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Bangladesh Trip Report

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Assessment of Food Fortification in Bangladesh

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The opinions expressed in this document are those of the author(s) and do not necessarily reflect the views of the U.S. Agency for International Development.

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Executive Summary

The objective of this visit was to determine the needs of food fortification as part of food-based interventions for reducing micronutrient deficiencies in Bangladesh. Specific tasks were to

- Assess the overall feasibility of food fortification in Bangladesh
- Explore the possibility of vitamin A fortification of staple foods such as wheat flour, oil, rice, and sugar
- Explore the feasibility of fortifying non-staple foods
- Determine the capacity of the private sector in fortification efforts

Input for this analysis was provided by a review of literature, data, and programs; interviews with individuals responsible in the government; discussions with researchers at universities and field personnel in donor and nongovernmental organizations; and visits to private industries.

Findings

The potential food vehicles considered for fortification are wheat flour (*atta*), rice, oil, sugar, tea, lentils, and non-staple traditional foods. Both the opportunities and constraints were examined for each of these foods. The conclusion reached is that, at the present time, flour is the best candidate for fortification.

Recommendations

The Bangladesh public and private sectors are willing and have the capacity to begin fortification of foods. In order to test the concept and lay the foundation for food fortification, the following should be done:

- Fortify wheat flour (*atta*) in government and private mills
- Design a pilot program for distribution of fortified *atta* through the Government of Bangladesh's Food for Education Program (FFE) to reach the target population
- Select eight to 10 sites out of 64 FFE sites for fortification, packaging, and distribution
- Thoroughly measure the impact of the intervention

To implement the recommended pilot program, technical support will be needed to

- Design the pilot program
- Conduct a survey to select the 10 sites for the pilot program
- Conduct a survey to determine consumption of *atta*, which will indicate the vitamin and mineral intake among the target population

- Determine the technical needs of the sites (for example, millers will need dosifiers, mixers, and packaging machines and materials)
- Establish quality control and testing procedures and provide support to an institute such as the Bangladesh Standards and Testing Institute (BSTI)
- Assist in procuring the fortificants and premixes
- Provide policy support for fortification legislation

1. Introduction

1.1 Purpose

The objective of this visit was to conduct an assessment of food fortification possibilities as part of food-based interventions for reducing micronutrient deficiencies in Bangladesh. Specific tasks were to

- Assess the overall feasibility of food fortification in Bangladesh
- Explore the possibility of vitamin A fortification of staple foods such as wheat flour, oil, rice, and sugar
- Explore the feasibility of fortifying non-staple foods
- Determine the capacity of the private sector in fortification efforts

(See Appendix A for the detailed Scope of Work.)

1.2 Background

Bangladesh is a south Asian country with a population of nearly 130 million people. About 90 percent of the people live in the rural areas. The local diet consists mainly of rice, *dahl* (lentil soup), green leafy vegetables, and fish, if available (1), (4). The 1981–82 dietary survey showed that vitamin A intake was 38 percent of the recommended daily intake (2). According to the National Nutritional Blindness Survey, xerophthalmia occurred in the most disadvantaged strata of society and 80 percent of the blind children were identified to be from landless households (3). The cause of night blindness has been associated with food habits, income level, and lack of prevention from infectious diseases. Supplementation with capsules every six months has increased the coverage to above the 85 percent level in children (1). Food-based diversification programs are making progress but would, in all likelihood, require a long period of time to show significant results.

Fortification of foods can strengthen the vitamin A programs as a medium-term potentially sustainable strategy in addition to supplementation and dietary diversification. It would increase the in-take of vitamins and minerals through regular food intake. The popular food vehicles chosen for fortification would need to be based on the dietary habits of target groups, ease of processing, packaging, and distribution. They should be acceptable and affordable by most of the members of the target groups. In 1989, Drexler (Helen Keller International) supported the idea of fortification and suggested that wheat grain should be fortified (5). However, there is no record of implementation of this idea.

1.3 Methodology

- Literature review of publications and reports
- Meetings with USAID, UNICEF, World Bank, Helen Keller International, The Micronutrient Initiative, CARE, ICDDR, Dhaka University Nutrition Group, and Government of Bangladesh officials at the Ministries of Food, Education, Industry, and Local Government for Rural Development
- Field visits to Chittagong and Narayanganj to see the government food grain storage and distribution and food processing in the private sector
- Review of the data for food consumption and nutritional status in rural and urban areas
- Review of relevant programs (such as the government's Food for Education program)

2. Activities and Findings

2.1 Potential Food Vehicles for Fortification in Bangladesh

2.1.1 Rice

In Bangladesh, rice would be the ideal vehicle to reach rural children and women at the low-income level. The total food grain production per capita is about 155 kg, and rice consumption is about 408 grams per person per day (1995–96 figures). Rice is produced and milled all over the country in small and large mills. Other than de-husking at the household level in villages, there is no central control over its processing and no quality control. Rice fortification would be extremely difficult from a logistic and management point of view. Moreover, rice preparation includes boiling, and in many cases the excess water after boiling is discarded prior to consumption. Unless the cooking method is changed, fortification will be ineffective since all the fortificants added to rice would be lost in the discarded water. Because of these conditions, rice is ruled out as a possible vehicle at the moment. The expenditure data in Table 1 show the rural and urban share from 11.44 to 42.23.

Table 1: Per capita expenditure on rice
(as percentage of total food expenditure)

Quintile*	1	2	3	4	5	All
Rural	42.23	37.61	33.02	27.86	18.88	33.28
Urban	37.45	32.54	28.80	22.55	11.44	18.74
Total	42.06	37.32	32.59	26.86	15.62	30.89

*Each quintile represents a segment of the population based on income level; 1–5 equals the lowest to the highest.
Source: 1995–96 World Bank data (7)

2.1.2 Wheat

Wheat is the second major staple food in Bangladesh. Wheat flour (*atta*) is widely consumed. The finer grade of wheat flour called *maida* is slightly more expensive and is consumed mostly in urban areas. Per capita consumption of wheat is 18 g per day (1995–96 figures). Most of the wheat grain is imported; this includes wheat from the US PL 480 program and the UN World Food Program. Domestic production in the northern part of Bangladesh is increasing and is currently 15 to 20 percent of the total wheat consumed. Consumption of wheat flour is increasing due to availability, ease of preparation, and its distribution by the Government of Bangladesh under the Food for Work and Food for Education program. There is one large government-owned and -operated flour mill that has been a trendsetter since it was established in the mid-1950s. There are also nearly 600 large and small privately owned flour mills. They produce *atta* in large 25-kg bags and also in 5-kg and 1-kg bags. Because of its growing popularity and countrywide processing in flour mills, *atta* may be a reasonable item for fortification although the expenditure data in Table 2 is not as strong as that for rice.

Table 2: Per capita expenditure on wheat
(as percentage of total food expenditure)

Quintile*	1	2	3	4	5	All
Rural	3.12	2.18	1.91	1.29	0.82	1.98
Urban	2.49	2.49	1.91	1.43	0.99	1.37
Total	3.10	2.20	1.91	1.32	0.89	1.88

*Each quintile represents a segment of the population based on income level; 1-5 equals the lowest to the highest.

Source: 1995-96 World Bank data (7)

2.1.3 Sugar

There are 16 sugar mills in Bangladesh. They are all owned by the Bangladesh Sugar and Allied Food Corporation, a government organization. From a quality control and distribution standpoint, it would be ideal to fortify sugar. However, these mills can produce only 50 percent of the demand; the rest comes from India. Even if legislation were to ban the entry of unfortified sugar, it would be difficult to prevent the entry because Indian sugar usually sells below Bangladeshi sugar by Taka 5 per kg. The per capita consumption of sugar is around 7 kg but the percent of expenditure for sugar based on a household survey in rural areas is 0.1 to 0.8. This indicates very low usage of sugar in the low-income rural population. People with household incomes below Taka 50 (US\$ 1.00) per month do not use sugar at all; they use *gur* (concentrated unrefined sap from palm trees). Therefore, consideration of sugar fortification should wait until the problems of production, packaging, pricing, and distribution are resolved, making it competitive and affordable in the open market.

Table 3: Sugar production and importation to meet the demand in Bangladesh

Year	Domestic Production in 100,000 MT	Importation in 100,000 MT
1998	1.66	2.15
1999 estimate	1.85	2.10
2000 estimate	2.17	1.92

Source: Bangladesh Sugar and Allied Food Corporation (8)

2.1.4 Fats and Oil

Bangladesh is deficient in the production of edible oil. Per capita availability of oil is about 13 grams per day (1996-97 figures). Imports of palm and soybean oil make up for the deficiency. Only 20 percent of oil is produced domestically. The rural poor people use, on average, 6 grams of oil per person per day; and some use none. If the oil consumption is boosted to 30-35 grams per day by increasing the supply and lowering the cost to make it more affordable, oil would be an excellent vehicle for fortification. The trend is encouraging because the average annual per capita consumption has increased from 2 kg in 1980 to 5 kg in 1997-78. However, only 21 percent of rural and 40 percent of people in urban areas can meet their fat requirement. The table below shows the consistently low per capita availability of oil based on domestic production and imports from 1994 to 1997.

Table 4: National edible oil balances in Bangladesh

	FY 97	FY 96	FY 95	FY 94
Total oil supply in 1000 MT	586	561	570	570
Population in millions	123.5	120.8	118.2	116.5
Per capita availability in kg per year	4.7	4.6	4.8	4.9
Per capita availability in grams per day	12.9	12.6	13.2	13.4

Source: World Food Program, Bangladesh Bureau of Statistics and USDA estimates (6)

2.1.4 Tea

Brick tea was fortified with vitamin A successfully in India. Bangladesh produced 54,000 MT of tea in 1997; it is major export item. In Bangladesh, it is consumed mainly by adults. Since it reduces the bioavailability of iron, in a country with a high prevalence of anemia (in rural areas, 70 percent of men and 85 percent of women age 15 and over) tea would be the wrong vehicle for fortification (9).

2.1.5 Lentil/Pulses

Lentils/pulses (*dahl*) is widely consumed all over Bangladesh. It is used in a soup with rice and flat unleavened bread (*chapati*). Daily per capita intake of *dahl* went down to 11 grams in 1995–96 from 27.6 grams in 1962–64. Its production has most likely gone down due to heavy land utilization to produce rice. Currently, large quantities are imported from India. It is not centrally processed. At the moment, it is not ideal for fortification although it may be considered in the future once production, processing, and distribution can be controlled from some central location.

Table 5: Daily per capita consumption of lentils/pulses (*dahl*)

	1995–96	1981–82	1975–76	1962–64
Rural	10.0 g	8.0 g	23.8 g	28.0 g
Urban	16.0 g	—	—	26.5 g
National	11.0 g	—	—	27.6 g

Source: National Survey of Bangladesh, Institute of Nutrition, Dhaka University and Nutrition Survey of East Pakistan, U.S. Department of Health, Education, and Welfare (4)

2.1.6 Non-staple Foods

Non-staple foods are popular items consumed by people in rural and urban areas, such as puffed rice (*muri*) which is sold at about Taka 23 per kg (US \$ 0.50). The price of raw sugar (*gur*) is Taka 21 per kg and sweet biscuits (cookies) Taka 56 per kg (9). If these items can be processed and packaged centrally at lower cost, they would be potential vehicles for fortification due to the high level of consumer preference for them nationwide.

2.2 Summary of Fortification Opportunities and Constraints

Food	Opportunities	Constraints
Wheat flour (<i>atta</i>)	<ul style="list-style-type: none"> Consumed widely and increasing in rural population Processed and packaged in mills in every district Easily stored and distributed Preparation methods do not destroy fortificant 	<ul style="list-style-type: none"> Local production low Needs quality control and standardization of packaging
Rice	<ul style="list-style-type: none"> High consumption levels in the entire population 	<ul style="list-style-type: none"> Produced all over the country at household level Cooking methods eliminate fortificant
Oil	<ul style="list-style-type: none"> Excellent vehicle since vitamin A soluble 	<ul style="list-style-type: none"> Very low consumption Refined in 50–60 plants all over the country Quality control and packaging required Cooking methods may destroy fortificant
Sugar	<ul style="list-style-type: none"> Only 16 mills centrally controlled by GOB Widely consumed 	<ul style="list-style-type: none"> 50 percent of country's demand is imported from India at lower cost Small packages required for distribution
Tea	<ul style="list-style-type: none"> Widely consumed 	<ul style="list-style-type: none"> Only consumed by adults Reduces bioavailability of iron
Lentil	<ul style="list-style-type: none"> Widely consumed 	<ul style="list-style-type: none"> Produced at local level No central processing possible
Non-staple traditional foods	<ul style="list-style-type: none"> <i>Gur</i> (raw sugar) used widely <i>Muri</i> (puffed rice) consumed widely by children Biscuits (cookies) are consumed widely by both adults and children 	<ul style="list-style-type: none"> <i>Gur</i> only produced at the household level <i>Muri</i> only produced at village level Biscuits may be too expensive for certain segments of the population

2.3 Institutional Capacity for Food Fortification

The growth of food, pharmaceutical, and allied industries has been quite rapid since 1971, when the country became Bangladesh. There are about 2,000 large, medium, and small flour mills all over the country, owned mostly by the private sector (9). The large flour mill owned by the government near Dhaka has been the trendsetter in this industry in the production and packaging of different grades of flour. The privately owned flour mills in Narayangunj and Chittagong appear to be efficiently operated under sanitary conditions. The milling capacity range is from 40 to 6,500 MT per eight-hour shift. Packaging in 25-kg, 5-kg, and 1-kg bags can be done in some of the mills. Most of these mills may be equipped with mixers and dosifiers for adding fortificants to the flour prior to bagging.

There are about 800 rice mills in northern Bangladesh, and in the entire country there are estimated to be more than 2,000 large and small mills. Parboiled rice is produced in small quantities. Most of the rice milling is done to remove the husk and bran. The milled rice is packed in 25 kg and 50 kg sacks. Small packages are not in use since rice is sold in bulk in the open markets.

Oil refineries for processing crude and de-gummed soybean oil have been installed in large numbers. Small oil seed crushing and expelling mills are available all over the country and are usually used for locally grown mustard seeds. There are about 60 oil refineries but they do not operate at capacity due to a lack of imported crude oil. Only a few plants produce hydrogenated vegetable oil.

There are 16 sugar mills, all owned by the government. They do not operate at capacity due to a lack of sugar cane production. The cost of production is high and imported sugar from India accounts for 50 percent of the demand (8).

The tea industry is flourishing, with processing plants for drying tea leaves in almost every tea garden in Chittagong and Sylhet. They are well established and some have even diversified into related businesses, such as bottled water and beverages.

Agro-based industries are getting a lot of attention because they are considered as the next major export earner. Fish, shrimp, fruits and vegetables are being processed for the domestic and export markets. Baked goods, bottled drinks, jams and jellies, milk, cheese, and butter are being processed and packaged in limited quantities but the trend is on the rise. Expansion of the canned, frozen, fried, and dried food industry is taking place at a rapid pace.

In the pharmaceutical and fine chemical industries, multinational companies (such as Pfizer, Rhone Poulenc, Ciba/Novartis) have local affiliates. A local company, Beximco Pharma, has a fine facility and is currently engaged in production of multivitamin and mineral tablets. Vitamin mix for feed is also produced in cooperation with companies like Roche and BASF.

2.4 Analytical Laboratory, Testing, and Monitoring Capabilities

In addition to small testing laboratories, the Government of Bangladesh maintains the Bangladesh Standards and Testing Institute (BSTI), which is responsible for analytical work for maintaining safety and quality of food and feed. BSTI also provides the seal of approval before a product goes to market. It can be strengthened to develop the testing and monitoring of fortified foods.

2.5 Government and Industry Support of Fortification

Fortification of food was perceived as an excellent idea by both the government officials and by the members of private industries in Bangladesh during individual and group meetings. In a seminar on fortification attended by approximately 50 members of the Bangladesh Agro Processors Association, there were numerous requests for fortification of noodles, baked goods, beverages, fruit juices, jams, jellies, and pickles. It was evident that private industries were willing to enhance food quality by adding appropriate fortificants.

At a meeting with the Flour Millers Association in Narayanganj, the idea of fortification was discussed at great length. These flour millers supply about 60 percent of the flour (*atta*, *maida*, *suji*) to all of Bangladesh. They were extremely enthusiastic about fortification because they felt that salt iodization had been very successful in Bangladesh and that fortified flour would be easily marketed as a value-added product.

In a separate meeting with the Director General of Food the idea of fortifying flour in the GOB-owned flour mill was discussed, and it was received with enthusiasm. Initial training of private sector participants during the trial period of flour fortification could be done at this mill. Coordination of testing and development of draft regulation for future legislation could also be initiated through this office. In subsequent meetings at the Ministry of Food and Agriculture, Ministry of Education and Ministry of Industry the fortification idea received support. Officials connected with the Ministry of Health were also positive about it.

The review of fortification-related legislation with GOB officials showed that drafting of umbrella legislation would be required. The GOB has competent staff in the relevant ministries dealing with legislation, regulation, and quality control. Since legislation for salt iodization had taken place successfully, it was envisaged that food fortification laws could be enacted without great difficulty. Policy support to the legislative and judiciary branches of the GOB will be helpful in moving this process forward with deliberate speed.

In a subsequent meeting with GOB officials and industry representatives, the question of tariffs and incentives was discussed. This area needs further discussion because taxation of imports is directly related to the revenue base in Bangladesh.

3. Conclusions and Recommendations

At present, fortification of wheat flour appears to be the most appropriate food vehicle for introducing the concept of food fortification. Sugar and oil may be considered as potential candidates for fortification in the future once production and processing can be centrally controlled and the supply can be increased to meet domestic consumer demand. Non-staple items may be fortified gradually by private industries once the concept is introduced to them. It would be difficult to fortify *muri* and *gur*, but a dry mix added as sprinkles at the point of consumption may be considered.

Wheat flour fortification, however, should be done in a systematic manner from a pilot program in a few mills and then should be scaled up, if successful. Wheat grain should not be fortified because it is stored in silos in bulk and transported to the mills in large sacks with a considerable amount of filth, which is removed prior to milling. Loss of fortificants at that stage would render the fortification of grain ineffective.

Pilot Fortification Program

It is extremely important to introduce flour fortification with vitamins and minerals in a careful and systematic manner. The quality of the premix and the amount required per batch of flour need a standardized system of recording, testing, and monitoring. The facilities should have the right mixers, dosifiers, and quality control equipment to meet the acceptable levels of additives according to regulations developed for the purpose. The overall sanitary condition of plants should be ensured according to good manufacturing practices (GMP) used in Europe and the United States. Finally, packaging, storage, and distribution of products should be done by distributors under controlled conditions to maintain the effective levels of fortificants at the end-user level. Wheat flour (*atta*) is more sensitive to oxidation than *maida*. Its storage and shelf life should be determined under field conditions so that the fortificants do not cause staleness and rancidity. All these steps require proper selection of flour mills and setting up logistics for storage and distribution prior to starting the fortification program.

A pilot program in a few selected facilities for a target population would be ideal. This would introduce not only the concept of fortification, but also determine the obstacles to be removed in achieving success prior to a nationwide launching of flour fortification in Bangladesh. An impact evaluation of fortified food consumption by the target population would help determine the extent to which fortification of flour would be effective in reducing micronutrient deficiency. Such a program can be developed by choosing a few private mills near test sites around the country and using the GOB-owned mill near Dhaka as the main training center.

Role of the Food for Education Program

The Food for Education (FFE) program was launched by the GOB in 1993 to increase the school enrollment and attendance rate and to reduce the dropout rate of children from low-income families in the primary education cycle. These children, 5–11 years old, are not reached by vitamin A and iron supplementation programs. The FFE program entitles a poor family with one child in primary school to 15 kg of wheat or rice of equivalent price, and with two or more children in the school to 20 kg of wheat or rice of equivalent price per month. The program is funded by the GOB and the food is given free as an incentive to families so that the children go to school instead of working to generate income.

In 1999, an assessment by the Center for Development Research, Bangladesh showed that FFE was implemented in 1,243 unions providing benefits to about 2,296,000 students from about 2,182,000 poor families (10). The program has been successful, and the GOB plans to refine and continue it. The distribution system is expected to undergo a change. Instead of schools serving as distribution centers, dealers in each district would be appointed for distribution of flour in a packaged form. This would eliminate the need for milling of wheat grain by recipients and avoid losses in handling and weighing at the point of distribution.

The program covers all 64 districts in Bangladesh. Therefore, there will be 64 dealers who would be responsible for distribution of packaged flour. The dealers would be compensated for their services by the GOB. In a meeting with the project director of FFE, the idea of fortification of flour was discussed in detail. The fortification idea was perceived as an excellent means of providing additional nutrients to poor families. If the wheat is milled by the dealers in each district, there will be 64 locations to introduce the technique of fortification. As a start-up, it would need a major, well-coordinated effort between the Ministry of Education and Ministry of Food with support from the Ministry of Health and Ministry of Industry. It was, therefore, suggested that a pilot program should be initiated starting in 10–15 percent of the locations (8–10 sites) for a trial period of 12 months with three months of preparation at the start and three months of evaluation at the end (a total of 18 months). Based on the results and lessons learned, it can be expanded to the entire FFE program.

Preparation/Implementation/Assessment of the Pilot Program

The following steps should be taken to prepare the pilot program:

- A task force should be formed jointly by the Ministry of Food and the Ministry of Education, with appropriate participation by USAID/Dhaka to oversee the program.
- A technical assistance team should be assembled to design the pilot program for distribution of fortified *atta* through FFE, select the pilot program sites, and prepare for the trial fortification. Consumption data for the target population should be collected prior to the launching of the pilot program.

- Assistance should be given in the purchase of fortifying equipment and packaging machinery.
- Assistance in the procurement of the premix with vitamins and minerals and the recommended dosage should be provided.
- The quality control system should be strengthened by providing equipment, reagents, protocol, and training at the local level and at the BSTI.
- Monitoring and evaluation of the program should be designed, including a survey to determine consumption of *atta*, which will indicate the vitamin and mineral intake among the target population. This will require a clear definition of the target population (age, sex, nutritional status, etc.) as well as the evaluation criteria (improvement in nutritional status, change in school enrollment, etc.).

At the end of 12 months, the following actions should be taken:

- A final assessment should be conducted to determine if the pilot program was successful to the extent that the fortification program could be extended to the entire FFE program and eventually to the entire country.
- A plan of action to expand the fortification to the entire country should be developed if the results of the pilot program are positive.

During the pilot program policy support should be given to prepare the following for discussion and necessary action:

- Draft of the umbrella legislation for food fortification and food additive regulations
- Standard testing procedure and certification by BSTI for issue of seal of approval
- Quality assurance program to monitor and regulate the fortification of food
- Nutrition labeling and declaration of food additives
- List of trade- and tariff-related issues to facilitate fortification
- Nutrition education for all beneficiaries of the FFE program
- Consumer education program with materials to promote fortification

Proposed Outcome and Cost of the Pilot Program

The pilot program will cover 15 percent of the 2.2 million families or 1.6 million people if the average family size is five persons. It can lead to the coverage of 11 million people for the entire FFE program at the end of the 18-month pilot program. Further expansion of flour fortification can take place within a few years if this program is successful.

The initial cost of the pilot program is estimated to be US \$455,000 to \$505,000. This is based on the following items for eight to 10 sites:

- Cost of dosifier, support equipment, packaging machine, and fortificant (premix containing vitamin A , vitamin B, iron, folic acid [see Appendix C]) per site \$20,000 x 10 sites = \$200,000 (160,000 for eight sites)
- Cost of laboratory testing equipment , reagents, and support to BSTI, \$50,000
- Technical assistance for a three-person team to visit three times and provide support in planning at the beginning, and for monitoring and data collection during the pilot program and evaluation/ assessment at the conclusion of the program, \$180,000
- Local field staff consisting of one team leader and 10 field representatives at site for 12 months, \$75,000 (\$65,000 for eight sites)

This pilot program will introduce fortification in a proper manner and lay the foundation for this method of intervention for other food vehicles in Bangladesh.

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Appendices

Appendix A

Scope of Work

MOST Project Fortification Assessment Visit

Background

The population living in Bangladesh has long been vulnerable to vitamin A deficiency (VAD). While the Government of Bangladesh (GOB) has developed programs to address this issue in some vulnerable sub-sectors of the population through vitamin A capsule (VAC) distribution, the underlying causes of VAD remain and non-supplemented populations continue to suffer. Inadequate agricultural production and low dietary consumption of vitamin A-rich foods, population increases, general malnutrition, frequent natural disasters, and high rates of childhood disease are all major factors contributing to VAD in Bangladesh.

In response to the VAD problem in Bangladesh, USAID/Bangladesh drafted a plan of action. The objective of the draft plan was to (1) describe the current status of VAD and programs that improve vitamin A status of children and women in Bangladesh; (2) document the programmatic gaps and needs of the country; and, (3) propose new USAID/Bangladesh activities that will help eliminate VAD and that are compatible with the Mission's Strategic Objectives of improved family health and food security. The plan has yet to be finalized.

One of the activities outlined in the draft plan of action is to assess the feasibility of food fortification with micronutrients, particularly vitamin A. To assess the current vitamin A and fortification situation, USAID/Bangladesh has requested technical assistance from the MOST Project.

Objective:

Work with USAID and its in-country partners such as HKI, the GOB including the Planning Commission and relevant ministries (Food, Agriculture, Health), private industry, other donors (MI and UNICEF) and local NGOs engaged in vitamin A and fortification activities to determine the feasibility of food fortification in Bangladesh.

Scope of Work:

This consultancy will be the beginning of collaborative efforts between MOST, USAID/Bangladesh and key partners engaged in vitamin A and fortification activities in Bangladesh. The result will be a fortification assessment report .

The assessment prepared by the MOST consultant will include the following:

- A review of available information regarding food consumption patterns to determine the potential penetration of fortified foods in the target population;
- A review of the accessibility of staple and non-staple traditional foods to the target population;
- A review of the institutional capacity of the food industry to produce, process fortify, package and distribute food products with consistent quality;
- A review of legislation, standards and guidelines related to food safety and fortification.

- A review of incentives and disincentives for the production of fortified foods as a result of tariff and import policies.

During the visit to Bangladesh, the consultant will:

- Meet with key partners to identify their priorities and discuss areas in which USAID assistance could compliment their efforts;
- Conduct site visits as needed to gather information to support the reviews itemized above; and
- If feasible, plan and conduct an informal meeting with partners in-country working in the micronutrient arena (including USAID, the GOB and other key partners) to propose priority areas for USAID fortification activities.

The product of the consultancy will be an assessment report including a discussion of the relative merits and drawbacks of fortification as an approach to the sustainable delivery of micronutrients in Bangladesh.

Duration of Assignment and Expertise Required

MOST will field to Bangladesh from 16 August to 10 September 1999, Dr. Kamal Hyder, MOST's Food Industry Advisor. Dr. Hyder will provide the fortification expertise required to conduct the assessment and will be responsible for writing the USAID/Bangladesh draft fortification assessment report.

Dr Hyder will brief and debrief USAID/Bangladesh personnel concerned with the Mission's SO1 and SO2 upon arrival and prior to departure from Bangladesh. During the briefing meeting, the Mission staff and Dr Hyder will discuss expectations of the consultancy, and in particular, the form, content and style of the report to be produced.

Primary USAID/Bangladesh contact person: Matt Friedman, TAACS

Deliverables:

MOST will provide to USAID/Bangladesh:

1. A draft version of the assessment report for comment and discussion before end of consultancy period in Bangladesh. The assessment report should contain extent of the VAD problem, the current situation, a list of contacts, and recommendations of follow-up activities detailing probable participating partners, including estimated timelines and illustrative budgets.
2. Upon receipt of USAID/Bangladesh's comments and approval of the draft version, MOST will complete the final version of the fortification assessment report and provide USAID with 3 copies.

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Appendix C

Premix Example

Composition of Roche Precision Premix (Title II Wheat Flour)

DESCRIPTION	USDA
Ascorbic Acid F.P.	78.0000 mg
Niacinamide	22.0000 mg
Pyridoxine Hydrochloride	2.7800 mg
Riboflavin, Type S	1.9600 mg
Thiamine Mononitrate	1.7300 mg
Vitamin B ₁₂ 1.0% SD (spray-dried)	0.7000 mg
Vitamin A 250 SD (spray-dried)	24.0000 mg
Vitamin E 50% CWS/F	69.0000 mg
Folic Acid	0.4800 mg
Vitamin D ₃ 100 SD (spray-dried)	4.8000 mg
D-Calcium Pantothenate SD (spray-dried)	12.5400 mg
Biotin	0.3600 mg
Di-Cal Phosphate anhydrous	0 mg
Copper Gluconate	15.7000 mg
Iron Electrolytic	19.1000 mg
Potassium Iodide	0.2430 mg
Zinc Oxide	20.0000 mg

Note: Specific calculations should be made for particular applications.