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Pakistan, Factor 11: Malnutrition

Pakistan: Conquering “Hidden Hunger” with Bio-fortification

Malnutrition is a continuing health issue in the world, with the highest prevalence in South Asian countries including India, Bangladesh and Pakistan. Inability of South Asian countries to reduce childhood malnutrition is said to be the phenomenon of the “Asian Enigma”. Multiple factors contribute to nutritional deficiency. An important component of this malnutrition is “hidden hunger” or micronutrient deficiency, which is the chronic lack of vitamins and minerals (1). Pakistan is one of the South Asian countries, which has not been able to make any significant improvement in the crisis of “hidden hunger” in the last four decades. “Hidden hunger” can have far-reaching effects on education, physical growth, national economy, productivity of the society and the population’s socio economic status. This can lead to a detrimental effect on the overall health of people in the country. Additional impacts include increased maternal and child mortality, increasing birth defects, problems with visual acuity, and reduced cognition. Many factors underlie this disastrous health crisis. Poor maternal and paternal education plays a significant role (2). There is severe lack of education for women in the rural areas with minimal engagement of mothers in spreading knowledge on the importance of a nutritionally rich diet. Factors such as poverty and rising food prices with a growing divide in the rich and poor make micronutrient malnutrition even more alarming. Fragmented efforts to overcome micronutrient malnutrition have been made by the government, but rather unsuccessfully. To counter this issue, a National Nutrition Strategy was developed a few years ago in partnership between the Ministry of Health of Pakistan (MHP) and UNICEF (United Nations International Children and Education Fund). Due to political instability and poor governance, the strategy was never implemented, despite participation of some of the best experts in the MHP and UNICEF.

Pakistan is the seventh most populous country in the world with a population of approximately 196 million (2). According to the Soil Survey of Pakistan, only twenty eight percent of Pakistan’s land area is under cultivation. A typical size for a rural family is seven people (3), living on a diet consisting of wheat, rice and legumes. On average, a child receives schooling for eight years. However, attending school is not a government requirement. The literacy rate in Pakistan is fifty five percent, which ranks 113th out of 120 countries. About twenty two percent of the population is below the poverty line in Pakistan. Only 2.1 percent of Pakistan’s GDP is spent on education while 2.5 percent is spent on health care. There are only 0.8 physicians per 1000 people and 0.6 hospital beds per 1000 people (2). Sanitation in the rural areas is poor and at least sixty six percent of the rural population lacks adequate access to sanitation. Poor sanitation leads to a high prevalence of intestinal parasites in rural areas; one study reports that 47.5 percent of people living in these regions have intestinal parasites (4).

Pakistan’s agriculture faces multiple issues, though there has been some progress recently. Approximately forty six percent of Pakistan’s labor force works in agriculture as compared to five percent in advanced countries. Due to increasing population and stricter laws of inheritance, land ownership is divided repeatedly so that a large number of farmers now own less than eight acres of land (6). The primary crops grown in Pakistan are cotton, wheat, rice, sugar cane, fruits and vegetables. Secondary crops include beans and legumes.

Farmers in Pakistan face several environmental challenges in crop production including desertification (degradation of soil due to intensive farming so that the soil loses important nutrients), soil erosion and natural disasters such as floods. Although the climate in Pakistan is suitable for farming, repeated floods over the last few years have jeopardized growth of crops containing important micronutrients. Recently,

drought in the province of Sindh has caused a high mortality rate in the local population, especially children. There are several other challenges to crop production. Due to poor use of pesticides, pests and insects have inflicted damage on crops leading to poor yields. Another hindrance is the persistent power shortages throughout the country affecting water supply from wells and leading to a detrimental effect on wide scale commercial mechanized farming.

The most important problem facing Pakistan's agriculture is the low yield per acre of every major crop. The yield per acre is as low as thirty percent of that compared with farming in advanced countries like the United Kingdom(7). The reason for the low crop yield is because of problems with water logging and salinity of the soil, old and inefficient farming methods such as using human and animal labor, improper crop rotation, inadequate agricultural research, subsistence farming and scarcity of high yield variety seeds. Additional stumbling blocks include poor household education, credit constraints (especially for small farm owners), water constraints, outdated cultivation and harvesting practices. Manual harvesting is slow and inefficient and leads to much wastage. Inadequate or delayed application of fertilizer has also led to a negative impact in producing a successful crop yield (5).

Overall, farming in Pakistan has improved in the last two decades. Most notably, two successive food crises forced policy makers to formulate a food security policy to improve farming. Commercial farming started at a large scale in 2007 by enterprising farmers, who boosted tunnel farming and farm mechanization. Commercial farmers implement multiple types of technology, such as chemical technology to protect plants, hydrological technology with tube wells to get a water supply for their farms and mechanical technology comprising of tractors, thrashers and bulldozers. There has also been a modest introduction of biotechnology in the private sector.

Access to food is limited in many rural parts of Pakistan because of several reasons. First, the cost of food is very high due to the high inflation rate of 7.7 percent (2). Second, various parts of the country are affected by violence and terrorism, which prevent the residents of these areas to have access to nutritious food. The infrastructure in Pakistan is limited. A particular sector of infrastructure in need is means of transportation and highways to rural areas. More focus is on urban roads than rural, even though majority of the population in Pakistan is in rural areas. Produce from farms and nutritionally fortified food products from factories cannot be readily transported in necessary quantities to the rural population. Another key issue is local and national politics. The province of the government that is in power gets a lion's share of the resources allocated to it. An example is the current prime minister, who hails from Punjab and funding more infrastructure projects in Punjab than in other provinces like Baluchistan and Sind. Lastly, poor food storage practices in villages lead to loss in the quality and quantity in food.

Malnutrition in Pakistan is directly and indirectly responsible for as much as thirty five percent of all deaths in children under the age of five. No improvement has occurred in the last forty-six years (8). In 2011, the National Nutrition Survey reported that among children under the age of five, 44 percent were stunted, 15.1 percent were wasted and 31.5 percent were underweight (8). These numbers have worsened as compared to the National Nutrition Survey of 2001. In certain parts of Pakistan, malnutrition is up to 21 percent to 23 percent, while international emergency standards are equivalent to 15 percent. This is considered one of the worst in the world. Furthermore, the purchasing power of an average family in the rural areas is decreasing progressively. A large Pakistani family spends up to 48 percent of family income on food, compared to 25 percent expenditure of household income on food in India and 7 percent in the USA (9). Over the past twenty years, little improvement has been made in the prevalence of malnutrition despite greater food availability and increased food intake per capita (8).

Malnutrition caused by micronutrient deficiency is a major healthcare concern for Pakistan. The micronutrients including iron, zinc, iodine, vitamin A and folic acid are served in significant paucity to the rural population. Fifty eight percent of rural children under the age of five had vitamin-A deficiency;

forty-three percent children under age five have iron deficiency. Thirty three percent of rural children iron deficiency anemia (8). Thirty six percent rural children under the age of five had zinc deficiency; thirty six percent of children had iodine deficiency. In the rural setting, sixty two percent of all children have anemia (7). Anemia is a condition in which a person does not have enough healthy red blood cells to carry adequate oxygen to different organs leading to fatigue, weakness and reduced capacity to work (10).

Iron deficiency anemia can lead to an increase in maternal and infant mortality, delayed mental and physical development, negative behavioral consequences, reduced hearing and visual function and impaired physical performance (11). Vitamin A deficiency can cause night blindness and a weak immune system with increased risk of diarrhea and measles (11). Lack of adequate micronutrients is the leading cause of neural tube defects and birth defects related to the heart (12). The Micronutrient Initiative and the World Bank estimate that due to micronutrient malnutrition, a country may lose as much as 2 percent to 3 percent of its GDP per year (11). Micronutrient deficiency causes a decrease in functional capacity leading to reduced productivity, increased absenteeism, lowered academic achievement and an overburdened health care system (12).

Introducing a strategic plan to counter micronutrient malnutrition will help reduce several problems for the under privileged people in Pakistan. The strategic plan will have to be multipronged.

Presently one provincial government in Pakistan has begun mandatory fortification of wheat flour with micronutrients (13). This process begins when harvested wheat is delivered to flour mills. Once the wheat arrives at the flour mills, the fortification process is performed. During the fortification of wheat, micronutrients such as iron and folic acid are added to the wheat flour so that the consumers face reduced incidence of iron and folic acid deficiency. This is a two-year project that started in 2013. The project is done in collaboration with Global Alliance for Improved Nutrition (GAIN) (14). GAIN uses a unique approach where they create a large scale intervention program with engagement of multiple stakeholders and partnerships to create scalable results. This may include private, sectoral and governmental stakeholders (23). An example of involvement of multiple stakeholders is demonstrated in the engagement and approval of The Pakistan Flour Mill Association and local government which has been key to the successful implementation of this project, where the goal is to make one million tons of iron and folic acid fortified flour available to sixteen million people by the end of December 2015. The government must make this implementation mandatory in all other provinces with strict quality standards.

Another advanced method of improving micronutrient malnutrition is through bio-fortification. Bio-fortification is the process of breeding nutrients and micronutrients into food crops (15). Bio-fortification can be done in different ways including genetic modification of seeds and soil enrichment with micronutrient rich fertilizer (16). These two processes can also be done together to complement each other (16). Biofortification of seeds is done through multiple techniques with genetic modification of the seeds. Plant seeds are genetically modified to increase micronutrient content in the seeds. The resulting plant contains grain that has a much greater amount of micronutrients compared to a non bio-fortified seed crop. Pakistan has acquired the capacity to produce genetically modified plants. However, apart from cotton, no genetically modified crops have been released in Pakistan (17). The advantage of food products developed through biotechnology is multifold. Genetically modified seeds can be resistant to water conditions such as drought, which will lead to a higher crop yield than normal with lower requirement for irrigation (25). Improved quality of taste can also be introduced through biotechnology (26). Due to poverty and overall economic issues, smaller food portions are available to the underprivileged population. Despite the consumption of smaller portions, adequately fortified and nutritionally enhanced meals through biotechnology may still allow for fulfillment of the need of micronutrient rich diet. Increased quantity of produce will also lower cost of food products for the consumer. In developing countries, the main problem faced by the common man is cost of food. Biotechnology can serve to

increase the buying power for food with lower cost for underprivileged populations. Another advantage from biotechnology for developing countries is the availability of pure and unadulterated products.

Certain biotechnological processes may not be suitable to Pakistanis. Processes that may affect the religious or ethical values of people may be inappropriate. Negative effect on the ecosystem and biodiversity in the local region may be impacted (25). Seed patenting has been an issue for genetically modified seeds developed by Monsanto, which owns 95% of the cotton market in India (25). The patenting raises the cost of seeds for poor farmers. Biotechnological processes must be cautiously evaluated considering the local population's sensitivities and financial limitation of farmers before being adopted for implementation.

Currently there are twenty-nine biotech institutes in Pakistan (18). The government and the World Food Program must invest in equipment and expertise with properly trained personnel to develop genetically modified micronutrient-enriched seeds that grow healthy, weather tolerant crops. These genetically modified seeds should be made easily available at a low cost to Pakistani farmers. Contribution from the private sector toward research will be necessary. Companies like Pioneer and Monsanto can subsidize research. Fauji Foundation, an army subsidiary can set up a research facility that can process and deliver products, considering the high quality organizational skills and network available from past army officers. Scholarships focused on biotechnology based expertise for need based students will create a mutually beneficial program for biotech and these students. These researchers should also be encouraged to participate in the agricultural department of the government, in order to make decisions based on firm grounds of knowledge.

The genetically modified seeds from these institutes must fulfill National Bio-Safety Guidelines. The government should expedite the release of the enriched genetically modified seeds for commercial use. Regulations to prevent illegal genetically modified crops must be enforced by the government. The regulations should follow the Cartagena Protocol on Bio-safety, which aims to insure the safe handling and transport of products developed through biotechnology (22)

Priority research centers must be developed to avoid duplication of biotech research by the government. Tight monitoring and evaluation to ensure quality of research is important. The research must also meet international regulatory obligations. The local farming industry must be linked with biotech research. The government must create jobs for biotechnology graduates. International agricultural corporations such as DuPont, Pioneer, Syngenta and Monsanto as well as international donors must increase their investment in the biotechnology sector and bring international experts for coaching and mentoring local research. However, occasionally, misinformation about international corporations can create problems locally with trust in their products and services. An example is a recent issue with Nestle Corporation in India, about Maggi Noodles, which were reported by local food regulators to have excess lead content in the Noodles. Despite Nestle claiming complete safety of the food product, Nestle still had to suffer poor public image for its product. (19).

Potential resistance from the local population towards the genetically modified products can be an obstacle to their wide scale usage in the public. Village elders who are trusted in resolving local conflicts are good sources of educating the families in their areas about the beneficial impact of products that are genetically modified. Non-profit U.S.A based organizations, such as United States Agency for International Development (USAID) and private corporations have made significant efforts in advancement of Pakistan's agricultural sector. A stumbling block for U.S. participation in agricultural projects is the resentment and lack of trust created by U.S. drone attacks in the Northern region of Pakistan. The Pakistani army has great rapport with the Pakistani population. The support and engagement from Pakistani army through their Fauji Foundation subsidiary in educating the general population will create more buy-in to accepting biotechnology. GAIN and organizations such as Scaling

Up Nutrition (SUN) movement and Bill and Melinda Gates Foundation can work on developing partnerships between public and private sectors (24). These organizations can work on scalability, sustainability and educating and understanding consumers. Corporate social responsibility in private corporations will help support the Non-profit organizations noted above through creation of a value proposition for the company. Tensions and suspicions between key stakeholders can create hinderances in the success of these partnerships. The Social Audit Model from the Sandra Rotman Centre can be used to resolve such conflicts (24). Additionally, partnering with neighboring countries such as China and India who are implementing micronutrient bio-fortified farming (18), and are more advanced in biotechnology in micronutrient rich bio-fortified crop production will help Pakistan gain insight in the biofortification methods that these countries are using successfully.

Education of the common people towards adoption of biotechnology is critical. Biotechnology courses should be included at the school and college level with opportunities of research for young students. This education will provide future farmers the knowledge to grow their own micronutrient rich crops without external assistance. The government should also implement programs for the education of all citizens regarding the nutritional benefits of genetically modified, micronutrient rich crops. By the same token, communities should increase awareness of the value of micronutrients to its people. Communal decision making for promotion of health through improved nutrition and adoption of biotechnology is important in lowering the presence of micronutrient malnutrition. Local village and town leaders must be engaged and educated about the benefits of crops, which have been bio-fortified. Politicians elected in their areas must play a key role in convincing the local farmers and communities about benefits of farming enhanced with biotechnology.

The prevalence of micronutrient malnutrition is a major health problem in Pakistan. A key remedy to this shortcoming is using biotechnology in farming to promote the production of plentiful amount of food containing a high amount of micronutrients. A diet rich with micronutrients for the people can help improve the current “hidden hunger” malnutrition problem as well as maternal and child mortality, education, productivity, chronic childhood health issues, national economy and lower demand on health care. A healthy child is a happy child and a child who is free of micronutrient malnutrition can perform as a highly productive member of the society. The GDP of Pakistan will demonstrate a positive trend by lowering the incidence of micronutrient malnutrition. Although new agricultural methods using biotechnology will seem complicated at first, Pakistani farmers will begin to adapt to them quickly. Moreover, in order for people to adopt eating a micronutrient rich diet, the government must educate its citizens about the importance of eating a healthy meal with micronutrients. Using this approach, communities are likely to see the multigenerational benefit and work in collaboration with the government, private entities, International organizations, and food manufacturers to resolve the problem of micronutrient malnutrition and its effects on the people and economy of Pakistan.

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