. With agricultural diversification away from cereals to non-rice crops, fisheries and animal farms, as Bangladesh has experienced in recent years

should reduce the relative prices of such food items, and the lower income groups have better access to such nutritious foods. According to Gillespie and Kadiyala (2011), the rate of decline in prevalence of child underweight tends to be half of the rate of growth in per capita GDP. In Bangladesh the GDP per capita has increased by almost 75% between 1994 and 2010 and the prevalence of underweight children has declined by 20 percent (BDHS 2005, 2009, 2011). Thus, there is a disconnect between economic growth and improvement in nutritional status in Bangladesh.

5. Agriculture Policy and Programs

5.1 Agriculture Policies

The Ministry of Agriculture (MoA) prepared the first comprehensive policy statement, the **National Agriculture Policy (NAP)** in 1999. NAP identified 18 subsidiary objectives and 18 program areas underlining the input and support sectors involved with crop production where actions or policies should be undertaken to achieve the overall goal of food self-sufficiency and food security. In 2010 the earlier version of NAP was revised and updated to address the new and emerging dimensions, i.e. climate change declining biodiversity, increasing frequency and intensity of natural disasters, increasing input prices, and so on. The MoA prepared the **New Agricultural Extension Policy (NAEP)** in 1996 in accordance with agriculture policies and priorities as set out in the fifteen-year prospective plan (1995-2010). The main goal of NAEP was to encourage the various partners and agencies within the national agricultural extension system to provide efficient and effective services which reinforce the effort to increase the productivity of agriculture in Bangladesh. The **Department of Agriculture Extension (DAE) strategic plan (1999-2002)** represents a structure of objectives designed to further implementation of the NAEP. There are also agriculture extension manuals and seed policies.

5.2 Program Responses

In the 1970s, the government invested heavily in large scale flood control and irrigation and drainage projects that accounted for half of the budget for agriculture and rural development. The Bangladesh Agricultural Development Corporation (BADDC) had monopoly control of the markets for modern agricultural inputs – seeds, fertilizer, and irrigation that used to be distributed to farmers at highly subsidized prices. In the 1980s, the government pursued liberalization of the input markets,

gradual elimination of subsidies on agricultural inputs, and removal of bans on private sector import of agricultural machinery. This policy change induced private investment to small scale irrigation (shallow tube wells and power pumps) that contributed to faster growth of irrigated rice (boro) during dry season over the last two decades. Subsidy on fertilizer was reintroduced in the 1990s and the practice continues since then. Fertilizer subsidies now account for over two thirds of the public sector expenditure for agriculture. Livestock and fisheries, which are pro-nutrition agriculture, receive only one-eighth of the allocation for the crop sector in the budget.

A seed policy promulgated in 1993 allowed the private sector to produce and import seeds (except for inbred rice, wheat and jute), and to distribute these to farmers with truthful labeling. This policy promoted the growth of the private sector seed industry and rapid expansion of the market for seeds of potatoes, fruits and vegetables. The production of these crops has grown very fast since the mid-1990s and has contributed to increased intake of nutritious food.

Over the last decades, substantial investments have been made by the private sector in converting low-lying land into fish ponds for engagement in commercial fish farming. The growth in the production of fish from pond aquaculture has been more than 10% over the last decade. While the price of indigenous fish has sky rocketed, the price of the fish cultured in the ponds (silver carp, tilapia, pangus, among others) has declined substantially. As a result, fish has become affordable to low-income households. The impact of this development on fish intake of low-income households and the nutritional status of women and children should be assessed, and policy support needed to sustain the development should be identified.

The Bangladesh Bank has recently been directing the commercial bank to increase their lending portfolio for financing agriculture. In 2009, a partnership project with BRAC (the largest NGO in Bangladesh) was launched to extend agricultural credit to tenant farmers with provision for a low cost revolving loan fund. BRAC has been organizing informal tenant farmers' associations in each village to provide working capital loans on easy terms, and organize monthly meetings to provide extension services on improved technology and pest management. Over the last two years, nearly 12,000 tenant farmers' associations have been formed with a membership of around 250,000 tenant farmers. One-fourth of the members are women, who use

the loan for home gardens and poultry and goat farming. The impact of the project on the livelihoods of low-income farm households, women' empowerment, and nutritional outcome of women and children could be assessed and lessons could be drawn for other countries in South Asia.

6. Pro-nutrition Agriculture Interventions

The main pro-nutrition agricultural intervention piloted in Bangladesh is the intensification of homestead food gardens involving women. In an effort primarily aimed at combating vitamin A deficiency, Helen Keller International (HKI) introduced the homestead food production (HFP) program in Bangladesh nearly two decades ago. HFP programming in Bangladesh has directly reached about 4% of the population in 240 of the 466 sub-districts in the country, covering diverse agro-ecological zones. The original model focused primarily on vitamin A deficiency, increasing consumption of vitamin A-rich vegetables and fruits available from home gardens. Later, the scope of the HFP model was broadened significantly to address multiple micronutrient deficiencies, including iron and zinc. This meant incorporating small animal husbandry into the model, because animal source foods are the best sources of bio available (easily absorbed and used) iron and zinc.

The objectives of HFP programs are to:

1. increase year-round production, varieties, and quantities of vegetables and fruits produced by home gardening;
2. increase animal foods through small animal husbandry;
3. increase consumption of micronutrient-rich foods through increased household production and income, enhanced by improved knowledge and awareness through nutrition education;
4. improve the health and nutritional status of women and children; and
5. empower women through control over resources that ensure better child care practices.

Beginning in 1990, a pilot HFP program targeted 1,000 households. A mid-term evaluation of this project demonstrated that its combined home gardening, nutrition education, and gender interventions could improve vegetable consumption among women and children, and the 'NGO Gardening and Nutrition Education Surveillance

Project' (NGNESP) was subsequently launched in 1993. A variety of assessments and evaluations have been carried out on the Bangladesh HFP program, including small-scale assessments of pilot projects, interim mid-term evaluations, monitoring data surveillance, and larger-scale impact evaluations.

The body of literature evaluated the impact of HFP on several indicators: dietary diversity and food expenditure, night blindness and micronutrient status, and women's empowerment. Bloem *et al.* (1996) reported that in rural Bangladesh vitamin A intake in pregnant women derived entirely from the consumption of fruits and vegetables. After adjusting for socio-economic status, vitamin A intake was determined by qualitative indicators of homestead gardens (type of home garden, the total quantity of pro-vitamin A-rich food produced and the number of fruit and vegetable varieties grown in the garden) (Bloem *et al.*, 1996). Assessing the relationship between homestead food production and night blindness among pre-school children in rural Bangladesh in the presence of a national vitamin A supplementation program, Campbell *et al.* (2011) reported that homestead food production conferred a protective effect against night blindness among pre-school children who missed vitamin A supplementation in rural areas (Campbell *et al.*, 2011).

In contrast, Faruque *et al.* (2006), assessing the prevalence of anemia and vitamin A deficiency in children where the home-gardening program had been running for more than two years, found that sub-clinical vitamin A deficiency was present in 3% of the children at severe level and in 20% of the children at moderate level. The study also found anemia in 48% of the children (Faruque *et al.*, 2006). Bushamuka *et al.* (2005) found that, homestead gardening programs that primarily targeted poor rural women in Bangladesh, enabled significantly more program participants to economically contribute to the family compared to the control peers (>85% vs. 52%). Similar results were found for the level of influence gained by women on household decision making (Bushamuka *et al.*, 2005).

Bouis (2002) examined programs that promoted adoption of polyculture fish production and commercial vegetable production which had income generation as the primary objective, although not better nutrition. The study found that fish and vegetable technologies were more profitable than rice production, although rice production provided a higher share of total income. There was no finding of disproportionately high own-consumption of fish and vegetables by the beneficiary households. The impacts on overall household income, although positive, were not

strong. The effects of program enrollment on women's status and time allocation also did not change this conclusion (Bouis, 2000).

The North-West Crop Diversification Project (NCDP) was initiated by the government of Bangladesh in 2000 with an objective to diversify cropping patterns from rice-based mono type cropping and to encourage small farmers, especially women to grow high value crops like maize, potatoes and the like, in addition to some vegetables and spices. Under the project, microcredit services were delivered through a partnership with non-government organizations like BRAC and RDRS. The analysis showed that the project was successful in expanding areas under high value non-rice crops and improving the economic condition of both male and female beneficiaries. The project however did not have any explicit nutrition component or indicator(Hossain and Jaim, 2011).

Food Security for Sustainable Household Livelihoods (FoSHoL) was a four year project (2005-2009) that aimed to improve food security and livelihoods of agriculture-dependent resource poor households. The project was funded by the European Commission (EC) and implemented by three international organizations: Action Aid Bangladesh, CARE Bangladesh and Practical Action. The project was coordinated by the International Rice Research Institute (IRRI). The beneficiaries of the FoSHoL-CARE project were sharecroppers, female headed households and indigenous people. The project reported to have improved the food security situation significantly among the beneficiaries, measured in terms of rice provisioning status of the household. Weekly consumption of fish, egg, pulses, milk and fruits also increased to some extent with the project beneficiaries, despite some food price inflation during the evaluation. The project did not show any impact on meat consumption.

Another major pro-nutrition intervention was providing access to **credit** to rural women to facilitate their engagement in poultry and subsistence based livestock farming. The micro-finance institutions (MFIs) have now reached nearly 16 million rural households. The loans disbursed by the MFIs now amount to nearly 2.5 times the disbursement of agricultural loans by formal financial institutions and specialized banks. It is estimated that nearly 40% of the MFI loans are used for livestock, poultry farming and pond aquaculture. Although many studies have been conducted on evaluations of microfinance, studies on the impact on women's empowerment and

improvement in the diet diversity and nutrition status on women and children are lacking.

7. Leveraging Agriculture for Nutrition: Capacity to optimize

Improving nutrition and health has been a commitment of the Government of Bangladesh, but nutrition in the country has been suffering from lack of stewardship and leadership (Ahmed *et al.*, 2012). To substantially improve the nutrition situation, it is essential to implement the package of essential nutrition interventions at scale in addition to addressing the underlying and structural causes of undernutrition (Ahmed and Ahmed, 2009) such as food insecurity, inadequate health services and poverty. Policies and policy instruments to address food security and nutrition - particularly maternal and child under nutrition - have been developed. The government has prepared a **Country Investment Plan (CIP)** which includes a coherent set of 12 priority investment programs to improve food security and nutrition in an integrated way. The CIP builds on the very solid existing policies, frameworks, strategies and plans in support of food security and nutrition. In particular, the CIP represents an investment tool in support of the revised National Strategy for Accelerated Poverty Reduction. That includes an updated vision, proposed actions and indicative costs in favor of poverty reduction, including agriculture as a major contributor to pro-poor economic growth, food security, social protection programs and nutrition.

The linkages between agriculture and nutrition seem obvious; adequate levels and qualities of food produced and consumed promote good nutrition. In reality the positive linkages between agriculture and nutrition are not often readily realized (Masset *et al.*, 2012). Increased agricultural production and income are not always sufficient conditions to reducing malnutrition (World Bank., 2007). In the policy and program paradigm in Bangladesh, the agriculture-nutrition pathways have not been explored with the rigor it deserves. Many agriculture programs in Bangladesh support agricultural product commercialization and cash crop production, or the production of fruits and vegetables or animal source foods with an overall objective of increasing agricultural productivity and household income. These programs, however, are lacking an explicit nutrition component to leverage agriculture for better nutrition outcomes. Far more substantial impacts could be achieved if agriculture interventions are complemented with non-agricultural elements that address other determinants of child undernutrition (World Bank.,

2007). Food security and agriculture programs in Bangladesh must move away from the calorie intake and income oriented measures of adequacy to nutrition-based measures to successfully leverage agriculture for better nutrition.

Women in Bangladesh hardly participate in agricultural activities outside the home. Women's economic activities are generally confined to homestead food production and post-harvest operation. However, women's participation as entrepreneurs in agriculture is increasing in Bangladesh (Hossain and Jaim, 2011). This creates a huge opportunity to foster women's empowerment through agricultural entrepreneurship, which in turn can positively impact on nutrition given that other direct determinants of malnutrition are simultaneously addressed.

Narrowing the nutrition gap is a challenge ahead; there is a gap between what foods are grown and available and what foods are needed for better nutrition. This knowledge gap still needs to be filled. For example – how can agricultural growth facilitate greater dietary diversity? Should investments focus more on staple crops, high-value crops or livestock? What conditional factors such as land distribution, education, women's empowerment, producer and consumer market structures and rural infrastructures do the most to leverage agricultural growth for nutrition and health?

To effectively address the multi causal issue of malnutrition, multiple and synergistic interventions embedded in true multi-sectoral programs need to be implemented. Investments in capacity strengthening of national agricultural/food systems to integrate nutrition outcomes in planning and policy processes will make significant contributions to improving nutrition on a sustainable basis. Nevertheless, systematic high level coordination between different sector ministries is challenging, given the bureaucratic barriers that divide them. Bangladesh already has sound policy frameworks for agriculture, food and nutrition security. But tackling the problem of undernutrition warrants cross-ministerial coordination, led by a high-powered body in the Prime Minister's office.

References

- Ahmed, T. & Ahmed, A. M. (2009) Reducing the Burden of Malnutrition in Bangladesh. *BMJ*, 339, b4490.
- Ahmed, T., Ali, M., Ullah, M. M., Choudhury, I. A., Haque, M. E., Salam, M. A., Rabbani, G. H., Suskind, R. M. & Fuchs, G. J. (1999) Mortality in Severely Malnourished Children with Diarrhoea and Use of a Standardised Management Protocol. *Lancet*, 353 (9168), 1919-22.
- Ahmed, T., Mahfuz, M., Ireen, S., Ahmed, A. M. S., Rahman, S., Islam, M., Alam, N., Hossain, I., Rahman, M., Choudhury, F. P. & Cravioto, A. (2012) Nutrition of Children and Women in Bangladesh: Trends and Directions for the Future. *J Health Popul Nutr*, 30 (1), 1 - 11.
- Alam, N., Roy, S. K., Ahmed, T. & Ahmed, A. M. (2010) Nutritional Status, Dietary Intake, and Relevant Knowledge of Adolescent Girls in Rural Bangladesh. *J Health Popul Nutr*, 28 (1), 86-94.
- Arsenault, J. E., Yakes, E. A., Hossain, M. B., Islam, M. M., Ahmed, T., Hotz, C., Lewis, B., Rahman, A. S., Jamil, K. M. & Brown, K. H. (2010) The Current High Prevalence of Dietary Zinc Inadequacy among Children and Women in Rural Bangladesh Could Be Substantially Ameliorated by Zinc Biofortification of Rice. *J Nutr*, 140 (9), 1683-90.
- BBS (1998) *Statistical Year Book of Bangladesh 1997*. Dhaka, Bangladesh Bureau of Statistics. Statistics Division, Ministry of Planning, Government of the People's Republic of Bangladesh.
- BBS (2011). *Statistical Year Book of Bangladesh 2010*. Dhaka, Bangladesh Bureau of Statistics. Statistics Division, Ministry of Planning, Government of the People's Republic of Bangladesh
- BBS HIES. (2003) Report of the Household Income and Expenditure Survey 2000. Bangladesh Bureau of Statistics, Ministry of Finance, People's Republic of Bangladesh.
- BBS HIES. (2011) Report of the Household Income and Expenditure Survey 2010. Bangladesh Bureau of Statistics, Ministry of Finance, People's Republic of Bangladesh.
- BDHS (2009) Bangladesh Demographic and Health Survey 2007. National Institute of Population Research and Training (NIPORT) and Mitra and Associates, Dhaka; Macro International Cleverton, Maryland.
- BDHS (2012) Bangladesh Demographic and Health Survey 2011. National Institute of Population Research and Training (NIPORT) and Mitra and Associates, Dhaka; Macro International Cleverton, Maryland.
- Black, R. E., Allen, L. H., Bhutta, Z. A., Caulfield, L. E., de Onis, M., Ezzati, M., Mathers, C. & Rivera, J. (2008) Maternal and Child Undernutrition: Global and Regional Exposures and Health Consequences. *Lancet*, 371 (9608), 243-60.
- Bloem, M. W., Huq, N., Gorstein, J., Burger, S., Kahn, T., Islam, N., Baker, S. & Davidson, F. (1996) Production of Fruits and Vegetables at the Homestead Is an Important Source of Vitamin a among Women in Rural Bangladesh. *Eur J Clin Nutr*, 50 Suppl 3, S62-7.

- Bouis, H. E. (2000) Commercial Vegetable and Polyculture Fish Production in Bangladesh: Their Impacts on Household Income and Dietary Quality. *Food and Nutrition Bulletin*, 21 (4), 482-487.
- Bushamuka, V. N., de Pee, S., Talukder, A., Kiess, L., Panagides, D., Taher, A. & Bloem, M. (2005) Impact of a Homestead Gardening Program on Household Food Security and Empowerment of Women in Bangladesh. *Food Nutr Bull*, 26 (1), 17-25.
- Campbell, A. A., Akhter, N., Sun, K., de Pee, S., Kraemer, K., Moench-Pfanner, R., Rah, J. H., Badham, J., Bloem, M. W. & Semba, R. D. (2011) Relationship of Homestead Food Production with Night Blindness among Children Below 5 Years of Age in Bangladesh. *Public Health Nutr*, 14 (9), 1627-31.
- de Onis, M., Blossner, M. & Villar, J. (1998) Levels and Patterns of Intrauterine Growth Retardation in Developing Countries. *Eur J Clin Nutr*, 52 Suppl 1, S5-15.
- FAO/WFP (2008) Special Report. Fao/Wfp Crop and Food Supply Assessment Mission to Bangladesh.
- Faruque, A. S., Khan, A. I., Malek, M. A., Huq, S., Wahed, M. A., Salam, M. A., Fuchs, G. J. & Khaled, M. A. (2006) Childhood Anemia and Vitamin a Deficiency in Rural Bangladesh. *Southeast Asian J Trop Med Public Health*, 37 (4), 771-7.
- HKI (1985) Bangladesh Nutritional Blindness Study 1982-83. Helen Keller International, 23.
- HKI (1999) Vitamin a Status Throughout the Lifecycle in Rural Bangladesh: National Vitamin a Survey, 1997-98. Helen Keller International, Bangladesh 20.
- HKI (2005) Bangladesh in Facts and Figures 2004. Annual Report of the Nutritional Surveillance Project. Helen Keller International Bangladesh.
- HKI & JGSPH 2011. State of Food Security and nutrition in Bangladesh:2010. Dhaka, BD: Hellen Keller International and James P Grant School of Public Health .
- Horton, S. & Ross, J. (2003) The Economics of Iron Deficiency. *Food Policy*, 28 (1), 51-75.
- Horton, S., Shekar, M., McDonald, C., Mahal, A. & Jana., B. K. (2010) *Scaling up Nutrition What Will It Cost?*, New York, The World Bank.
- Hossain, Mahabub (2010). Shallow Tubewells, boro rice and food security in Bangladesh. In Spielman David and R. Pandya_Lorch (eds): Proven Successes in Agricultural Development: A technical Compendium to Millions Fed. International Food Policy Reserch Institute, Washington DC.
- Hossain, Mahabub, Uttam Deb (2011). Crop Sector in the Sixth Plan: Issues, Strategies and Policies. Dhaka: Bangladesh Institute of Development Studies.
- Hossain, M. & Jaim, W. M. H. (2011) Wmpowering Women to Become Farmer Enterprenuer. *IFAD Conference on New Directions for Smallholder Agriculture*. Via Paolo Di Dono, Rome, Italy, International Fund for Agriculture Development.
- Hossain, S. M., Duffield, A. & Taylor, A. (2005) An Evaluation of the Impact of a Us\$60 Million Nutrition Programme in Bangladesh. *Health Policy Plan*, 20 (1), 35-40.
- HPNSDP (2011) Health, Population and Nutrition Sector Development Program (2011-2016). Ministry of Health and Family Welfare, Government of the People's Republic of Bangladesh.
- IPHN (1989) Nutritional Blindness Prevention Programme: Evaluation Report 1989. Institute of Public Health Nutrition xi, 67.
- IPHN/UNICEF/ICCIDD (2007) National Iodine Deficiency Disorders and Universal Salt Iodization Survey of Bangladesh 2004-5. Institute of Public Health Nutrition, United

- Nation Children's Fund, International Centre for Control of Iodine Deficiency Disorders.
- Islam, M. A., Tahmeed., A., Faruque, A., Sabuktagin, R., S.K., D., D., A., Fattori, V., R., C., Endtz, H. P. & A, C. (2012) Microbiological Quality of Complementary Foods and Its Association with Diarrhoeal Morbidity and Nutritional Status of Bangladeshi Children *Eur J Clin Nutr*, (In press).
- Khan, A.R. (1977). Poverty & Inequality in Rural Bangladesh, in Griffin & Khan (1977).
- Khan and Hossain 1990, BBS 1998 and 2011.
- Khan and Hossain 1990. Khan, A.R. Hossain Mahabub (1989). The Strategy of Development in Bangladesh. St. Martin's Press (New York).
- Kimmons, J. E., Dewey, K. G., Haque, E., Chakraborty, J., Osendarp, S. J. & Brown, K. H. (2005) Low Nutrient Intakes among Infants in Rural Bangladesh Are Attributable to Low Intake and Micronutrient Density of Complementary Foods. *J Nutr*, 135 (3), 444-51.
- Matin, I., Parveen, M., Das, N.C., Taylor, N.M. & Raihan, S. (2009) Implications for Human Development- Impacts of Food Price Volatility on Nutrition and Schooling. BIDS Policy Brief, No 0901, May.
- Masset, E., Haddad, L., Cornelius, A. & Isaza-Castro, J. (2012) Effectiveness of Agricultural Interventions That Aim to Improve Nutritional Status of Children: Systematic Review. *BMJ*, 344, d8222.
- Planning Commission, Govt. of the People's Republic of Bangladesh (2009). The Millennium Development Goals: Bangladesh Progress Report.
<http://www.undp.org.bd/info/pub/Bangladesh%20MDGs%20Progress%20Report%202009.pdf>. Accessed on: 23 July 2012
- Quibiria, M. G. (1977) Labor Migration & Labor Market Integration in Asia, *World Economy* 20(1): 21.42
- Rahman, M., Rahaman, M., Flora, M. S., Akter, S. F. U., Hossain, S. & Mascie-Taylor, C. G. (2006) Behavioural Risk Factors of Non-Communicable Diseases in Bangladesh. Dhaka.
- Shafique, S., Akhter, N., Stallkamp, G., de Pee, S., Panagides, D. & Bloem, M. W. (2007) Trends of under- and Overweight among Rural and Urban Poor Women Indicate the Double Burden of Malnutrition in Bangladesh. *Int J Epidemiol*, 36 (2), 449-57.
- Sen, B.; Menon, P.; Ahmed, A. U.; and Chowdhury F. P. 2010. "Food Utilization and Nutrition Security." Background Paper, Bangladesh Food Security Investment Forum, May 2010. Dhaka, Bangladesh
- TN Inception Report (2012). 'Bangladesh: Situation Analysis ' in Inception Report of Transform Nutrition Research Program Consortium: Additional Annexes, 24 April, pp. 66-68.
<http://community.eldis.org/?233@@.5add8324!enclosure=.5add8325&ad=1>
Accessed on 27 Nov 2012.
- UNICEF (1990) Strategy for Improved Nutrition of Children and Women in Developing Countries. UNICEF.
- UNICEF (2008). Bangladesh Statistics.
http://www.unicef.org/infobycountry/bangladesh_bangladesh_statistics.html.
Accessed on 31st July 2010.
- UNS: SCN. (2009) Landscape Analysis on Countries' Readiness to Accelerate Action in Nutrition. *SCN News*, World Health Organization.

- White, H. (2005) *Maintaining Momentum to 2015? An Impact Evaluation of Interventions to Improve Maternal and Child Health and Nutrition in Bangladesh*, Washington, DC, World Bank.
- World Bank. (2007) *From Agriculture to Nutrition: Pathways, Synergies and Outcomes*. The World Bank.
- Yakes, E. A., Arsenault, J. E., Munirul Islam, M., Hossain, M. B., Ahmed, T., Bruce German, J., Gillies, L. A., Shafiqur Rahman, A., Drake, C., Jamil, K. M., Lewis, B. L. & Brown, K. H. (2011) Intakes and Breast-Milk Concentrations of Essential Fatty Acids Are Low among Bangladeshi Women with 24-48-Month-Old Children. *Br J Nutr*, 105 (11), 1660-70.
- Yusuf, H. K., Quazi, S., Kahn, M. R., Mohiduzzaman, M., Nahar, B., Rahman, M. M., Islam, M. N., Khan, M. A., Shahidullah, M., Hoque, T., Baquer, M. & Pandav, C. S. (1996) Iodine Deficiency Disorders in Bangladesh. *Indian J Pediatr*, 63 (1), 105-10.